



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL
PIPELINE UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



GAIL (India) Limited
(A Government of India Undertaking)
A Maharatna Company
GAIL Jubilee Tower, B-35 & 36, Sector-1,
Noida- 201301, State: Uttar Pradesh, India

TENDER REF.- GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

TENDER ID: 2026_GAIL_278290_1

**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED
WORKS OF STEEL PIPELINE UNDER JAMSHEDPUR GA
(CITY AREA) FOR CITY GAS DISTRIBUTION NETWORK
(1 YEAR ARC)**

OPEN DOMESTIC COMPETITIVE BIDDING

VOLUME – I OF III



PREPARED AND ISSUED BY
BRIDGE AND ROOF COMPANY (INDIA) LIMITED
(A Govt. of India Enterprise)
KANKARIA CENTER (5TH FLOOR), 2/1 RUSSEL STREET,
KOLKATA – 700071, WEST BENGAL (INDIA)
PHONE: +91(33)2217-2108/2274.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

**SECTION-I
"INVITATION FOR BID (IFB)"**

ON OPEN DOMESTIC COMPETITIVE BASIS

Ref No: GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

Date: 03.06.2026

**To,
PROSPECTIVE BIDDERS**

SUB: TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION NETWORK (1 YEAR ARC).

Dear Sir/Madam,

1.0 BRIDGE AND ROOF COMPANY (INDIA) LIMITED (BANDR) (CIN U27310WB1929GOI003601), EPMC for the project, invites bids on behalf of M/s GAIL (INDIA) LIMITED (CIN No. L40200DL1984GOI018976) the largest state-owned natural gas processing and distribution company and the Maharatna, from bidders for the subject job/works on Government NIC portal, in complete accordance with following details and enclosed Tender Documents.

2.0 The brief details of the tender are as under:

(A)	NAME OF JOB / BRIEF SCOPE OF WORK	TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION NETWORK (1 YEAR ARC).					
(B)	TENDER NO. & DATE	Tender ID: 2026_GAIL_278290_1 , DT-03.06.2026					
(C)	TYPE OF BIDDING SYSTEM	<table><tr><td>SINGLE BID SYSTEM</td><td>X</td></tr><tr><td>TWO BID SYSTEM</td><td>√</td></tr></table>		SINGLE BID SYSTEM	X	TWO BID SYSTEM	√
SINGLE BID SYSTEM	X						
TWO BID SYSTEM	√						
(D)	TYPE OF TENDER	<table><tr><td>E-TENDER</td><td>√</td></tr><tr><td>MANUAL TENDER</td><td>X</td></tr></table>		E-TENDER	√	MANUAL TENDER	X
E-TENDER	√						
MANUAL TENDER	X						
(E)	COMPLETION/CONTRACT PERIOD	Annual Rate Contract shall be valid for 12 (Twelve Months) from date of issuance of “Fax of Acceptance”,					



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

		SL.No	Description of Work	Time Schedule
		1	Laying of pipeline including all associated works up to 2.0 Km	3 months
		2	Laying of pipeline including all associated works more than 2.0 Km and up to 5.0 Km	4 months
		3	Laying of pipeline including all associated works more than 5.0 Km and up to 10.0 Km	6 months
		4	HDD for length up to 300 meter including all associated works for various dia crossing	4 months
		5	HDD for More than 300 meter and less than or equal to 600 meter for various dia crossing	5 months
		6	HDD for More than 600 meters for various dia crossing	6 months
		7	Above ground piping works at each location including supply of material & valves.	4 months
(F)	BID SECURITY / EAR-NEST MONEY DEPOSIT (EMD)	APPLICABLE	<div>√</div>	
		NOT APPLICABLE	<div></div>	
Rs. 9,56,022/- (Rupees Nine Lakh Fifty Six Thousand Twenty Two Only)				
EMD exemption is not applicable to MSE				



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

		bidders being a works contract. MSE bidders also have to submit EMD in order to participate in this tender. (Refer clause no.16 of ITB)
(F1)	DECLARATION FOR BID SECURITY	Start-Ups and CPSEs (to whom exemption is allowed as per extant guidelines in vogue) are required to submit Declaration for Bid Security as per proforma at Form F-2A.
(G)	AVAILABILITY OF TENDER DOCUMENT ON WEBSITE(S)	From 03.06.2026 to 17.06.2026 (1400 Hrs., IST) on following websites: Govt. e-Procurement System of National Informatics Center (GePNIC) portal [e-tender portal] https://etenders.gov.in/eprocure/app [Note: E-bid to be submitted only through this portal] GAIL's Tender Website – www.gailtenders.in (Notice of the e-NIT)
(H)	DATE, TIME & VENUE OF PRE-BID MEETING	Date: 10.06.2026. Time: 17:00 Hrs. Venue: To be held through virtual/online/video conferencing mode using following Google Meet Link: Join the Google Meet Meeting Link: https://meet.google.com/eqh-aunp-huf
(I)	DUE DATE & TIME OF BID-SUBMISSION (ON OR BEFORE)	Date: 17.06.2026 Time: 14:00 Hrs.
(J)	DATE AND TIME OF UN-PRICED BID OPENING	Date: 18.06.2026. Time: 15:00 Hrs.
(K)	CONTACT DETAILS OF TENDER DEALING OFFICER	Name : Sandip Talukdar Designation: GM(CS)/ Head SBU-II Bridge And Roof Company (India) Limited e-mail : sandip.talukdar@bridgeroof.co.in <u>In addition may contact</u> Sri Rahul Kumar Mob-8709391189



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

		e-mail: kumar.rahul95@bridgeroof.co.in Sri Mreenmoy Halder Mob-9744764501 e-mail: mreenmoy.halder05@bridgeroof.co.in Sri. Vijayakrishnan V E-mail: vijayakrishnan.v@bridgeroof.co.in
(L)	DEALING GAIL'S OFFICE ADDRESS	GAIL (India) Limited Jubilee Tower, B-35 & 36, Sector-1, Noida-201301 (UP)-INDIA

In case of the days specified above happens to be a holiday in GAIL, the next working day shall be implied.

- 3.0 Bids must be submitted strictly in accordance with Clause No. 11 of ITB (Section-III) depending upon Type of Tender [refer Clause no. 2.0 (D) above]. The IFB is an integral and inseparable part of the bidding document.
- 4.0 In case of E-Tender, bid must be submitted only on <https://etenders.gov.in/eprocure/app>. Further, the following documents in addition to uploading the bid on E-tender portal shall also be submitted in Original (in physical form) within 7 (seven) days from the bid due date provided the scanned copies of the same have been uploaded in E-tender by the bidder along with e-bid within the due date and time to the address mentioned in Bidding Data Sheet (BDS) [Annexure-IV to Section-III]:-
 - i) EMD/Bid Security/Declaration for Bid Security (as applicable)
 - ii) Power of Attorney
 - iii) Integrity Pact (if applicable)
 - iv) Line of Credit (if applicable)
- 5.0 Clarification(s)/Corrigendum(s) if any shall also be available on above referred websites. Any revision, clarification, addendum, corrigendum, time extension, etc. to this Tender Document will be hosted on the above-mentioned website(s) only. Bidders are requested to visit the website regularly to keep themselves updated.

Bidder(s) are advised to quote strictly as per terms and conditions of the tender documents and not to stipulate any deviations/exceptions.
- 6.0 Any bidder, who meets the Bid Evaluation Criteria (BEC) and wishes to quote against this Tender Document, may download the complete Tender Document alongwith its amendment(s) if any from websites as mentioned at 2.0 (G) of IFB and submit their Bid complete in all respect as per terms & conditions of Tender Document on or before the Due Date & Time of Bid Submission.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- 8.0 Bid(s) received from bidders to whom tender/information regarding this Tender Document has been issued as well as offers received from the bidder(s) by downloading Tender Document from above mentioned website(s) shall be taken into consideration for evaluation & award provided that the Bidder is found responsive subject to provisions contained in Clause No. 2 of ITB (Section-III).

The Tender Document calls for offers on single point “Sole Bidder” responsibility basis (except where JV/Consortium bid is allowed pursuant to clause no. 3.0 of ITB) and in total compliance of Scope of Works as specified in Tender Document.

- 9.0 Any revision, clarification, corrigendum, time extension, etc. to this Tender Document will be hosted on the above mentioned website(s) only. Bidders are requested to visit the website regularly to keep themselves updated. In case of manual tendering, Clarification(s)/Corrigendum(s), if any, shall be sent to the prospective bidder(s) by email/post.
- 10.0 All the bidders including those who are not willing to submit their bid are required to submit F-6 (Acknowledgement cum Consent letter) duly filled within 7 days from the date of receipt of tender information.
- 11.0 GAIL reserves the right to reject any or all the bids received at its discretion without assigning any reason whatsoever.

This is not an Order.

For & on behalf of
GAIL (India) Limited
(Authorized Signatory)

Sanjoy Bhattacharyya
Designation: Executive Director (Engineering)
Phone No. & Extn : :+91(33)2217-2108/2274
E-mail : sanjoy.bhattacharyya@bridgeroof.co.in



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

DO NOT OPEN - THIS IS A QUOTATION

Tender ID No. : 2026_GAIL_278290_1, DT-03.06.2026

**Item : TENDER DOCUMENT FOR LAYING, HDD
AND ASSOCIATED WORKS OF STEEL
PIPELINE UNDER JAMSHEDPUR GA (CITY
AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC).**

Due Date & Time : Up to 1400 Hrs. (IST) on 17.06.2026

From: To:

**Kind Attn: Sri. Sanjoy Bhattacharyya, ED (Engineering)
Bridge And Roof Company (India) Limited
Kankaria Center (5th Floor), 2/1 Russel Street,
Kolkata – 700071, West Bengal (India)
Phone: +91(33)2217-2108/2274.**

***To be pasted on the envelope containing Originals of Power of Attorney, Integrity Pact, EMD/
Declaration for Bid Security (as applicable), Line of Credit (if applicable); refer clause 4.0 of IFB.***



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



SECTION-II

BID EVALUATION CRITERIA & EVALUATION METHODOLOGY



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



SECTION-II

BID EVALUATION CRITERIA (BEC) & EVALUATION METHODOLOGY

A. Technical Criteria

A.1 The Bidder must have successfully ‘executed / completed, work for ‘laying /installation’, Hydro-testing and ‘EGP or drying or nitrogen purging or commissioning’ of buried hydrocarbon steel pipeline along with associated work in the preceding 7 (seven) years reckoned from the bid due date as mentioned below: -

(i) Experience of at least one (01) completed (*) work with executed value not less than **Rs. 451.25 Lakhs.**

OR

(ii) Experience of at least Two (02) completed (*) works with executed value of each work not less than **Rs. 282.03 Lakhs.**

OR

(iii) Experience of at least Three (03) completed (*) works with executed value of each work not less than **Rs. 225.63 Lakhs.**

(*)

- (i) In case more than one contract is emanating against one tender, all such individual contracts are to be considered as a single contract for the evaluation of credentials of a bidder for meeting their experience criteria.
- (ii) Further in the case of a rate contract, the cumulative value of all release orders emanating from one rate contract shall be considered as a single contract for the evaluation of the credential of a bidder for meeting their experience criteria.
- (iii) In case the bidder is executing a rate contract of the above nature that is still running, and the contract executed value till one day prior to the due date of submission is equal to or more than the minimum prescribed value as mentioned above, such experience will also be taken into consideration provided that the bidder has submitted satisfactory work execution certificate to this effect issued by the end user/owner/authorized consultant.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Notes to Technical Criteria:

- (i) A Job executed by a Bidder for its own plant/project cannot be considered as experience for the purpose of meeting the BEC of the tender. However, jobs executed for subsidiary/Fellow subsidiary/Holding company will be considered as experience for the purpose of meeting BEC subject to submission of tax paid invoice(s) duly certified by Statutory Auditor of the Bidder towards payments of statutory tax in support of the job executed for subsidiary/Fellow subsidiary/Holding company. Such bidders are to submit these documents in addition to the documents specified to meet BEC.
- (ii) Execution certificate issued by the end user/owner/authorized consultant submitted by a bidder against work contracts can also be considered in place of a completion certificate for meeting the stipulated experience criteria provided that the certified work has been completed satisfactorily by the bidder and duly certified by the End User Owner/ Authorized Consultant.
- (iii) In case the bidder has an experience as a consortium member and such member has executed earlier a job within its scope as a member of the consortium, which is required as experience as per the qualification criteria in clause no. A.1 will be considered Documentary evidence as stipulated in the bidding document is to be submitted to establish such experience.
- (iv) Experience of bidder acquired as a sub-contractor can be accepted against submission of certificate from the end user by such bidder along with other specified documents.
- (v) Only documents (Work Order, Completion certificate, Execution Certificate etc.) that have been referred/ specified in the bid shall be considered in reply to queries during the evaluation of Bids.
After submission of bid, only related shortfall documents will be asked for in TQ/CQ and considered for evaluation. For example, if the bidder has submitted a contract without its completion certificate, the certificate will be asked for and considered. However, no new reference/PO/WO/LOA is to be submitted by bidder in response to TQ/CQ so as to qualify and such documents will not be considered by GAIL for evaluation of Bid.
- (vi) **Eligibility criteria in case bid is submitted on the basis of technical experience of FOREIGN BASED ANOTHER COMPANY(SUPPORTING COMPANY) which holds more than fifty percent of the paid up share capital of the bidder company or vice versa:**

Offers of those bidders (not under consortium arrangement) who themselves do not meet the technical experience criteria as stipulated in the BEC and are quoting based on the experience of Foreign based another company (Supporting Company) can also be considered. In such



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

case the supporting company should hold more than fifty percent of the paid up share capital of the bidding company or vice versa.

However, the supporting company should on its own meet the technical experience as stipulated in the BEC and should not rely on any other company or through any other arrangement like Technical collaboration agreement.

In that case as the bidding company is dependent upon the technical experience of another company with a view to ensure commitment and involvement of the companies involved for successful execution of the contract, the participating bidder should enclose the following Agreements/ Guarantees/ Undertakings along with the techno-commercial bid:

- (i) An Agreement (*as per format enclosed at Appendix- A1 to Section II*) between the bidder and the supporting company.
- (ii) Guarantee (*as per format enclosed at Appendix- A2 to Section II*) by the supporting company to GAIL for fulfilling the obligation under the Agreement along with certificate issued by Company Secretary as per *Appendix- A2A to Section II*.
- (iii) Undertaking by Supporting Company to provide a Performance Bank Guarantee (*as per format and instructions enclosed at Appendix- A3 to Section II*), equivalent to 50% of the value of the PBG which is to be submitted by the bidding company, in case of being the successful bidder.

In cases where foreign based supporting company does not have Permanent Establishment in India as per Indian Income Tax Act, the bidding company can furnish Performance Bank Guarantee for an amount which is sum of PBG amount to be submitted by the bidder and additional PBG amount required to be submitted by the supporting company subject to the condition that supporting company have 100% paid up equity share capital of the bidder either directly or through intermediate subsidiaries or vice versa.

In such case bidding company shall furnish an undertaking that their foreign based supporting company is not having any Permanent Establishment in India in terms of Income Tax Act of India.

- (iv) Undertaking from the supporting company to the effect that in addition to invoking the PBG submitted by the bidding company, the PBG provided by supporting company shall be invoked by GAIL due to non-performance of the bidding company.

Note:

- 1.0 In case Supporting Company fails to submit Bank Guarantee as per (iii) above, EMD/SD submitted by the bidder shall be forfeited.
- 2.0 The Financial BEC of tender is to be met by bidder on their own.
- 3.0 The Supporting Company shall meet conditions of 'Eligible Bidder', as per clause



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



no. 2 of Section-III (ITB).

4.0 The clause I (Procurement from a bidder which shares a Land Border with India) shall be applicable to above supporting company also.

B. Financial Criteria

B.1 Average Annual Turnover

The minimum average annual turnover of the bidder as per the audited financial statement during preceding three financial years shall be **Rs. 282.03 Lakhs**.

(*) In case the date of constitution/incorporation of the bidder is less than 3 years old, the average turnover in respect of the completed financial years after the date of constitution/ incorporation shall be taken into account for minimum Average Annual Financial Turnover criteria.

B.2 Net Worth

The net worth of the bidder should be positive as per the last audited financial statement of immediate preceding financial year. For the purpose of Net Worth for this tender, the same shall be as defined in the "Format for Chartered Accountant Certificate/ Certified Public Accountant (CPA) for Financial Capability of the Bidder" enclosed in the tender document.

B.3 Working Capital:

The minimum working capital of the bidder as per the last audited financial statement of immediate preceding financial year shall **Rs. 56.41 Lakhs**.

Note to Clause B(Financial BEC):

(i) Average Annual Turnover:

Preceding 3 financial years mentioned in aforesaid BEC refer to immediate 3 preceding financial years wherever the closing date of the bid is after 30th September of the relevant financial year. In case the tenders having the due date for submission of bid up to 30th September of the relevant financial year, and audited financial results of the immediate 3 preceding financial years are not available, the audited financial results of the 3 years immediately prior to that will be considered.

(ii) Net Worth/Working Capital:

Immediate preceding financial year mentioned in aforesaid BEC refer to audited financial results for the immediate preceding financial year wherever the closing date of the bid is after 30th September of the relevant financial year. In case the tenders having the due date for submission of bid up to 30th September of the relevant financial year, and audited fi-



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



financial results of the immediate preceding financial year is not available, in such case the audited financial results of the year immediately prior to that year will be considered. Bidder is to submit Audited Financial Statement of immediate preceding financial years (as mentioned above) along with format F-10 accordingly for Net Worth/ Working Capital.

- (iii) If the bidder's working capital is negative or inadequate, the bidder shall submit a letter from their bank having net worth not less than Rs.100 crores (or equivalent in USD), confirming the availability of line of credit for working capital amount mentioned herein above. The line of credit letter from bank to be submitted strictly as per format enclosed in the tender document.

The Declaration Letter/Certificate for line of credit due to short fall of working capital shall be from single bank only. Letters from multiple banks shall not be applicable. However, banking syndicate will also be acceptable wherein a group of banks can jointly provide line of credit to the bidder.

The bank shall be required to issue the letter for declaration certificate of the line of credit on their letterhead along with the contact details of the issuing authority like email id, contact number etc.

The original document for 'Line of Credit' should be submitted along with other physical documents required as per tender conditions, or in response to commercial query, failing which bid shall be rejected.

- (iv) Any shortfall information / documents on the Audited Annual Report / Financial Statement of the Bidder and/or line of credit for working capital issued on or before the final bid due date can only be sought against Commercial queries (CQs). Any information/ documents issued post final bid due date shall not be considered for evaluation.

C. Exchange rate for Conversion of Currency for evaluation of documents submitted by bidders for BEC which are in other currency than specified in BEC shall be as follows:

(a) **BEC (Technical Criteria):** Bill Selling (foreign exchange) Rate of State Bank of India as prevailing on the date of award of contract submitted by bidder.

(b) **BEC (Financial Criteria):**

(i) **For Annual Turnover:**

The average of Bill Selling (foreign exchange) Rate of State Bank of India as prevailing on the First date and Last date of the respective Financial Year.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



(ii) For Net-Worth & Working Capital:

The Bill Selling (foreign exchange) Rate of State Bank of India as prevailing on the Last date of the respective Financial Year.

(c) In case, the SBI Selling rate is not available as on the date of conversion as specified above for respective cases, the exchange rate for conversion of currency shall be taken from the internet, such as:

<https://www.xe.com/currencyconverter>

<https://economictimes.indiatimes.com/markets/forex/currency-converter>

<https://www.oanda.com/currency/converter>

D. RELAXATION OF PRIOR TURNOVER AND PRIOR EXPERIENCE FOR STARTUPS

Not Applicable

E. DOCUMENTS TO BE SUBMITTED FOR COMPLIANCE TO BEC:

Documents required to be submitted by the bidder along with the bid for BEC qualification::



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

BEC Clause no.	Description	Documents required for qualification
A	Technical Criteria:	
A.1 Note (i)	Experience criteria	<p>(a) Copy of detailed work order along Schedule of Rates.</p> <p>(b) Copy of completion certificate issued by end user / Owner (or their consultant who has been duly authorized by owner to issue such certificate) only after completion of work in all aspects.</p> <p>Execution certificate issued by the end user/owner/authorized consultant submitted by a bidder against work contracts can also be considered in place of a completion certificate for meeting the stipulated experience criteria provided that the certified work has been completed satisfactorily by the bidder and duly certified by the End User/ Owner/ Authorized Consultant.</p> <p>Note: The completion/execution certificate(s) shall have details like work order no./date, the brief scope of work, completion date etc.</p>
A.1 Note (ii)	Jobs executed for Subsidiary / Fellow subsidiary/ Holding company	Tax paid invoice(s) duly certified by statutory auditor of the bidder towards payments of statutory tax in support of the job executed for Subsidiary / Fellow subsidiary /Holding company.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

A.1 Note (iii)	Experience criteria in case of the single bidder, having experience as a consortium member	a) Same documents as mentioned in clause A.1 above. b) Consortium Agreement/MOU clearly defining the scope and responsibility. Note: The completion/execution certificate(s) shall have details like work order no./date, the brief scope of work, completion date etc.
B	Financial Criteria:	
B.1	Average Annual Turnover	Bidder(s) shall submit following documents: a) A certificate for financial capability of the bidder from Practicing CA/CPA on letter-head with UDIN in prescribed format [Format F-10] as provided in the Tender Document. b) Copy of Audited Annual Financial Statement [Balance Sheet and Profit & Loss Account statements including Auditor's Report] of three (3) preceding Financial Year(s).
B.2	Net Worth	Bidder(s) shall submit following documents: a) A certificate for financial capability of the bidder from Practicing CA/CPA on letter-head with UDIN in prescribed format [Format F-10] as provided in the Tender Document. b) Copy of Audited Annual Financial Statement [Balance Sheet and Profit & Loss Account statements including Auditor's Report] of the last Financial Year.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

B.3	Working Capital	<p>Bidder(s) shall submit following documents:</p> <ol style="list-style-type: none">A certificate for financial capability of the bidder from Practicing CA/CPA on letter-head with UDIN in prescribed format [Format F-10] as provided in the Tender Document.Copy of Audited Annual Financial Statement [Balance Sheet and Profit & Loss Account statements including Auditor's Report] of the last Financial Year. <p>Note: If the bidder's working capital is negative or inadequate, the bidder shall submit a letter from their bank having net worth not less than Rs.100 crores (or equivalent in USD), confirming the availability of line of credit for working capital amount mentioned herein above.</p> <p>The line of credit letter from bank to be submitted strictly as per format(F-9). Bidder to note that Line of Credit requirement is not for shortfall amount but for the entire working capital requirement</p> <p>Declaration Letter/Certificate for line of credit due to shortfall of working capital shall be from single bank only. Letters from multiple banks shall not be applicable. However, banking syndicate will also be acceptable wherein a group of banks can jointly provide line of credit to the bidder.</p> <p>The bank shall be required to issue the letter for declaration/certificate of line of credit on their letter head along with the contact details of the issuing authority like email id, contact number etc.</p> <p>The original document for "Line of Credit" should be submitted along with other physical documents required as per terms and conditions of tender.</p>
-----	-----------------	---



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



F. AUTHENTICATION OF DOCUMENTS SUBMITTED IN SUPPORT OF BID EVALUATION CRITERIA (BEC):

(i) Technical Criteria of BEC:

All documents in support of Technical Criteria of Bid Evaluation Criteria (BEC) to be furnished by the bidders shall necessarily be duly certified / attested by Chartered Engineer and Notary Public with legible stamp.

(ii) Financial Criteria of BEC:

Bidder shall submit "Details of Financial Capability of the bidder in prescribed format (Format F-10), duly signed and stamped by a Chartered Accountant on letterhead along with UDIN. Further a copy of Audited Financial Statement submitted in bid shall be duly certified/attested by Notary Public with legible stamp.

In absence of requisite documents, M/s GAIL/BANDR reserve the right to reject the bid without making any reference to the bidder.

G. BID EVALUATION METHODOLOGY:

- I. Bid shall be evaluated on overall L1 (Lowest cost) basis.
- II. GAIL intends to select Two (02) contractors.
- III. The "Schedule of Rates" including quoted GST for the complete scope of work shall be taken up for evaluation purposes.

Note 1:

1. In case, any unregistered bidder [i.e. not registered with statutory authority for GST] is submitting their bid, their prices will be loaded with applicable GST (CGST&SGST/UTGST or IGST) during the evaluation of the bid.
2. In case any cess on GST is applicable, the same shall also be considered in the evaluation.

The ranking of bidders (L-1, L-2, L-3 ...) shall be determined by the bidder's evaluated price in ascending order.

In case of a 'tie' i.e., more than one bidder quotes the same price arrived at based on evaluation, the rank will be decided based on the turnover of the audited account for the immediately preceding financial year. As an example, in case two bidders become L-2, the bidder having higher turnover in the immediately preceding financial year will be considered as L2 and the other bidder will be ranked as L3.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- IV. Purchase preference of PPP-2012 is not applicable for the instant tender being a works contract. Purchase preference as per PPP-MII shall be applicable, as per the distribution of work mentioned at (H) below.

H. DISTRIBUTION OF WORK

GAIL intends to select Two (02) contractors to execute the entire scope of work, at L1 rates, as per the distribution of work given below:

- (i) The Complete work shall be awarded to Two (2) Contractors as per Table 1 below:

Table-1

Rank	%age of Total Scope
L1	60
L2(*)	40

(*): Upon matching with Price as quoted by the L1 bidder.

- (ii) All the Techno-commercially acceptable bidders other than L1(irrespective of their ranks) shall be asked to confirm matching their price with the L1 bidder in a single step to save on time and One(01) bidder (in addition to L1 bidder), who have agreed to match the L1 item wise price, shall be considered for award of work in order of their ranking while giving preference to bidder eligible for purchase preference as per conditions of PPP-MII Policy.
- (iii) **Applicability of purchase preference as per PPP-MII policy:** If all 'Class-I Local suppliers' (taken in totality), considered for award of contract as per above, accounts for less than 50% of the tendered quantity, purchase preference shall be applicable as per below:

The distribution as given above shall be changed to the extent of providing preference as per the conditions given in PPP-MII policy. The quantities to be provided to the preferential bidder (class I local supplier) will be taken out from the allocation of class II local supplier(s) bidders in reverse order of their ranking [i.e. first qty. from L2 shall be taken out (if required)].

- (iv) Award of work more than 60% of tendered scope to any bidder under any circumstances shall be subject to bidder(s) meeting BEC for quantum being considered for award. While distributing, quantities shall be rounded off suitably (wherever required) and the decision regarding the award quantity by GAIL/B AND R shall be final in this regard.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- (v) In such case, BEC for intended award qty. (i.e. for more than 60% & upto 100% scope of work) shall be re-checked on a pro-rata basis considering BEC for eligibility towards total scope as given below:

A	Technical BEC	Min. executed value for total scope
1	Experience of a single work order with executed value not less than	Rs. 752.08 Lakhs
2	Experience of at least two works with executed value of each work not less than	Rs. 470.05 Lakhs
3	Experience of at least three completed works with executed value of each work not less than	Rs. 376.04 Lakhs
B	Financial BEC	Required Value for total scope
1	Average Annual Turnover	Rs. 470.05 Lakhs
2	Working capital	Rs. 94.01 Lakhs

All other terms and conditions of BEC shall be as per clause no. A to F above.

Therefore, bidder(s) are advised to submit the relevant documents (work order and completion/execution certificate etc. of the highest value available) for BEC corresponding to 100% scope of work, to the extent possible, at the time of submitting the bid to meet BEC, if such situation arises. No additional document shall be accepted after the conclusion of the techno-commercial evaluation of bids.

- (vi) The balance left over quantity shall be re-tender, if required.

H. PROCUREMENT FROM A BIDDER WHICH SHARES A LAND BORDER WITH INDIA

1. OM no. 7/10/2021-PPD(1) dated 23.02.2023, Department of Expenditure, Ministry of Finance, Govt. of India refers. The same are available at website <https://doe.gov.in/procurement-policy-divisions>.
2. Any bidder from a country which shares a land border with India will be eligible to bid in this tender only if the bidder is registered with the Competent Authority. For details of competent authority refer to Annexure I of Order (Public Procurement no. 4) dated 23.02.2023.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

Further, any bidder (including bidder from India) having specified Transfer of Technology (ToT) arrangement with an entity from a country which shares a land border with India, shall also require to be registered with the same competent authority.

Further the above will not apply to bidders from those countries (even if sharing a land border with India) to which the Government of India has extended lines of credit or in which the Government of India is engaged in development projects. Updated lists of countries to which lines of credit have been extended or in which development projects are undertaken are given in the website of the Ministry of External Affairs, Govt. of India

3. **"Bidder"** (including the term 'tenderer', 'consultant' 'vendor' or 'service provider' in certain contexts) **for purpose of this provision** means any person or firm or company, including any member of a consortium or joint venture (that is an association of several persons, or firms or companies), every artificial juridical person not falling in any of the descriptions of bidders stated hereinbefore, including any agency, branch or office controlled by such person, participating in a procurement process.
4. **"Bidder from a country which shares a land border with India"** for the purpose of this:
 - a. An entity incorporated, established or registered in such a country; or
 - b. A subsidiary of an entity incorporated, established or registered in such a country; or
 - c. An entity substantially controlled through entities incorporated, established or registered in such a country; or
 - d. An entity whose beneficial owner is situated in such a country; or
 - e. An Indian (or other) agent of such an entity; or
 - f. A natural person who is a citizen of such a country; or
 - g. A consortium or joint venture where any member of the consortium or joint venture falls under any of the above
5. **"Beneficial owner"** for the purpose of above (4) will be as under:
 - i. In case of a company or Limited Liability Partnership, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person(s), has a controlling ownership interest or who exercises control through other means.

Explanation—

 - a) "Controlling ownership interest" means ownership of, or entitlement to, more than twenty-five per cent of shares or capital or profits of the company;
 - b) "Control" shall include the right to appoint the majority of the directors or to control the management or policy decisions, including by virtue of their share-



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

holding or management rights or shareholders agreements or voting agreements;

- ii) In case of a partnership firm, the beneficial owner is the natural person(s) who, whether acting alone or together, or through one or more juridical person, has ownership of entitlement to more than fifteen percent of capital or profits of the partnership;
 - iii) In case of an unincorporated association or body of individuals, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has ownership of or entitlement to more than fifteen percent of the property or capital or profits of such association or body of individuals;
 - iv) Where no natural person is identified under (i) or (ii) or (iii) above, the beneficial owner is the relevant natural person who holds the position of senior managing official;
 - v) In case of a trust, the identification of beneficial owner(s) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen percent or more interest in the trust and any other natural person exercising ultimate effective control over the trust through a chain of control or ownership.
6. **"Agent"** for the purpose of this Order is a person employed to do any act for another, or to represent another in dealings with third persons
- Note :
- (i) A person who procures and supplies finished goods from an entity from a country which shares a land border with India will, regardless of the nature of his legal or commercial relationship with the producer of the goods, be deemed to be an Agent for the purpose of this Order.
 - (ii) However, a bidder who only procures raw material, components etc. from an entity from a country which shares a land border with India and then manufactures or converts them into other goods will not be treated as an Agent.]
7. **"Transfer of Technology"** means dissemination and transfer of all forms of commercially usable knowledge such as transfer of know-how, skills, technical expertise, designs, processes and procedures, trade secrets, which enables the acquirer of such technology to perform activities using the transferred technology independently. (Matters of interpretation of this term shall be referred to the Registration Committee constituted by the Department for Promotion of Industry and Internal Trade, and the interpretation of the Committee shall be final.)



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

8. **"Specified Transfer of Technology"** means a transfer of technology in the sectors and/ or technologies, specified at Schedule-I, II & III of this order.

9. **SUBMISSION OF CERTIFICATE IN BIDS:**

Bidder shall submit a certificate in this regard as Form-I-A.

For cases falling under the category of Transfer of Technology, Bidder shall submit a certificate in this regard as Form-I-B.

If such certificate given by a bidder whose bid is accepted is found to be false, this would be a ground for immediate rejection of the bid/termination and further action as per "Procedure for Action in case of Corrupt/Fraudulent/ Collusive / Coercive Practices" of tender document.

10. The registration, wherever applicable, should be valid at the time of submission of bids and at the time of acceptance of bids. In respect of supply otherwise than by tender, registration should be valid at the time of placement of order. If the bidder was validly registered at the time of acceptance / placement of order, registration shall not be a relevant consideration during contract execution.

11. **PROVISION TO BE IN WORKS CONTRACTS, INCLUDING TURNKEY CONTRACTS:**

The successful bidder shall not be allowed to sub-contract works to any contractor from a country which shares a land border with India unless such contractor is registered with the Competent Authority. The definition of "contractor from a country which shares a land border with India" shall be as in Para 4 herein above. A Certificate to this regard is to be submitted by bidder is placed at Form-II.

[Note: Procurement of raw material, components, etc. does not constitute sub-contracting].

I. RESTRICTING PARTICIPATION OF NCLT REFERRED BIDDERS

- (i) Offer from the following type of bidders / members of consortium will not be considered:
- Bidders who are undergoing insolvency resolution process or liquidation or bankruptcy proceeding under Insolvency and Bankruptcy Code, 2016 (Code).



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- Bidders whose resolution process or liquidation or bankruptcy proceeding is initiated under the Code at any stage of evaluation of bid.
- (ii) It will be responsibility of the bidder/contractor/vendor to inform GAIL/ PMC within 15 (Fifteen) days from the date of order of insolvency resolution process or liquidation or bankruptcy proceeding passed by the Adjudating Authority Namely National Company Law Tribunal (NCLT) or Debt Recovery Tribunal (DRT) or any other similar authority under the Code.
- (iii) If bidder fails to share the information regarding their status of insolvency resolution process or liquidation or bankruptcy proceeding in their bid or at any latter stage, their offer is liable to be rejected by GAIL/ PMC.
- (iv) GAIL/ PMC reserve the right to cancel / terminate the contract without any liability on the part of GAIL/ PMC immediately on the commencement of insolvency resolution process or liquidation or bankruptcy proceeding of any party under the contract.

A declaration in this regard shall be furnished by the bidder as per proforma at Annexure-A to Section-II.



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Form-I-A

UNDERTAKING ON LETTERHEAD

To,

M/s GAIL (INDIA) LIMITED

SUB:

TENDER NO:

REF: OM No. 7/10/2021-PPD(1) dated 23.02.2023 of Dept of Expenditure, Ministry of Finance, Government of India

(<https://doe.gov.in/procurement-policy-divisions>)

Dear Sir

We, M/s _____ (*Name of Bidder*), have read the clause regarding restrictions on Procurement from a Bidder of a country which shares a land border with India as mentioned in the tender document in line with the above referred guidelines dated 23.02.2023 for Procurement from a bidder which shares a land border with India and We certify that

- (i) Bidder is not from such a country []
- (ii) If the Bidder is from such a country []
which shares a land border with India, has been registered
with the Competent Authority.
(Evidence of valid registration by the
Competent Authority to be attached by the bidder)

(Bidder is to tick appropriate option (✓ or X) above).

We hereby certify that we fulfill all requirements in this regard and is eligible to be considered against the subject tender.

Place:

[Signature of Authorized Signatory of Bidder]

Date:

Name:

Designation:

Seal:



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Form-I-B

UNDERTAKING ON LETTERHEAD

(Applicable in case of Transfer of Technology cases only)

To,

M/s GAIL (INDIA) LIMITED

SUB:

TENDER NO:

REF: OM No. 7/10/2021-PPD(1) dated 23.02.2023 of Dept of Expenditure, Ministry of Finance, Government of India

<https://doe.gov.in/procurement-policy-divisions>

Dear Sir

We, M/s _____ (*Name of Bidder*), have read the clause regarding restrictions on Procurement from a Bidder of a Country having Transfer of Technology (ToT) arrangement as mentioned in the tender document in line with the above referred guidelines dated 23.02.2023 for Procurement from a bidder which shares a land border with India and We certify that

- (i) The Bidder does not have ToT with such a country []
- (iii) If the Bidder is having ToT from such a country []
which share a land border with India, has been registered
with the Competent Authority.
(Evidence of valid registration by the
Competent Authority to be attached by the bidder)

(Bidder is to tick appropriate option (✓) above).

We hereby certify that we fulfill all requirements in this regard and is eligible to be considered against the subject tender.

Place:

[Signature of Authorized Signatory of Bidder]

Date:

Name:

Designation:

Seal:



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Form-II

**CERTIFICATE FOR TENDERS FOR WORKS INVOLVING POSSIBILITY OF SUB-
CONTRACTING**

To,
M/s GAIL (INDIA) LIMITED

SUB:

TENDER NO:

REF: OM No. 7/10/2021-PPD(1) dated 23.02.2023 of Dept of Expenditure, Ministry of Finance, Gov-
ernment of India

(<https://doe.gov.in/procurement-policy-divisions>)

Dear Sir

We, M/s _____ (*Name of Bidder*), have read the clause regarding restrictions on Procurement from a Bidder of a country which shares a land border with India and on sub-contracting to contractors from such countries as mentioned in the tender document in line with the above referred guidelines dated 23.02.2023 for Procurement from a bidder which shares a land border with India and We certify that

- (i) Bidder is not from such a country []
- (ii) If the Bidder is from such a country []
which share a land border with India, has been registered
with the Competent Authority.
(Evidence of valid registration by the
Competent Authority to be attached by the bidder)

(Bidder is to tick appropriate option (✓) above).

We further certify that we will not sub-contract any work to a contractor from such countries unless such contractor is registered with the Competent Authority.

We hereby certify that we fulfill all requirements in this regard and is eligible to be considered.

Place: [Signature of Authorized Signatory of Bidder]
Date: Name:
Designation:
Seal:



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Schedule I

List of Category-I Sensitive sectors:

Sr. No.	Sector
(i)	Atomic Energy
(ii)	Brocasting/ Print and Digital Media
(iii)	Defense
(iv)	Space
(v)	Telecommunications

Schedule II

List of Category-II Sensitive sectors:

Sr.No.	Sector
(i)	Power and Energy (including exploration/ generation/transmission/ distribution/ pipeline)
(ii)	Banking and Finance including Insurance
(iii)	Civil Aviation
(iv)	Construction of ports and dams & river valley projects
(v)	Electronics and Microelectronics
(vi)	Meteorology and Ocean Observation
(vii)	Mining and extraction (including deep sea projects)
(viii)	Railways
(ix)	Pharmaceuticals & Medical Devices
(x)	Agriculture
(xi)	Health
(xii)	Urban Transportation



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

--	--

Schedule III

List of Sensitive Technologies:

Sr.No.	Sensitive Technologies
(i)	Additive Manufacturing (e.g. 3D Printing)
(ii)	Any equipment having electronic programmable components or autonomous systems (e.g. SCADA systems)
(iii)	Any technology used for uploading and streaming of data including broadcasting, satellite communication etc.
(iv)	Chemical Technologies
(v)	Biotechnologies including Genetic Engineering and Biological Technologies
(vi)	Information and Communication Technologies
(vii)	Software



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Annexure-A to Section-II

**DECLARATION ON PROCEEDINGS AS PER INSOLVENCY AND BANKRUPTCY CODE
2016**

To,

M/s GAIL (INDIA) LIMITED

SUB:

TENDER NO:

Dear Sir,

I/ We hereby declare that I/We ,M/s _____, declare that :

I/We am/are not undergoing insolvency resolution process or liquidation or bankruptcy proceeding
as on date.

OR

I/We am/are undergoing insolvency resolution process or liquidation or bankruptcy proceeding as
on date as per details mentioned below.

- (a) _____
(b) _____
(c) _____

(Attach details in separate sheet)

Further, I/We also confirms that in case there is any change in status of this declaration at any stage
of tendering/ execution (in case of award), the same will be promptly informed to GAIL.

Note: Strike out either (i) or (ii) as applicable.

It is understood that if this declaration is found to be false, GAIL (India) Limited shall have the
right to reject my/our bid, and forfeit the EMD/ CPS. If the bid has resulted in a contract, the con-
tract will be liable for termination without prejudice to any other right or remedy (including ban-
ning or holiday listing) available to GAIL (India) Limited.

Place:

[Signature of Authorized Signatory of Bidder]

Date:

Name:

Designation:

Seal:



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Appendix-A1 to Section II

FORMAT OF AGREEMENT TO BE EXECUTED BETWEEN BIDDER AND THEIR FOREIGN BASED SUPPORTING COMPANY ON INDIAN NON-JUDICIAL STAMP PAPER OF REQUISITE VALUE DULY NOTARIZED.

This agreement made this ____ day of ____ month ____ year by and between M/s. _____ (Fill in Bidder's full name, constitution and registered office address) hereinafter referred to as bidder on the first part and M/s. _____ (Fill in full name, constitution and registered office address company which hold more than fifty percent of the paid up share capital of the bidding company or vice versa) hereinafter referred to as "Supporting Company" of the second part.

Whereas

M/s. GAIL (India) Limited (hereinafter referred to as GAIL) has invited offers vide their tender No. _____ for _____ and M/s. _____ (Bidder) intends to bid against the said tender and desires to have technical support of M/s. _____ [Supporting Company]

And whereas Supporting Company represents that they have gone through and understood the requirements of the subject tender and are capable and committed to provide the services as required by the bidder for successful execution of the contract, if awarded to the bidder.

Now, it is hereby agreed to by and between the parties as follows:

- a) M/s. _____ (Bidder) will submit an offer to GAIL for the full scope of work as envisaged in the tender document as a main bidder and liaise GAIL directly for any clarifications etc. in this context.
- b) M/s. _____ [Supporting Company] undertakes to provide technical support and expertise, expert manpower and project management including financial support, if so required, to the bidder to discharge its obligations as per the Scope of Work of the tender / Contract for which offer has been made by the bidder and accepted the GAIL.
- c) The Bidder/ Supporting Company holds more than 50% paid up equity capital of the Supporting Company/ Bidder.
- d) This agreement will remain valid till validity of bidder's offer to GAIL including extension if any and till satisfactory performance of the contract, the same is awarded by GAIL to the bidder.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- e) Supporting Company undertakes that this agreement shall remain enforceable even if their stake in Bidder is diminished during the execution of works under the contract between the Bidder and GAIL.
- f) The bidder shall have the overall responsibility of satisfactory execution of the contract awarded by GAIL, however without prejudice to any rights that GAIL might have against the Supporting Company
- g) It is further agreed that, if contract pursuant to Supporting Company shall be jointly and severely responsible to GAIL for the performance of works during contract period and for the satisfactory execution of the contract, and for all the consequences for non-performance thereof.

In witness whereof the parties hereto have executed this agreement on the date mentioned above.

For and on behalf of
(Bidder)
M/s.

Witness:

- 1)
- 2)

For and on behalf of
(Supporting Company)
M/s.

Witness:

- 1)
- 2)



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Appendix-A2 to Section II

GUARANTEE BY THE FOREIGN BASED SUPPORTING COMPANY/ GUARANTOR
(to be executed on plain paper)

THIS DEED OF GUARANTEE executed at this day of by M/s (mention complete name) a company duly established and existing under the laws of (insert country), having its Registered Office at hereinafter called “the Guarantor and/ or the Supporting Company” which expression shall, unless excluded by or repugnant to the subject or context thereof, be deemed to include its successors and permitted assignees.

FOR

M/s (bidder) a company duly established and existing under the laws of (insert country), having its Registered Office at hereinafter called the “Bidder” which expression shall, unless excluded by or repugnant to the subject or context thereof, be deemed to include its successors and permitted assignees.

TOWARDS

M/s GAIL(India) Limited, a company duly registered under the law of India having its Registered Office at 16, Bhikaiji Cama Place, R. K. Puram, New Delhi-110066, India, and having Purchase center at hereinafter called “GAIL” which expression shall unless excluded by or repugnant to the context thereof, be deemed to include its successor and assignees

WHEREAS GAIL has invited tender number for on, and the bidder has submitted its bid number..... in response to the above mentioned tender invited by GAIL.

AND WHEREAS the bidder/ Guarantor Company holds more than 50% paid up equity capital of the Supporting Company/ Bidder .

AND WHEREAS one of the condition for acceptance of Bidder’s bid against said tender is that in case the bidder is seeking to qualify upon the technical credentials of its Guarantor Company, then the bidder shall arrange a guarantee from its Guarantor Company guaranteeing due and satisfactory performance of the work covered under the said tender including any change therein as may be deemed appropriate by the GAIL at any stage.

The Guarantor represents that they have gone through and understood the requirement of the above



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

said tender and are capable of and committed to provide technical and such other supports as may be required by the Bidder for successful execution of the same.

The Bidder and the Guarantor have entered into an agreement dated as per which the Guarantor shall be providing technical, financial and such other supports as may be necessary for performance of the work under the tender, if the contract is awarded to the Bidder.

Accordingly, at the request of the Bidder and in consideration of and as a requirement for the GAIL to enter into agreement(s) with the Bidder, the Guarantor hereby guarantees and undertakes that upon award of Contract to Bidder against bid number, made by the Bidder under tender number.....:

1. The Guarantor unconditionally agrees that in case of non-performance by the Bidder of any of its obligations in any respect, the Guarantor shall, immediately on receipt of notice of demand by the GAIL, take up the job without any demur or objection, in continuation and without loss of time and without any cost to the GAIL and duly perform the obligations of the Bidder to the satisfaction of the GAIL.
2. The Guarantor agrees that the Guarantee contained herein shall remain valid till the satisfactory execution and completion of the work (including discharge of the warranty obligations) awarded to the Bidder.
3. The Guarantor shall be jointly and severally responsible to GAIL for satisfactory performance of works during contract period and for the satisfactory execution of the contract, and for all consequences for non-performance thereof.
4. The liability of the Guarantor, under the Guarantee, is limited of the Bidder for non- performance under the contract entered between GAIL and the Bidder. This will, however, be in addition to the forfeiture of the Performance and Advance Guarantees furnished by the Bidder.
5. The Guarantor agrees to execute a Corporate Guarantee in favour of GAIL, guaranteeing the performance of obligations by the Bidder, in case the Contract is awarded to the Bidder by GAIL.
6. The Guarantor represents that this Guarantee has been issued after due observance of the appropriate laws in force in India. The Guarantor hereby undertakes that the Guarantor shall obtain and maintain in full force and effect all the governmental and other approvals and consents that are necessary and do all other acts and things necessary or desirable in connection therewith or for the due performance of the Guarantor's obligations towards GAIL.
7. Any dispute arising out of or in connection with this contract, including any question regarding its existence, validity or termination, shall be referred to and finally resolved by arbitration. It is further agreed that Claims by and against the Guarantor, the Bidder and GAIL under the different contract to be entered pursuant to their relationship can be brought under a single reference and there shall be no bar on the consolidation of



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

such proceedings before the same arbitral tribunal. The governing law shall be the laws of India and seat of arbitration shall be New Delhi, India. The language of arbitration shall be English.

8. The Guarantor hereby declares and represents that this Guarantee has been given without any undue influence or coercion, and that the Guarantor has fully understood the implications of the same.
9. In case of award of contract to the bidder, the Guarantor shall provide Performance Bank Security to GAIL, equivalent to 50% of the value of Performance Bank Security to be submitted by the bidding company, in the prescribed format within 15 days from the date of Fax of Acceptance, as guarantee for performance by the bidder/Supplier. The Guarantor hereby expressly agrees that if in the opinion of GAIL, the Bidder / Supplier has failed to perform its obligations under the contract in any manner, GAIL shall have unfettered right to invoke the said Bank guarantee. The guarantor hereby agrees that decision of GAIL about performance of the bidder / Supplier shall be final and shall not be questioned by the Guarantor. Guarantor shall have no objection to invocation of the Performance Bank Guarantee submitted by the Guarantor

OR

(applicable, subject to meeting the conditions stipulated in BEC in respect of additional Performance Bank Security)

In case of award of contract to the bidder, the bidder on behalf of the Guarantor shall provide additional Performance Bank Security to GAIL, equivalent to 50% of the value of Performance bank Security to be submitted by the bidding company, in the prescribed format within 15 days from the date of Fax of Acceptance, as guarantee for performance by the bidder/Supplier. The Guarantor hereby expressly agrees that if in the opinion of GAIL, the Bidder / Supplier has failed to perform its obligations under the contract in any manner, GAIL shall have unfettered right to invoke the said Bank guarantee. The Guarantor hereby agrees that decision of GAIL about performance of the bidder / Supplier shall be final and shall not be questioned by the Guarantor. Guarantor shall have no objection to invocation of the Performance Bank Security submitted by the Bidder on behalf The Guarantor represents and confirms that the Guarantor has the legal capacity, power and authority to issue this Guarantee and that giving of this Guarantee and the performance and observations of the obligations hereunder do not contravene any existing laws.

(Strike through the clause whichever is not applicable)

10. The Guarantor represents and confirms that the Guarantor has the legal capacity, power and authority to issue this Guarantee and that giving of this Guarantee and the performance and observations of the obligations hereunder do not contravene any existing



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



laws.

For & on behalf of (Supporting Company)

M/s _____

Signature _____

Name _____

Designation _____

official seal _____

Witness:

1. Signature _____

Full Name _____

Address _____

2. Signature _____

Full Name _____

Address _____

INSTRUCTIONS FOR FURNISHING GUARANTEE

1. The official(s) executing the guarantee should affix full signature(s) on each page.
2. Resolution passed by Board of Directors of the guarantor company authorizing the signatory (ies) to execute the guarantee, duly certified by Company Secretary should be furnished along with Guarantee.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Appendix-A2A to Section II

CERTIFICATE ISSUED BY COMPANY SECRETARY OF THE GUARANTOR COMPANY

“Obligations contained in deed of guarantee No. _____ furnished against tender No. _____ are enforceable against the Guarantor Company and the same do not, in any way, contravene any law of the country of which the Guarantor Company is the subject.”

The above certificate should be enclosed alongwith the Guarantee.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

Appendix-A3 to Section II

**PROFORMA OF "BANK GUARANTEE" TOWARDS PERFORMANCE SECURITY BY
FOREIGN BASED SUPPORTING COMPANY OF THE BIDDING COMPANY**

CONTRACT PERFORMANCE SECURITY / SECURITY DEPOSIT

(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)

To,

To, M/s GAIL (India) Limited _____	Bank Guarantee No.	
	Date of BG	
	BG Valid up to (Expiry date)	
	Claim period up to (indicate date of expiry of claim period which includes minimum three months from the expiry date)	
	Stamp Sl. No./e-Stamp Certificate No.	

Dear Sir(s),

M/s. _____ having registered office at _____ (herein after called the “CONTRACTOR” which expression shall wherever the context so require include its successors and assignees) have been placed/awarded the job/work of _____ vide PO/LOA /FOA No. _____ dated _____ (herein after called CONTRACT) for GAIL (India) Limited having registered office at 16, Bhikaiji Cama Place, R.K. Puram, New Delhi (herein after called the “GAIL” which expression shall wherever the context so require include its successors and assignees).

Further, M/s _____ (Name of the Supporting company) having its registered/head office at _____ based on whose experience/technical strength, the CONTRACTOR has qualified for award of contract (hereinafter referred to as the 'SUPPORTING COMPANY') which expression shall, unless repugnant to the context or meaning thereof include all its successors, administrators, executors and assignees) has agreed to provide complete technical and other support to the CONTRACTOR for successful completion of the contract/order as mentioned above, entered between GAIL and the CONTRACTOR and GAIL having agreed that the 'SUPPORTING COMPANY' shall furnish to GAIL a performance guarantee for Indian Rupees/US\$ towards



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

providing complete financial and other support to the CONTRACTOR for successful completion of the contract/order as mentioned above,

The said M/s. _____ (Supporting Company) has approached us and at their request and in consideration of the premises we having our office at _____ have agreed to give such guarantee as hereinafter mentioned.

2. We (name of the bank) _____ registered under the laws of _____ having head/registered office at _____ (hereinafter referred to as "the Bank", which expression shall, unless repugnant to the context or meaning thereof, include all its successors, administrators, executors and permitted assignees) do hereby guarantee and undertake to pay immediately on first demand in writing any/all moneys to the extent of Indian Rs./US\$ (in figures) _____ (Indian Rupees/US Dollars (in words) _____) without any demur, reservation, contest or protest and/or without any reference to the 'SUPPORTING COMPANY'. Any such demand made by GAIL on the Bank by serving a written notice shall be conclusive and binding, without any proof, on the bank as regards the amount due and payable, notwithstanding any dispute(s) pending before any Court, Tribunal, Arbitrator or any other authority and/or any other matter or thing whatsoever, as liability under these presents being absolute and unequivocal. We agree that the guarantee herein contained shall be irrevocable and shall continue to be enforceable until it is discharged by GAIL in writing. This guarantee shall not be determined, discharged or affected by the liquidation, winding up, dissolution or insolvency of the 'SUPPORTING COMPANY' and shall remain valid, binding and operative against the bank.
3. The Bank also agrees that GAIL at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance, without proceeding against the 'SUPPORTING COMPANY' and notwithstanding any security or other guarantee that GAIL may have in relation to the 'SUPPORTING COMPANY's liabilities.
4. The Bank further agrees that GAIL shall have the fullest liberty without our consent and without affecting in any manner our obligations hereunder to vary any of the terms and conditions of the said CONTRACT or to extend time of performance by the said CONTRACTOR from time to time or to postpone for any time or from time to time exercise of any of the powers vested in GAIL against the said CONTRACTOR and to forbear or enforce any of the terms and conditions relating to the said agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said CONTRACTOR or for any forbearance, act or omission on the part of GAIL or any indulgence by GAIL to the said CONTRACTOR (s) or any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.
5. The Bank further agrees that the Guarantee herein contained shall remain in full force during the period that is taken for the performance of the CONTRACT and all dues of GAIL under or by



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- virtue of this CONTRACT have been fully paid and its claim satisfied or discharged or till GAIL discharges this guarantee in writing, whichever is earlier.
6. This Guarantee shall not be discharged by any change in our constitution, in the constitution of GAIL or that of the 'SUPPORTING COMPANY'.
 7. The Bank confirms that this guarantee has been issued with observance of appropriate laws of the country of issue.
 8. The Bank also agrees that this guarantee shall be governed and construed in accordance with Indian Laws and subject to the exclusive jurisdiction of Indian Courts of the place from where the purchase CONTRACT has been placed.
 9. Notwithstanding anything contained hereinabove, our liability under this Guarantee is limited to Indian Rs./US\$ (in figures) _____ (Indian Rupees/US Dollars (in words) _____ only) and our guarantee shall remain in force until (indicate the date of expiry of bank guarantee) _____.
 10. We have power to issue this guarantee in your favor under Memorandum and Articles of Association and the undersigned has full power to do under the Power of Attorney, dated _____ granted to him by the Bank.
1. Notwithstanding anything contained herein:
 - a) The Bank's liability under this Guarantee shall not exceed (currency in figures) (currency in words only)
 - b) This Guarantee shall remain in force upto _____ (this date should be expiry date of defect liability period of the Contract) and any extension(s) thereof; and
 - c) The Bank shall be released and discharged from all liability under this Guarantee unless a written claim or demand is issued to the Bank on or before the midnight of(indicate date of expiry of claim period which includes minimum three months from the expiry of this Bank Guarantee) and if extended, the date of expiry of the last extension of this Guarantee. If a claim has been received by us within the said date, all the rights of GAIL under this Guarantee shall be valid and shall not cease until we have satisfied that claim.

Details of next Higher Authority of the Officials who have issued the Bank Guarantee:

Name

Designation

Yours faithfully,

Bank by its Constituted Attorney



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

Signature of a person duly
Authorized to sign on behalf of the Bank

INSTRUCTIONS FOR FURNISHING

"PERFORMANCE SECURITY / SECURITY DEPOSIT " BY "BANK GUARANTEE"

1. The Bank Guarantee by successful Bidder(s) will be given on non-judicial stamp paper as per 'stamp duty' applicable. The non-judicial stamp paper should be in name of the issuing bank. In case of foreign bank, the said Bank Guarantee to be issued by its correspondent bank in India on requisite non-judicial stamp paper and place of Bid to be considered as Delhi.
2. A letter from the issuing bank of the requisite Bank Guarantee confirming that said Bank Guarantee and all future communication relating to the Bank Guarantee shall be forwarded to Purchaser as per format appended below.
3. The Bank Guarantee shall be from any Indian scheduled bank (excluding Co-operative banks and Regional Rural bank) or a branch of an International bank situated in India and registered with Reserve bank of India as scheduled foreign bank. However, in case of bank guarantees from banks other than the Nationalised Indian banks, the bank must be a commercial bank having net worth in excess of Rs 100 crores and a declaration to this effect shall be made by such commercial bank either in the Bank Guarantee itself or separately on its letterhead.

**MATTER TO BE MENTIONED IN COVERING LETTER TO BE SUBMITTED BY VENDOR
ALONG WITH BANK GUARANTEE**

1	BANK GUARANTEE NO	:				
2	VENDOR NAME / VENDOR CODE	:	NAME			
			VENDOR CODE			
3	BANK GUARANTEE AMOUNT	:				
4	PURCHASE ORDER/ LOA NO	:				
5	NATURE OF BANK GUARANTEE	:				
	(Please Tick (√) Whichever is Applicable)		PERFORMANCE BANK GUARAN- TEE	SECURITY DEPOSIT	EMD	ADVANCE
6	BG ISSUED BANK DETAILS					
(A)		EMAIL ID	:			
(B)		ADDRESS	:			
(C)		PHONE NO	:			
		(D)	IFSC CODE:			



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



SECTION-III

INSTRUCTION TO BIDDERS **(TO BE READ IN CONJUNCTION WITH** **BIDDING DATA SHEET (BDS)**



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



SECTION-III

INSTRUCTION TO BIDDERS

INDEX

[A] GENERAL:

1. SCOPE OF BID
2. ELIGIBLE BIDDERS
3. BIDS FROM CONSORTIUM
4. ONE BID PER BIDDER
5. COST OF BIDDING
6. SITE-VISIT

[B] BIDDING DOCUMENTS:

7. CONTENTS OF BIDDING DOCUMENTS
8. CLARIFICATION OF TENDER DOCUMENTS
9. AMENDMENT OF BIDDING DOCUMENTS

[C] PREPARATION OF BIDS:

10. LANGUAGE OF BID
11. DOCUMENTS COMPRISING THE BID
12. BID PRICES
13. GST (CGST & SGST/ UTGST or IGST)
14. BID CURRENCIES
15. BID VALIDITY
16. EARNEST MONEY DEPOSIT / BID SECURITY
17. PRE-BID MEETING
18. FORMAT AND SIGNING OF BID
19. ZERO DEVIATION & REJECTION CRITERIA
20. E-PAYMENT

[D] SUBMISSION OF BIDS:

21. SUBMISSION, SEALING AND MARKING OF BIDS
22. DEADLINE FOR SUBMISSION OF BIDS
23. LATE BIDS
24. MODIFICATION AND WITHDRAWAL OF BIDS

[E] BID OPENING AND EVALUATION:

25. EMPLOYER'S RIGHT TO ACCEPT ANY BID AND TO REJECT ANY OR ALL BIDS
26. BID OPENING
27. CONFIDENTIALITY



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

28. CONTACTING THE EMPLOYER
29. EXAMINATION OF BIDS AND DETERMINATION OF RESPONSIVENESS
30. CORRECTION OF ERRORS
31. CONVERSION TO SINGLE CURRENCY FOR COMPARISON OF BIDS
32. EVALUATION AND COMPARISON OF BIDS
33. COMPENSATION FOR EXTENDED STAY
34. PURCHASE PREFERENCE

[F] AWARD OF CONTRACT:

35. AWARD
36. NOTIFICATION OF AWARD / FAX OF ACCEPTANCE [FOA]
37. SIGNING OF AGREEMENT
38. CONTRACT PERFORMANCE SECURITY / SECURITY DEPOSIT
39. PROCEDURE FOR ACTION IN CASE CORRUPT/FRAUDULENT/COLLUSIVE/COERCIVE PRACTICES
40. PUBLIC PROCUREMENT POLICY FOR MICRO AND SMALL ENTERPRISE
41. AHR ITEMS
42. VENDOR EVALUATION PROCEDURE
43. INCOME TAX & CORPORATE TAX
44. DISPUTE RESOLUTION MECHANISM
45. DISPUTES BETWEEN CPSE'S/GOVERNMENT DEPARTMENT'S/ ORGANIZATIONS
46. INAM-PRO (PLATFORM FOR INFRASTRUCTURE AND MATERIALS PROVIDERS)
47. PROMOTION OF PAYMENT THROUGH CARDS AND DIGITAL MEANS
48. CONTRACTOR TO ENGAGE CONTRACT MANPOWER BELONGING TO SCHEDULED CASTES AND WEAKER SECTIONS OF THE SOCIETY
49. PROVISION FOR STARTUPS
50. PROVISION REGARDING INVOICE FOR REDUCED VALUE OR CREDIT NOTE TOWARDS PRS
51. UNIQUE DOCUMENT IDENTIFICATION NUMBER BY PRACTICING CHARTERED ACCOUNTANTS
52. ANJANI PORTAL
53. DOCUMENTS FOR PAYMENT
54. ORDER TRANSMITTAL SYSTEM
55. SUBLETTING AND ASSIGNMENT
56. VENDOR INVOICE MANAGEMENT (VIM)

[G] ANNEXURES:



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

1. ANNEXURE-I: PROCEDURE FOR ACTION IN CASE CORRUPT/FRAUDULENT/COLLUSIVE/COERCIVE PRACTICES
2. ANNEXURE-II: VENDOR PERFORMANCE EVALUATION PROCEDURE
3. ANNEXURE-III : ADDENDUM TO INSTRUCTIONS TO BIDDERS (INSTRUCTION FOR PARTICIPATION IN E-TENDER)
4. ANNEXURE-IV: BIDDING DATA SHEET (BDS)
5. ANNEXURE-V: POLICY TO PROVIDE PURCHASE PREFERENCE AS PER PUBLIC PROCUREMENT (PREFERENCE TO MAKE IN INDIA), ORDER 2017
6. ANNEXURE-VI: THIRD PARTY DEPOSIT CONFIRMATION LETTER FOR FDR



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



**INSTRUCTIONS TO BIDDERS [ITB]
(TO BE READ IN CONJUNCTION WITH BIDDING DATA SHEET (BDS))**

[A] – GENERAL

1 SCOPE OF BID

- 1.1 The Employer as defined in the "General Conditions of Contract [GCC]", wishes to receive Bids as described in the Invitation For Bid (the “**Tender Document /Bid Document**”) issued by Employer. Employer/Owner/GAIL occurring herein under shall be considered synonymous.
- 1.1 SCOPE OF BID: The scope of work/ Services shall be as defined in the Tender documents.
- 1.3 The successful bidder will be expected to complete the scope of Bid within the period stated in Special Conditions of Contract.
- 1.4 Throughout the Tender Documents, the terms 'Bid', 'Tender' & 'Offer' and their derivatives [Bidder/Tenderer, Bid/Tender/Offer etc.] are synonymous. Further, 'Day' means 'Calendar Day' and 'Singular' also means 'Plural'.

2 ELIGIBLE BIDDERS

- 2.1 The Bidder shall not be under a declaration of ineligibility by Employer for Corrupt/ Fraudulent/ Collusive/ Coercive practices, as defined in "Instructions to Bidders [ITB], Clause No. 39” (Action in case Corrupt/ Fraudulent/ Collusive/ Coercive Practices).
- 2.2 The Bidder is not put on ‘Holiday’ by GAIL or Public Sector Project Management Consultant (like EIL, BANDR only due to “poor performance” or “corrupt and fraudulent practices”) or banned/blacklisted by Government department/ Public Sector on due date of submission of bid. Further, neither bidder nor their allied agency/(ies) (as defined in the Procedure for Action in case of Corrupt/ Fraudulent/ Collusive/ Coercive Practices) are on banning list of GAIL or the Ministry of Petroleum and Natural Gas.

If the bidding documents were issued inadvertently/ downloaded from website, offers submitted by such bidders shall not be considered for opening/ evaluation/Award and will be returned immediately to such bidders.

In case there is any change in status of the declaration prior to award of contract, the same has to be promptly informed to GAIL/BANDR by the bidder.

It shall be the sole responsibility of the bidder to inform about their status regarding para 1 of clause 2.2 herein above on due date of submission of bid and during the course of finalization of the tender. Concealment of the facts shall tantamount to misrepresentation of facts and shall lead to action against such Bidders as per clause 39 of ITB.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

- 2.3 The Bidder should not be under any liquidation court receivership or similar proceedings on due date of submission of bid. In case there is any change in status of the declaration prior to award of contract, the same has to be promptly informed to GAIL/BANDR by the bidder. It shall be the sole responsibility of the bidder to inform GAIL/BANDR there status on above on due date of submission of bid and during the course of finalization of the tender. Concealment of the facts shall tantamount to misrepresentation of facts and shall lead to action against such Bidders as per clause no.39 of ITB.
- 2.4 Bidder shall not be affiliated with a firm or entity:
- (i) that has provided consulting services related to the work to the Employer during the preparatory stages of the work or of the project of which the works/services forms a part of or
 - (ii) that has been hired (proposed to be hired) by the Employer as an Engineer/ Consultant for the contract.
- 2.5 Neither the firm/entity appointed as the Project Management Consultant (PMC) for a contract nor its affiliates/ JV'S/ Subsidiaries shall be allowed to participate in the tendering process unless it is the sole Licensor/Licensor nominated agent/ vendor.
- 2.6 Pursuant to qualification criteria set forth in the bidding document, the Bidder shall furnish all necessary supporting documentary evidence to establish Bidder's claim of meeting qualification criteria.
- 2.7 Power of Attorney:
- Power of Attorney (POA) to be issued by the bidder in favour of the authorised employee(s), in respect of the particular tender, for purpose of signing the documents including bid, all subsequent communications, agreements, documents etc. pertaining to the tender and act and take any and all decision on behalf of the bidder (including Consortium). Any consequence resulting due to such signing shall be binding on the Bidder (including Consortium).
- (I) In case of a Single Bidder, the Power of Attorney shall be issued as per the constitution of the bidder as below:
 - a) **In case of Proprietorship:** by Proprietor
 - b) **In case of Partnership:** by all Partners or Managing Partner
 - c) **In case of Limited Liability Partnership:** by any bidder's employee authorized in terms of Deed of LLP
 - d) **In case of Public / Limited Company:** PoA in favour of authorized employee(s) by Board of Directors through Board Resolution or by the designated officer authorized by Board to do so. Such Board Resolution should be duly countersigned by Company Secretary / MD / CMD / CEO.
 - (II) In case of a Consortium, Power of Attorney shall be issued both by Leader as well as Consortium Member(s) of the Consortium as per procedure defined herein above in favour of employee of Leader of Consortium.
- The Power of Attorney should be valid till award of contract / order to successful bidder.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

- 2.8 In case of change of constitution of bidder after submission of bid, the same shall be informed by the bidder to GAIL/BANDR promptly. Failure to same shall be considered as misrepresentation by the bidder.

3 BIDS FROM "CONSORTIUM" : Not Applicable

4 ONE BID PER BIDDER

- 4.1 A Bidder shall submit only 'one [01] Bid' in the same Bidding Process either as single entity or as a member of any consortium (wherever consortium bid is allowed). A Bidder who submits or participates in more than 'one [01] Bid' will cause all the proposals in which the Bidder has participated to be disqualified.
- 4.2 A bidder shall not have conflict of interest with other bidders. Such conflict of interest can lead to anti-competitive practices. The bidder found to have a conflict of interest shall be disqualified. A bidder shall be considered to have a conflict of interest with one or more bidders in this bidding process, if:
- a) they have controlling partner (s) in common; or
 - b) they receive or have received any direct or indirect subsidy/ financial stake from any of them; or
 - c) they have the same legal representative/authorized signatory/agent for purposes of this bid; or
 - d) they have relationship with each other, directly or through common third parties, that puts them in a position to have access to information about or influence on the bid of another Bidder; or
 - e) Bidder participates in more than one bid in bidding process. Participation by a Bidder in more than one Bid will result in the disqualification of all bids in which the parties are involved. However, this does not limit the inclusion of the components/ sub-assembly/ Assemblies from one bidding manufacturer in more than one bid.
 - f) a Bidder or any of its affiliates participated as a consultant in the preparation of the design or technical specifications of the contract that is the subject of the Bid;
 - g) In case of a holding company having more than one independently manufacturing units, or more than one unit having common business ownership/management, only one unit should quote. Similar restrictions would apply to closely related sister companies. Bidders must proactively declare such sister/ common business/ management units in same/ similar line of business.

Bidders are required to submit a confirmation for no conflict of interest with other bidders in Format F-5..

Failure to comply this clause during tendering process will disqualify all such bidders from process of evaluation of bids.

- 4.3 Alternative Bids shall not be considered.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

- 4.4 The provisions mentioned at sl. no. 4.1 and 4.2 shall not be applicable wherein bidders are quoting for different Items / Sections / Parts / Groups/ SOR items of the same tender which specifies evaluation on Items / Sections / Parts / Groups/ SOR items basis.
- 4.5 Bidders are required to provide complete details of all Directors/Partners/Proprietors etc. including Father's name, Residential address, AADHAR, PAN Card details & DIN Nos. in Form F-1 & F-1(A) of ITB **and corresponding documents duly notarized by Notary Public.**

It is the responsibility of the participating Bidder(s) to assess the relationship as mentioned above.

In case any undertaking/declaration given by a Bidder(s) in this regard is found to be false, this would be a sufficient ground for rejection of Bid(s) /termination of contract and also initiation of further action as per "Procedure for Action in case of Corrupt/Fraudulent/ Collusive / Coercive Practices" of tender document

5 COST OF BIDDING

The Bidder shall bear all costs associated with the preparation and submission of the Bid including but not limited to Documentation Charges, Bank charges, all courier charges, translation charges, authentication charges and any associated charges including taxes & duties thereon. Further, GAIL/BANDR will in no case, be responsible or liable for these costs, regardless of the outcome of the bidding process.

6 SITE VISIT

- 6.1 The Bidder is advised to visit and examine the site of works and its surroundings and obtain for itself on its own responsibility all information that may be necessary for preparing the Bid and entering into a Contract for the required job. The costs of visiting the site shall be borne by the Bidder.
- 6.2 The Bidder or any of its personnel or agents shall be granted permission by the Employer to enter upon its premises and land for the purpose of such visits, but only upon the express conditions that the Bidder, its personnel and agents will release and indemnify the Employer and its personnel, agents from and against all liabilities in respect thereof, and will be responsible for death or injury, loss or damage to property, and any other loss, damage, costs, and expenses incurred as a result of inspection.
- 6.3 The Bidder shall not be entitled to hold any claim against GAIL/CMC for non-compliance due to lack of any kind of pre-requisite information as it is the sole responsibility of the Bidder to obtain all the necessary information with regard to site, surrounding, working conditions, weather etc. on its own before submission of the bid.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



[B] – BIDDING DOCUMENTS

7 CONTENTS OF BIDDING DOCUMENTS

7.1 The contents of Bidding Documents / Tender Documents are those stated below, and should be read in conjunction with any 'Addendum / Corrigendum and Clarification(s)' issued in accordance with "ITB: Clause-8 & 9":

- Section-I : Invitation for Bid [IFB]*
- Section-II : Bid Evaluation Criteria [BEC] & Evaluation methodology
- Section-III : Instructions to Bidders [ITB], Annexure, Forms & Format**
- Section-IV : General Conditions of Contract [GCC]***
- Section-V : Special Conditions of Contract [SCC]
- Section-VI : Scope of Work /Drawing & List of Approved Makes
- Section-VII : Schedule of Rates
- Section-VIII : Technical Specification (Volume-II of III)
- Section-IX : Technical Specification (Volume-III of III)

*Request for Quotation', wherever applicable, shall also form part of the Bidding Document.

** The subject tender is based on standard formats and applicability of some specific clauses may be seen in Annexure-IV to Section-III i.e. BDS (Bidding Data Sheet).

*** General Conditions of Contract – Works is available on GAIL's Tender website (<http://gailtenders.in/Gailtenders/gccs.asp>). Further, Hindi version of GCC is available on the GAIL's tender website for reference. However, in case of any discrepancy in English & its Hindi translation, for interpretation and legal aspects, the English version shall prevail.

For participation in E-tender, instructions are mentioned at Annexure-III to Section-III.

7.2 The Bidder is expected to examine all instructions, forms, terms & conditions in the Bidding Documents. The "Request for Quotation [RFQ] & Invitation for Bid (IFB)" together with all its attachments thereto, shall be considered to be read, understood and accepted by the Bidders. Failure to furnish all information required by the Bidding Documents or submission of a Bid not substantially responsive to the Bidding Documents in every respect will be at Bidder's risk and may result in the rejection of his Bid.

8 CLARIFICATION OF TENDER DOCUMENTS

8.1 A prospective Bidder requiring any clarification(s) of the Bidding Documents may notify BANDR in writing by email at BANDR's mailing address indicated in the BDS no later than 02 (two) days prior to pre-bid meeting (in cases where pre-bid meeting is scheduled) or 05 (five) days prior to the due date of submission of bid in cases where pre-bid meeting is not scheduled. GAIL reserves the right to ignore the bidders request for clarification if received after the aforesaid period. GAIL may respond in writing to the request for clarification. GAIL's



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

- response including an explanation of the query, but without identifying the source of the query will be uploaded on e-tender portal / communicated to prospective bidders by e-mail.
- 8.2 Any clarification or information required by the Bidder but same not received by the Employer at clause 8.1 (refer BDS for address) above is liable to be considered as "no clarification / information required".

9 AMENDMENT OF BIDDING DOCUMENTS

- 9.1 At any time prior to the 'Bid Due Date', Employer may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective Bidder, modify the Bidding Documents by addenda/ corrigendum.
- 9.2 Any corrigendum thus issued shall be integral part of the Tender Document and shall be hosted on the websites as provided at clause no. 2.0 (G) of IFB /communicated to prospective bidders by e-mail. Bidders have to take into account all such corrigendum before submitting their Bid.
- 9.3 The Employer, if consider necessary, may extend the Bid Due Date in order to allow the Bidders a reasonable time to furnish their most competitive bid taking into account the addenda/corrigendum issued thereof.

10] – PREPARATION OF BIDS

10 LANGUAGE OF BID:

The bid prepared by the Bidder and all correspondence, drawing(s), document(s), certificate(s) etc. relating to the Bid exchanged by Bidder and GAIL shall be written in English language only. In case a document, certificate, printed literature etc. furnished by the Bidder in a language other than English, the same should be accompanied by an English translation duly authenticated by the Indian Chamber of Commerce, in which case, for the purpose of interpretation of the Bid, the English translation shall govern.

11. DOCUMENTS COMPRISING THE BID

11.1 IN CASE OF MANUAL TENDERING

In case the Bids are invited under the Manual two Bid system. The Bid prepared by the Bidder shall comprise the following components sealed in 2 different envelopes:

- 11.1.1 **ENVELOPE-I: "TECHNO-COMMERCIAL / UN-PRICED BID"** shall contain the following:
- (a) 'Covering Letter' on Bidder's 'Letterhead' clearly specifying the enclosed contents with index.
 - (b) 'Bidder's General Information', as per 'Form F-1'.
 - (c) Copies of documents, as specified in tender document



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

- (d) Copy of Schedule of Rate (SOR) with prices blanked out mentioning quoted / not quoted (as applicable) written against each item as a confirmation that the prices are quoted in requisite format .
- (e) 'Letter of Authority' on the Letter Head, as per 'Form F-3'
- (f) 'Agreed Terms and Conditions', as per 'Form F-5'
- (g) 'Acknowledgement Cum Consent Letter', as per 'Form F-6'
- (h) Duly attested documents in accordance with the "Bid Evaluation Criteria [BEC]" establishing the qualification.
- (i) Copy of Power of Attorney /copy of Board Resolution, in favour of the authorized signatory of the Bid, as per clause no.2.7 of ITB
- (j) EMD in original (in case of manual tendering) / copy of EMD (in case of e-Tender), as per Clause 16 of ITB. Declaration for Bid Security as per provision of ITB.
- (l) Undertaking as per *Form-2 to Annexure-V to Section-III* and Certification from the statutory auditor or cost auditor of the company (in the case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of other than companies) as per *Form-3 to Annexure-V to Section-III*
- (m) Undertaking as per *Form-I to Section-II* regarding Provisions for Procurement from a Bidder which shares a land border with India
- (n) All forms and Formats including Annexures
- (o) 'Integrity Pact' as per 'Form F-14'
- (p) 'Indemnity Bond' as per 'Form F-15'
- (q) Tender Document, its Corrigendum/Amendment/Clarification(s) duly signed on each page (in case of manual tendering)/ digitally signed (in case of e-Tender) by the Authorized Signatory holding POA.
- (r) Additional document specified in BDS, SCC, Scope of Supply or mentioned elsewhere in the Tender Document, its corrigendum/Amendment/Clarification(s).
- (s) Any other information/details required as per Bidding Document

Note: All the pages of the Bid must be signed by the "Authorized Signatory" of the Bidder holding POA.

11.1.2 ENVELOPE-II: Price Bid

- i) The Prices are to be submitted strictly as per the Schedule of Rate of the bidding documents. GAIL shall not be responsible for any failure on the part of the bidder to follow the instructions.
- ii) Bidders are advised NOT to mention Rebate/Discount separately, either in the SOR format or anywhere else in the offer. In case Bidder(s) intend to offer any Rebate/Discount, they should include the same in the item rate(s) itself under the "Schedule of Rates (SOR)" and indicate the discounted unit rate(s) only.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- iii) If any unconditional rebate has been offered in the quoted rate the same shall be considered in arriving at evaluated price. However no cognizance shall be taken for any conditional discount for the purpose of evaluation of the bids.
- iv) In case, it is observed that any of the bidder(s) has/have offered suo-moto Discount/Rebate after opening of unpriced bid but before opening of price bids such discount /rebate(s) shall not be considered for evaluation. However, in the event of the bidder emerging as the lowest evaluated bidder without considering the discount/rebate(s), then such discount/rebate(s) offered by the bidder shall be considered for Award of Work and the same will be conclusive and binding on the bidder.
- v) In the event as a result of techno-commercial discussions or pursuant to seeking clarifications / confirmations from bidders, while evaluating the un-priced part of the bid, any of the bidders submits a sealed envelope stating that it contains revised prices; such bidder(s) will be requested to withdraw the revised prices failing which the bid will not be considered for further evaluation.

11.1.3 In case of bids invited under Single Bid System (clause no. 2.0(C) of IFB refers), all the documents as specified at Clause 11.1.1 & 11.1.2 of ITB can be submitted in single envelope /folder, as per instructions of Tender Document.

11.2 IN CASE OF E-TENDERING:

Bidders are requested to refer instructions for participating in e-Tendering (Annexure-I to Section III), Bidders manual kit and FAQs available in E-tender portal and bids submitted manually shall be rejected. All pages of the Bid must be digitally signed by the "authorized signatory" of the Bidder holding Power of Attorney. The Bid must be submitted on e-tender portal (<https://etenders.gov.in/e procure/app>) as follows:-

11.2.1 PART-I: “TECHNO-COMMERCIAL/UN-PRICED BID” comprising all the above documents mentioned at 11.1.1 along with copy of EMD/Bid Security/Declaration for Bid Security, copy of Power of Attorney and copy of integrity pact should be uploaded in the technical bid in the e-tender portal.

Further, Bidders must submit the original " EMD, Power of Attorney, Integrity Pact (wherever applicable) and any other documents specified in the Tender Document to the address mentioned in IFB, in a sealed envelope, superscribing the details of Tender Document (i.e. tender number & tender for) within 7 days from the date of un-priced bid opening.

Bidders are required to submit the EMD in original by Due Date and Time of Bid Submission or upload a scanned copy of the same in the Part-I of the Bid. If the Bidder is unable to submit EMD in original by Due Date and Time of Bid Submission, the Bidder is required to upload a scanned copy of the EMD in Part-I of Bid, provided the original EMD, copy of which has been uploaded, is received within 7 days from the Due Date of Bid Opening, failing which the Bid



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



will be rejected irrespective of their status/ranking in tendering process and notwithstanding the fact that a copy of EMD was earlier uploaded by the Bidder.

Further, GAIL reserves the right to seek in physical form (original/notarized true copy) of any document(s) uploaded in digital form, at any time during the processing of tender and execution of contract. In the event of failure of a bidder/vendor/contractor to submit original/notarized true copy of any document(s) within the specified time schedule, EMD or CPS of the bidder/vendor/contractor shall be forfeited /Bid Security Declaration clause shall be invoked.

11.2.2 PART-II: PRICE BID

The Prices are to be filled strictly in the Schedule of Rate of the bidding documents and provision mentioned at para 11.1.2 here in above and to upload in Financial bid in the e-tender portal.

- 11.3 In case of bids invited under *single bid system*, a single envelope containing all documents specified at Clause 11.1.1 & 11.1.2 of ITB above form the BID. All corresponding conditions specified at Clause 11.1.1 & 11.1.2 of ITB shall become applicable in such a case.

12 BID PRICES

- 12.1 Unless stated otherwise in the Bidding Documents, the Contract shall be for the whole works as described in Bidding Documents, based on the rates and prices submitted by the Bidder and accepted by the Employer. The prices quoted by the Bidders will be inclusive of all taxes except **GST (CGST & SGST/UTGST or IGST)**.
- 12.2 Prices must be filled in format for "Schedule of Rates [SOR]" enclosed as part of Tender document. If quoted in separate typed sheets and any variation in item description, unit or quantity is noticed; the Bid is liable to be rejected.
- 12.3 Bidder shall quote for all the items of "SOR" after careful analysis of cost involved for the performance of the completed item considering all parts of the Bidding Document. In case any activity though specifically not covered in description of item under "SOR" but is required to complete the works as per Specifications, Scope of Work / Service, Standards, General Conditions of Contract ("GCC"), Special Conditions of Contract ("SCC") or any other part of Bidding Document, the prices quoted shall deemed to be inclusive of cost incurred for such activity.
- 12.4 All duties, taxes and other levies [if any] payable by the Contractor under the Contract, or for any other cause except final **GST (CGST & SGST/ UTGST or IGST)** shall be included in the rates / prices and the total bid-price submitted by the Bidder.

Bidder shall indicate applicable rate of GST (CGST & SGST/ UTGST or IGST) in SOR.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

- 12.5 Prices quoted by the Bidder, shall remain firm and fixed and valid till completion of the Contract and will not be subject to variation on any account unless any price escalation/variation is allowed elsewhere in the Tender Document.
- 12.6 The Bidder shall quote the prices in 'figures' & words. There should not be any discrepancy between the prices indicated in figures and the price indicated in words. In case of any discrepancy, the same shall be dealt as per clause no. 30 of ITB.
- 12.7 Bidder shall also mention the **Service Accounting Codes (SAC) / Harmonized System of Nomenclature (HSN)** at the designated place in SOR.

13 GST (CGST & SGST/ UTGST or IGST)

- 13.1 Bidders are required to submit copy of the GST Registration Certificate while submitting the bids wherever **GST (CGST & SGST/UTGST or IGST)** is applicable.
- 13.2 Quoted prices should be inclusive of all taxes and duties, except **GST (CGST & SGST or IGST or UTGST)**. Please note that the responsibility of payment of **GST (CGST & SGST or IGST or UTGST)** lies with the Contractor only. Contractor providing taxable service shall issue an e-Invoice/Invoice/Bill, as the case may be as per rules/ regulation of GST. Further, returns and details required to be filled under GST laws & rules should be timely filed by Contractor with requisite details.

Payments to Contractor for claiming **GST (CGST & SGST/UTGST or IGST)** amount will be made provided the above formalities are fulfilled. Further, GAIL may seek copies of challan and certificate from Chartered Accountant for deposit of **GST (CGST & SGST/UTGST or IGST)** collected from Owner.

- 13.3 In case CBIC (Central Board of Indirect Taxes and Customs)/ any tax authority / any equivalent government agency brings to the notice of GAIL that the Contractor has not remitted the amount towards **GST (CGST & SGST/UTGST or IGST)** collected from GAIL to the government exchequer, then, that Contractor shall be put under Holiday list of GAIL for period of six months after following the due procedure. This action will be in addition to the right of recovery of financial implication arising on GAIL.

- 13.4 In case of statutory variation in **GST (CGST & SGST/UTGST or IGST)**, other than due to change in turnover, payable on the contract value during contract period, the Contractor shall submit a copy of the 'Government Notification' to evidence the rate as applicable on the Bid due date and on the date of revision.

Beyond the contract period, in case GAIL is not entitled for input tax credit of **GST (CGST & SGST/UTGST or IGST)**, then any increase in the rate of **GST (CGST & SGST/UTGST or IGST)** beyond the contractual delivery period shall be to Contractor's account whereas any decrease in the rate **GST (CGST & SGST/UTGST or IGST)** shall be passed on to the Owner.

Beyond the contract period, in case GAIL is entitled for input tax credit of **GST (CGST & SGST/UTGST or IGST)**, then statutory variation in quoted **GST (CGST & SGST/UTGST or IGST)** on supply and on incidental services, shall be to GAIL's account.

Claim for payment of **GST (CGST & SGST/UTGST or IGST)**/ Statutory variation, should be raised within two [02] months from the date of issue of 'Government Notification' for pay-



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

ment of differential (in %) **GST (CGST & SGST/UTGST or IGST)**, otherwise claim in respect of above shall not be entertained for payment of arrears.

The base date for the purpose of applying statutory variation shall be the Bid Due Date.

13.5 Where GAIL is entitled to avail the input tax credit of **GST (CGST & SGST/UTGST or IGST)**:-

13.5.1 Owner/GAIL will reimburse the **GST (CGST & SGST/UTGST or IGST)** to the Contractor at actuals against submission of E-Invoices/Invoices as per format specified in rules/ regulation of GST to enable Owner/GAIL to claim input tax credit of **GST (CGST & SGST/UTGST or IGST)** paid. In case of any variation in the executed quantities, the amount on which the **GST (CGST & SGST/UTGST or IGST)** is applicable shall be modified in same proportion. Returns and details required to be filled under GST laws & rules should be timely filed by supplier with requisite details.

13.5.2 The input tax credit of quoted **GST (CGST & SGST/UTGST or IGST)** shall be considered for evaluation of bids, as per evaluation criteria of tender document.

13.6 Where GAIL is not entitled to avail/take the full input tax credit of **GST (CGST & SGST/UTGST or IGST)**:-

13.6.1 Owner/GAIL will reimburse **GST (CGST & SGST/UTGST or IGST)** to the Contractor at actuals against submission of E-Invoices/Invoices as per format specified in rules/ regulation of GST subject to the ceiling amount of **GST (CGST & SGST/UTGST or IGST)** as quoted by the bidder, subject to any statutory variations, except variations arising due to change in turnover. In case of any variation in the executed quantities (If directed and/or certified by the Engineer-In-Charge) the ceiling amount on which **GST (CGST & SGST/UTGST or IGST)** is applicable will be modified on pro-rata basis.

13.6.2 The bids will be evaluated based on total price including quoted **GST (CGST & SGST/UTGST or IGST)**.

13.7 GAIL will prefer to deal with registered supplier of goods/ services under GST. Therefore, bidders are requested to get themselves registered under GST, if not registered yet.

However, in case any unregistered bidder is submitting their bid, Bids will be evaluated as per quoted prices without loading of **GST (CGST & SGST/UTGST or IGST)**, if not quoted. their prices will be loaded with applicable GST (CGST & SGST/UTGST or IGST) while evaluation of bid (if applicable as per Govt. Act/ Law in vogue). Where GAIL is entitled for input credit of **GST (CGST & SGST/UTGST or IGST)**, the same will be considered for evaluation of bid as per evaluation methodology of tender document. Further, an unregistered bidder is required to mention its Income Tax PAN in bid document. Further, an unregistered bidder is required to mention its Income Tax PAN in bid document..

13.8 In case GAIL is required to pay entire/certain portion of applicable **GST (CGST & SGST/UTGST or IGST)** and remaining portion, if any, is to be deposited by Bidder directly as per **GST (CGST & SGST/UTGST or IGST)** laws, entire applicable rate/amount of **GST (CGST & SGST/UTGST or IGST)** to be indicated by bidder in the SOR.

Where GAIL has the obligation to discharge **GST (CGST & SGST/UTGST or IGST)** liability under reverse charge mechanism and GAIL has paid or is /liable to pay **GST (CGST &**



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

SGST/UTGST or IGST) to the Government on which interest or penalties becomes payable as per GST laws for any reason which is not attributable to GAIL or ITC with respect to such payments is not available to GAIL for any reason which is not attributable to GAIL, then GAIL shall be entitled to deduct/ setoff / recover such amounts against any amounts paid or payable by GAIL to Contractor / Supplier.

- 13.9 Contractor shall ensure timely submission of correct invoice(s) /e-invoice(s), as per GST rules/regulation, with all required supporting document(s) within a period specified in Contract to enable GAIL to avail input credit of GST (CGST & SGST/UTGST or IGST). Further, returns and details required to be filled under GST laws & rules should be timely filed by Contractor with requisite details.

If input tax credit is not available to GAIL for any reason not attributable to GAIL, then GAIL shall not be obligated or liable to pay or reimburse GST (CGST & SGST/UTGST or IGST) claimed in the invoice(s) and shall be entitled to deduct / setoff / recover such GST amount (CGST & SGST/UTGST or IGST) or Input Tax Credit amount together with penalties and interest, if any, against any amounts paid or becomes payable by GAIL in future to the Contractor under this contract or under any other contract.

13.10 Anti-profiteering clause

As per Clause 171 of GST Act it is mandatory to pass on the benefit due to reduction in rate of tax or from input tax credit to the consumer by way of commensurate reduction in prices. The Contractor may note the above and quote their prices accordingly.

- 13.11 In case the GST rating of contractor on the GST portal / Govt. official website is negative / black listed, then the bids may be rejected by GAIL. Further, in case rating of bidder is negative / black listed after award of work, then GAIL shall not be obligated or liable to pay or reimburse GST to such c and shall also be entitled to deduct / recover such GST along with all penalties / interest, if any, incurred by GAIL.

- 13.12 GST (CGST & SGST/UTGST or IGST) is implemented w.e.f. 01.07.2017 which subsumed various indirect taxes and duties applicable before 01.07.2017. Accordingly, the provisions of General Condition of Contract relating to taxes and duties which are subsumed in GST are modified to aforesaid provisions mentioned in clause no. 12 and 13 of ITB.

- 13.13 GST, as quoted by the bidder in Schedule of Rates, shall be deemed as final and binding for the purpose of bid evaluation (applicable for tenders where bidder quotes the GST rates). In case a bidder enters “zero/blank” GST or an erroneous GST, the bid evaluation for finalizing the L1 bidder will be done considering the “Zero” or quoted GST rate, as the case may be. No request for change in GST will be entertained after submission of bids.

In cases where the successful bidder quotes a wrong GST rate, for releasing the order, the following methodology will be followed:

- In case the actual GST rate applicable is lower than the quoted GST rate, the actual GST rate will be added to the quoted basic prices. The final cash outflow will be based on actual GST rate.
- In case the actual GST rate applicable is more than the quoted GST rate, the basic prices quoted will be reduced proportionately, keeping the final cash outflow the same as



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



the overall quoted amount.

Based on the Total Cash Outflow calculated as above, GAIL shall place orders.

- 13.14 Wherever TDS under GST Laws has been deducted from the invoices raised / payments made to the Contractors, as per the provisions of the GST law / Rules, Contractors should accept the corresponding GST-TDS amount populated in the relevant screen on GST common portal (www.gst.gov.in). Further, Vendors should also download the GST TDS certificate from GST common portal (reference path: Services > User Services > View/Download Certificates option).

13.15 Provision w.r.t. E- Invoicing requirement as per GST laws:

Supplier who is required to comply with the requirements of E-invoice for B2B transactions as per the requirement of GST Law will ensure the compliance of requirement of E Invoicing under GST law. If the invoice issued without following this process, such invoice can-not be processed for payment by GAIL as no ITC is allowed on such invoices.

Therefore, all the payments to such supplier who is liable to comply with e-invoice as per GST Laws shall be made against the proper e-invoice(s) only. Further, returns and details required to be filled under GST laws & rules against such e-invoices should be timely filed by Supplier of Goods with requisite details.

If input tax credit is not available to GAIL for any reason attributable to supplier (both for E-invoicing cases and non-E-invoicing cases), then GAIL shall not be obligated or liable to pay or reimburse GST (CGST & SGST/UTGST or IGST) claimed in the invoice(s) and shall be entitled to deduct / setoff / recover such GST amount (CGST & SGST/UTGST or IGST) or Input Tax Credit amount together with penalties and interest, if any, by adjusting against any amounts paid or becomes payable in future to the supplier under this contract or under any other contract.

To ensure compliance, undertaking in requisite format is to be submitted by supplier as per format F-17 along with documents for release of payment.

- 13.16 **New Taxes & duties:** Any new taxes & duties, if imposed by the State/ Central Govt. of India after the due date of bid submission but before the Contractual Completion Date, shall be reimbursed to the Service Provider on submission of copy of notification(s) issued from State/ Central Govt. Authorities along with documentary evidence for proof of payment of such taxes & duties, but only after ascertaining it's applicability with respect to the Contract.
- 13.17 Full payment including GST will be released at the time of processing of invoice for payment, where the GST amount reflects in Form GSTR-2A of GAIL. However, in case where the GST amount doesn't reflect in Form GSTR-2A of GAIL, the amount of GST will be released after reflection of GST amount of corresponding invoice in Form GSTR-2A of GAIL.

14 BID CURRENCIES:

Bidders must submit bid in Indian Rupees only.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

15 BID VALIDITY

- 15.1 Bids shall be kept valid for period specified in BDS from the final Due date of submission of bid'. A Bid valid for a shorter period may be rejected by GAIL as 'non-responsive'.
- 15.2 In exceptional circumstances, prior to expiry of the original 'Bid Validity Period', the Employer may request the Bidders to extend the 'Period of Bid Validity' for a specified additional period. The request and the responses thereto shall be made in writing or by email. A Bidder may refuse the request without forfeiture of his EMD / Bid Security.

A Bidder agreeing to the request will not be required or permitted to modify his Bid, but will be required to extend the validity of its EMD for the period of the extension and in accordance with "ITB: Clause-16" in all respects.

16 EARNEST MONEY DEPOSIT

- 16.1 Bid must be accompanied with earnest money (i.e **Earnest Money Deposit (EMD)**) also known as **Bid Security**) in the form of '**Demand Draft**' / '**Banker's Cheque**' / '**Insurance Surety Bond**' / '**Fixed Deposit Receipt**' [in favour of **GAIL (India) Limited** payable at place mentioned in **BDS**] or '**Bank Guarantee (including e- bank guarantee)**' strictly as per the format given in form F-2 of the **Tender Document**. Bidder shall ensure that EMD submitted in the form of '**Bank Guarantee**' should have a validity of at least 'two [02] months' beyond the validity of the Bid. EMD submitted in the form of '**Demand Draft**' or '**Banker's Cheque**' should be valid for three months.
- Bid not accompanied with EMD, or EMD not in requisite format shall be liable for rejection. The EMD shall be submitted in Indian Rupees only.
- 16.2 The bidder can also submit the EMD through online banking transaction i.e. IMPS/NEFT/RTGS etc. For this purpose, the details of GAIL's Bank Account are mentioned under BDS. While remitting, the bidder must indicate EMD and tender/E-tender no. under remarks. Bidders shall be required to submit/ upload the successful transaction details along-with their bid/e-bid in addition to forwarding the details to dealing officer through email/letter with tender reference number immediately after remittance of EMD. In absence of submitting/ uploading the remittance details, the bid is likely to be considered as bid not accompanied with EMD. Further, in case of the online transaction, submission of EMD in original is not applicable.
- 16.3 GAIL/BANDR shall not be liable to pay any documentation charges, Bank charges, commission, interest etc. on the amount of EMD. In case EMD is in the form of a 'Bank Guarantee', the same shall be from any Indian scheduled Bank (excluding Co-operative banks and Regional Rural bank) or a branch of an International Bank situated in India and registered with 'Reserve Bank of India' as Scheduled Foreign Bank. However, in case of 'Bank Guarantee' from Banks other than the Nationalized Indian Banks, the Bank must be commercial Bank having



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



net worth in excess of Rs. 100 Crores [Rupees One Hundred Crores] and a declaration to this effect should be made by such commercial Bank either in the 'Bank Guarantee' itself or separately on its letterhead. Purchaser will verify the BG from issuing bank.

- 16.4 Any Bid not secured in accordance with "ITB: Clause-16.1 & Clause-16.3" may be rejected by GAIL/BANDR as non-responsive.
- 16.5 Unsuccessful Bidder's EMD will be discharged/ returned as promptly as possible, but not later than 'thirty [30] days' after finalization of tendering process.
- 16.6 The successful Bidder's EMD will be discharged upon the Bidder's acknowledging the 'Award' and signing the 'Agreement' (if applicable) and furnishing the 'Contract Performance Security (CPS)/ Security Deposit' pursuant to clause no. 38 of ITB.
- 16.7 Notwithstanding anything contained herein, the EMD may also be forfeited in any of the following cases:
- (a) If a Bidder withdraws his Bid during the 'Period of Bid Validity'
 - (b) If a Bidder has indulged in corrupt/fraudulent /collusive/coercive practice
 - (c) If the Bidder modifies Bid during the period of bid validity (after Due Date and Time for Bid Submission).
 - (d) Violates any other condition, mentioned elsewhere in the Tender Document, which may lead to forfeiture of EMD.
 - (e) In the case of a successful Bidder, if the Bidder fails to:
 - (i) to acknowledge receipt of the "Notification of Award" / Fax of Acceptance[FOA]",
 - (ii) to furnish "Contract Performance Security / Security Deposit", in accordance with "ITB: Clause-38"
 - (iii) to accept 'arithmetical corrections' as per provision of the clause 30 of ITB.
- 16.8 In case EMD is in the form of 'Bank Guarantee', the same must indicate the Tender Document No. and the name of Tender Document for which the Bidder is quoting. This is essential to have proper correlation at a later date.
- 16.9 **MSEs (Micro & Small Enterprises) are not exempted from submission of EMD.**
The Government Departments/PSUs are exempted from the payment of EMD. Further, Startups are also exempted from the payment of EMD **subject to submission of Start-up Certificate duly attested by Chartered accountant & Notary public.**
- 16.10 In case of forfeiture of EMD/ Bid Security, the forfeited amount will be considered inclusive of tax and tax invoice will be issued by GAIL. The forfeiture amount will be subject to final decision of GAIL based on other terms and conditions of order/ contract."



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- 16.11 EMD/Bid Bond will not be accepted in case the same has reference of ‘remitter’/’financer’ other than bidder on the aforementioned financial instrument of EMD/ Bid Bond submitted by the bidder and bid of such bidder will be summarily rejected.

16.12 Fixed Deposit Receipt (FDR) as EMD:

- 16.12.1 The Fixed Deposit Receipt (FDR) submitted by Bidder from a Bank based in India shall be duly pledged / lien in favour of “GAIL (India) Limited” (GAIL).

The FDR shall be in the name of the GAIL (India) Limited A/c.....(Name of Bidder) and the Bidder cannot encash / pre-mature this FDR without the discharge letter / NOC/approval of GAIL. However, GAIL can encash this FDR without the approval of the Bidder in case of non-compliance of the terms of the tender.

The original FDR shall be accompanied by a confirmation letter in original on letter head from the issuing bank to GAIL as per the format of “Third Party Deposit Confirmation Letter” placed as Annexure-III To Section-III.

Note: FDR (free from any encumbrance payable at place mentioned in BDS) along with original confirmation letter in the manner mentioned above shall be uploaded/submitted as per tender conditions.

Bank means - Any Indian scheduled Bank (excluding Co-operative banks and Regional Rural bank) or a branch of an International Bank situated in India and registered with ‘Reserve Bank of India’ as Scheduled Foreign Bank. However, in case of “Fixed Deposit” from Banks other than the Nationalized Indian Banks, the Bank must be commercial Bank having net worth in excess of Rs. 100 Crores [Rupees One Hundred Crores] and a declaration to this effect should be made by such commercial Bank either in the “Fixed Deposit” itself or separately on its letterhead. GAIL will verify the Fixed Deposit Receipt from issuing bank.

- 16.12.2 The FDR should have a validity of at least ‘two [02] months’ beyond the date on which the bid expires.
- 16.12.3 Any dispute arising out of or in relation to the said FDR shall be subject to the exclusive jurisdiction of courts at New Delhi.
- 16.12.4 FDR in Original and Third Party Deposit Confirmation Letter in Original has to be kept in Custody of GAIL.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



16A DECLARATION FOR BID SECURITY

Start-Ups and CPSEs (to whom exemption is allowed as per extant guidelines in vogue) are required to submit Declaration for Bid Security as per proforma at Form F-2A.

17 PRE-BID MEETING (IF APPLICABLE)

- 17.1 The Bidder(s) or his designated representative are invited to attend a "Pre-Bid Meeting" which will be held at address specified in IFB. It is expected that a bidder shall not depute more than 02 representatives for the meeting.
- 17.2 Purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage and give hands-on e-tendering.
- 17.3 Text of the questions raised and the responses given, together with any responses prepared after the meeting, will be uploaded on e-tender portal against the Tender as specified in "ITB: Clause-8. Any modification of the Contents of Bidding Documents listed in "ITB: Clause-7.1", that may become necessary as a result of the Pre-Bid Meeting shall be made by the Employer exclusively through the issue of an Corrigendum pursuant to "ITB: Clause-9", and not through the minutes of the Pre-Bid Meeting.
- 17.4 Non-attendance of the Pre-Bid Meeting will not be a cause for disqualification of Bidder.

18 FORMAT AND SIGNING OF BID

- 18.1 The original and all copies of the Bid shall be typed or written in indelible ink [in the case of copies, photocopies are also acceptable] and shall be signed by a person or persons duly authorized to sign on behalf of the Bidder (as per POA). The name and position held by each person signing, must be typed or printed below the signature. All pages of the Bid except for unamendable printed literature where entry(s) or amendment(s) have been made shall be initialed by the person or persons signing the Bid.
- 18.2 The Bid shall contain no alterations, omissions, or additions, unless such corrections are initialed by the person or persons signing the Bid.
- 18.3 In case of e-tendering, digitally signed documents to be uploaded as detailed in addendum to ITB (Annexure-III to Section III).

19 ZERO DEVIATION AND REJECTION CRITERIA

- 19.1 ZERO DEVIATION: Deviation to terms and conditions of "Bidding Documents" may lead to rejection of bid. GAIL/BANDR will accept bids based on terms & conditions of "Bidding Documents" only. Bidder may note GAIL/BANDR will determine the substantial responsiveness of each bid to the Bidding Documents pursuant to provision contained in clause 29 of ITB. For purpose of this, a substantially responsive bid is one which conforms to all terms and conditions of the Bidding Documents without deviations or reservations. GAIL's/BANDR's



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



determination of a bid's responsiveness is based on the content of the bid itself without recourse to extrinsic evidence.

Bidder is requested not to take any deviation(s)/exception(s) to the terms & conditions of Tender Document, and submit all requisite documents as mentioned in this Tender Document, failing which their Bid will be liable for rejection. If a Bidder does not reply to the queries in the permitted time frame then its Bid shall be evaluated based on the documents available in the Bid.

As a principle, clarifications from bidders after opening of tenders will not be sought. However, where clarifications / documents from the bidders on important aspects are absolutely necessary for finalization of tender, clarifications from bidder can be asked. The request for clarification shall be given in email/portal, asking the bidder to respond by a specified date, and also mentioning therein that, if the bidder does not comply or respond by the date, his tender will be liable to be rejected. Depending on the outcome, such tenders are to be ignored or considered further. No change in prices or substance of the bid including specifications, shall be offered or permitted. No post-bid clarification at the initiative of the bidder shall be entertained. The shortfall information/ documents should be sought only in case of historical documents which pre-existed bids and which have not undergone change since then.

19.2 REJECTION CRITERIA: Notwithstanding the above, deviation to the following clauses of Tender document shall lead to summarily rejection of Bid:

- (a) Firm Price
- (b) Earnest Money Deposit / Bid Security/ Bid Security declaration, as applicable
- (c) Specifications & Scope of Work
- (d) Schedule of Rates / Price Schedule / Price Basis
- (e) Duration / Period of Contract/ Completion schedule
- (f) Period of Validity of Bid
- (g) Price Reduction Schedule
- (h) Contract Performance Security
- (i) Guarantee / Defect Liability Period
- (j) Arbitration / Resolution of Dispute/Jurisdiction of Court
- (k) Force Majeure & Applicable Laws
- (l) Integrity Pact, if Applicable
- (m) Any other condition specifically mentioned in the tender document elsewhere that non-compliance of the clause lead to rejection of bid

Note: Further, it is once again reminded not to mention any condition in the Bid which is contradictory to the terms and conditions of Tender document.

20 E-PAYMENT



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



GAIL (India) Limited has initiated payments to Contractors electronically, and to facilitate the payments electronically through 'e-banking'.

[D] – SUBMISSION OF BIDS

21 SUBMISSION, SEALING AND MARKING OF BIDS

- 21.1 In case of e-tendering, bids shall be submitted through e-tender mode in the manner specified elsewhere in tender document. No Manual/ Hard Copy (Original) offer shall be acceptable. Physical documents shall be addressed to the owner at address specified in IFB.
- 21.2 In case of manual tendering bid must be submitted in sealed envelope. If the envelope is not sealed & marked as per Clause No. 11 of ITB, the employer will assume no responsibility for misplacement or pre-mature opening of the bid.
- 21.3 All the bids shall be addressed to the owner at address specified in IFB.
- 21.4 Bids submitted under the name of AGENT / REPRESENTATIVE /RETAINER/ ASSOCI-ATE etc. on behalf of a bidder/affiliate shall not be accepted.

22 DEADLINE FOR SUBMISSION OF BIDS

- 22.1 In case of e-bidding, the bids must be submitted through e-tender mode not later than the date and time specified in the tender documents/BDS.
- 22.2 In case of manual tendering EMD along with bid must be submitted within the due date & time, as specified in Clause no. 2.0 (I) of IFB and place mentioned in BDS.
- 22.3 GAIL may, in exceptional circumstances and at its discretion, extend the deadline for submission of Bids (8.0 and/or 9 of ITB refers). In which case all rights and obligations of GAIL and the Bidders, previously subject to the original deadline will thereafter be subject to the deadline as extended. Notice for extension of due date of submission of bid will be uploaded on e-tender portal / communicated to the bidders.

23 LATE BIDS

- 23.1 Any bids received after the notified date and time of closing of tenders will be treated as late bids.
- 23.2 In case of e-tendering, e-tendering system of GePNIC shall close immediately after the due date for submission of bid and no bids can be submitted thereafter.
In case of manual tendering, bids received by GAIL after the due date for submission of bids shall not be considered. Such late bids shall be returned to the bidder within “10 days” in ‘un-opened conditions’. The EMD of such bidders shall be returned along with the un-opened bid. In case of e-tendering, where the EMD/physical documents has been received but the bid is not



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



submitted by the bidder in the e-tendering portal, such bid bond/ physical documents shall be returned immediately.

- 23.3 EMD /physical documents received to address other than one specifically stipulated in the Tender Document will not be considered for evaluation/opening/award if not received to the specified destination within stipulated date & time.
- 23.4 Unsolicited Bids or Bids received to address other than one specifically stipulated in the tender document will not be considered for evaluation/opening/award if not received to the specified destination within stipulated date & time.

24 MODIFICATION AND WITHDRAWAL OF BIDS

24.1 Modification and withdrawal of bids shall be as follows:-

24.1.1 IN CASE OF E- TENDERING

The bidder may withdraw or modify its bid after bid submission but before the due date and time for submission as per tender document.

24.1.2 IN CASE OF MANUAL BIDDING – Not Applicable

[E] – BID OPENING AND EVALUATION

25 EMPLOYER'S RIGHT TO ACCEPT ANY BID AND TO REJECT ANY OR ALL BIDS

- 25.1 GAIL/BANDR reserves the right to accept or reject any Bid, and to annul the Bidding process and reject all Bids, at any time prior to award of Contract, without thereby incurring any liability to the affected Bidder(s) or any obligations to inform the affected Bidder(s) of the ground for GAIL's action. However, Bidder if so desire may seek the reason (in writing) for rejection of their Bid to which GAIL/BANDR shall respond quickly.
- 25.2 A bidder is to be permitted to send his representation in writing to dealing officer specified in tender for rejection of bid. But, such representation has to be sent upto 10(Ten) days from the date of Notification of Award/FOA. A decision on representation will be taken by GAIL within 15 (fifteen) days of the receipt of the representation. Only a directly affected bidder can represent in this regard:
- i) Only a bidder who has participated in tender can make such representation
 - ii) In case technical bid has been evaluated before the opening of the financial bid, an application for review in relation to the financial bid may be filed only by a bidder whose technical bid is found to be acceptable
- 25.3 However, following decisions of GAIL shall not be subject to review:
- a) Determination of the need for procurement;
 - b) Selection of the mode of procurement or bidding system;



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- c) Choice of selection procedure;
- d) Provisions limiting participation of bidders in the procurement process;
- e) The decision to enter into negotiations with the L1 bidder;
- f) Cancellation of the procurement process except where it is intended to subsequently re-tender the same requirements;
- g) Issues related to ambiguity in contract terms may not be taken up after a contract has been signed, all such issues should be highlighted before consummation of the contract by the vendor/ contractor; and
- h) Complaints against specifications except under the premise that they are either vague or too specific so as to limit competition may be permissible.

26 BID OPENING

26.1 *Unpriced Bid Opening :*

GAIL/BANDR will open bids, in the presence of bidders (if mentioned in BDS)' designated representatives who choose to attend, at date, time and location stipulated in the BDS. The bidders' representatives, who are present shall sign a bid opening register evidencing their attendance.

26.2 *Priced Bid Opening:*

26.2.1 GAIL/BANDR will open the price bids of those Bidders who meet the qualification requirement and whose bid is determined to be technically and commercially responsive. Techno-commercial bid evaluation status will be are to be informed to all bidders (including informing the techno-commercially not qualified Bidders). Price bids are to be opened in the presence of only techno-commercially acceptable bidders, who are willing to attend the bid opening, at a pre-publicised date, time and place or on the portal in case of e-procurement. The bidder's name, bid price, discount (if any) and any such details considered appropriate shall be read out during the price bid opening. Offers should not, repeat not, be circulated amongst the bidder's representative. Bidders selected for opening of their price bid shall be informed about the date & time of price bid opening. Bidders may depute their authorized representative to witness the price bid opening. The Bidders' representatives, who are present shall sign a Price Bid Opening Register evidencing their attendance and may be required to be present even on a short notice.

26.2.2 The price bids of those Bidders who were not found to be techno-commercially responsive shall not be opened in both manual tendering and e-tendering.

26.3 In case of bids invited under the single bid system, bid shall be opened on the specified due date & time.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

27 CONFIDENTIALITY

Information relating to the examination, clarification, evaluation and comparison of bids, and recommendations for the award of a contract, shall not be disclosed to bidders or any other person not officially concerned with such a process until the award to the successful bidder.

28 CONTACTING THE EMPLOYER

- 28.1 From the time of bid opening to the time of contract award, no bidder shall contact GAIL/BANDR on any matter related to the bid, except on request and prior written permission.
- 28.2 Any effort by the bidder to influence GAIL/BANDR in bid evaluation, bid comparison or contract award decisions will vitiate the process and will result in the rejection of the bidder's bid and action shall be initiated as per the GAIL's procedure for action in case Corrupt / Fraudulent / Collusive / Coercive practices in this regard apart from forfeiture of EMD/ Bid Security, if any.

29 EXAMINATION OF BIDS AND DETERMINATION OF RESPONSIVENESS

- 29.1 The employer's determination of a bid's responsiveness is based on the content of the bid only. Prior to the detailed evaluation of Bids, the Employer will determine whether each Bid:-
- (a) Meets the "Bid Evaluation Criteria" of the Bidding Documents;
 - (b) Has been properly signed;
 - (c) Is accompanied by the required 'Earnest Money / Bid Security / Bid Security Declaration';
 - (d) Is substantially responsive to the requirements of the Bidding Documents; and
 - (e) Provides any clarification and/or substantiation that the Employer may require to determine responsiveness pursuant to "ITB: Clause-29.2"
- 29.2 A substantially responsive Bid is one which conforms to all the terms, conditions and specifications of the Bidding Documents without material deviations or reservations or omissions for this purpose employer defines the foregoing terms below:-
- a) "Deviation" is departure from the requirement specified in the tender documents.
 - b) "Reservation" is the setting of limiting conditions or withholding from complete acceptance of the requirement in the tender documents.
 - c) "Omission" is the failure to submit part or all of the information or documentation required in the tender document for evaluation of bid.
- 29.3 A material deviation, reservation or omission is one that,
- a) If accepted would,
 - i) Affect in any substantial way the scope, quality, or performance of the job as specified in tender documents.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

- ii) Limit, in any substantial way, inconsistent with the Tender Document, the Employer's rights or the tenderer's obligations under the proposed Contract.
 - b) If rectified, would unfairly affect the competitive position of other bidders presenting substantially responsive bids.
- 29.4 The employer shall examine all aspects of the bid to confirm that all requirements have been met without any material deviation, reservation or omission.
- 29.5 Tenders that do not meet the basic requirements specified in the bid documents are to be treated as unresponsive {both during Techno-commercial evaluation and Financial Evaluation in case of Two Bid System } and will be ignored. All tenders received will first be scrutinized to see whether the tenders meet the basic requirements as incorporated in the Bid document and to identify unresponsive tenders, if any. Unresponsive offers may not subsequently be made responsive by correction or withdrawal of the non-conforming stipulation. Some important points on the basis of which a tender may be declared as unresponsive and be ignored during the initial scrutiny are :
- i) The tender is not in the prescribed format or is unsigned or not signed as per the stipulations in the bid document;
 - ii) The required EMD has not been provided or exemption from EMD is claimed without acceptable proof of exemption;
 - iii) The bidder is not eligible to participate in the bid as per laid down eligibility criteria
 - iv) The bid departs from the essential requirements specified in the bidding document (for example, the tenderer has not agreed to give the required contract performance security); or
 - v) Against a schedule in the list of requirements in the tender enquiry, the tenderer has not quoted for the entire requirement as specified in that schedule (example: in a schedule, it has been stipulated that the tenderer will supply the equipment, install and commission it and also train the GAIL's personnel for operating the equipment. The tenderer has, however, quoted only for supply of the equipment).

30 CORRECTION OF ERRORS

- 30.1 Bids determined to be substantially responsive will be checked by the Employer for any arithmetic errors. Errors in Price Schedule/Schedule of Rates (SOR) will be corrected by the Employer as follows:
- (i) When there is a difference between the rates in figures and words, the rate which corresponds to the amount worked out by the Bidder (i.e. by multiplying the quantity and rate) shall be taken as correct.
 - (ii) When the rate quoted by the Bidder in figures and words tallies but the amount is incorrect, the rate quoted by the bidder shall be taken as correct and not the amount. The amount shall be re-calculated/ corrected accordingly.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- (iii) In case a Price Schedule/ Schedule of Rate is having provisions of sub-total and grand total and there is a difference between “sum of sub totals” and “grand total”, “sum of sub totals” shall be taken as correct
- (iv) When it is not possible to ascertain the correct rate, in the manner prescribed above, the rate as quoted in words shall be adopted and the amount worked out, for comparison purposes.
- (v) In case any bidder does not quote for any item(s) of “Schedule of Rates” and the estimated price impact is more than 10% of the quoted price, then the bid will be rejected. If such price impact of unquoted items is 10% or less of his quoted price, then the unquoted item(s) shall be loaded highest of the price quoted by the other bidders . If such bidder happens to be lowest evaluated bidder, price of unquoted items shall be considered as included in the quoted bid price.

30.2 The discrepancy in bid shall be conveyed to the bidder asking to respond by a target date and if the bidder does not agree with observation, its Bid is liable to be rejected, and the EMD shall be forfeited / actions shall be invoked as per Declaration for Bid Security.

30.3 The above provision of Correction of Error shall not be applicable for E-tendering.

31 CONVERSION TO SINGLE CURRENCY FOR COMPARISON OF BIDS

Not Applicable. All bids submitted must be in the currency specified at clause 14 of ITB.

32 EVALUATION AND COMPARISON OF BIDS

Bid shall be evaluated as per evaluation criteria mentioned in Section-II of bidding documents on lowest bid.

In case of a tie at the lowest bid (L1) position between two or more bidders, the order/LoA will be placed on the bidder who has higher/ highest turnover in last audited financial year.

In case there is a tie at the lowest bid (L1) position between only startup bidders and none of them has past turnover, the order/LoA will be placed on the startup who is registered earlier with Department for Promotion of Industry and Internal Trade.

33 COMPENSATION FOR EXTENDED STAY : *Not Applicable*

34 PURCHASE PREFERENCE

Purchase Preference as per Policy to Provide Purchase Preference as per Public Procurement (Preference to Make in India), Order 2017 shall be allowed as per Government instructions in vogue, as applicable from time to time.

The Policy to Provide Purchase Preference as per Public Procurement (Preference to Make in



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



India), Order 2017 is enclosed as Annexure V to ITB herewith.

Bidders are required to select the applicable purchase preference (i.e. preference category) option while submitting the bid on GePNIC portal. However, evaluation and applicability of purchase preference policy will be based on the confirmations & documents submitted by the bidder in the their bid irrespective of selection made on GePNIC portal.

[F] – AWARD OF CONTRACT

35 AWARD

Subject to "ITB: Clause-29", GAIL will award the Contract to the successful Bidder whose Bid has been determined to be substantially responsive and has been determined as the lowest provided that bidder, is determined to be qualified to satisfactorily perform the Contract.

“GAIL intent to place the contract directly on the address from where Goods are produced/dispatched or Services are rendered. In case, bidder wants contract at some other address or supply of Goods/ Services from multiple locations, bidder is required to provide in their bid address on which order is to be placed”.

GAIL will place the Contract directly on the successful bidder from whom the bid has been received & evaluated and will not place order on other entities such as subsidiary, business associate or partner, dealer/distributor etc. of the Bidder.

36 NOTIFICATION OF AWARD / FAX OF ACCEPTANCE

- 36.1 Prior to the expiry of ‘Period of Bid Validity’, Notification of Award for acceptance of the Bid will be intimated to the successful Bidder by GAIL/BANDR either by E - mail /Letter or like means defined as the “Fax of Acceptance (FOA)”. The Contract shall enter into force on the date of FOA and the same shall be binding on GAIL and successful Bidder (i.e. Contractor). The Notification of Award/FOA will constitute the formation of a Contract. The detailed Letter of Acceptance shall be issued thereafter incorporating terms & conditions of Tender Document, Corrigendum, Clarification(s), Bid and agreed variation(s)/acceptable deviation(s), if any. GAIL/BANDR may choose to issue Notification of Award in form of detailed Letter of Acceptance without issuing FOA and in such case the Contract shall enter into force on the date of detailed Letter of Acceptance only.
- 36.2 Contract period shall commence from the date of "Notification of Award" or as mentioned in the Notification of Award. The "Notification of Award" will constitute the formation of a Contract, until the Contract has been effected pursuant to signing of Contract Agreement as per "ITB: Clause-37".
- 36.3 Upon the successful Bidder's / Contractor's furnishing of 'Contract Performance Security / Security Deposit', pursuant to "ITB: Clause-38", GAIL/BANDR will promptly discharge his 'Earnest Money Deposit / Bid Security', pursuant to "ITB: Clause-16"



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

- 36.4 The Order/ contract value mentioned above is subject to Price Reduction Schedule clause.
- 36.5 GAIL/BANDR will award the Contract to the successful Bidder, who, within 'fifteen [15] days' of receipt of the same, shall sign and return the acknowledged copy to GAIL.

37 SIGNING OF AGREEMENT

- 37.1 The successful Bidder/Contractor shall be required to execute an 'Agreement' (in case the individual contract value as specified in Notification of Award is more than INR 10 Lakhs exclusive of GST) in the proforma given in this Bidding Document on a 'non-judicial stamp paper' of appropriate value [cost of the 'stamp-paper' shall be borne by the successful Bidder/Contractor] and of ' State of India' specified in Bidding Data Sheet (BDS) only, within 'fifteen [15] days' of receipt of the "Fax of Acceptance [FOA]" of the Tender by the successful Bidder/Contractor failure on the part of the successful Bidder/Contractor to sign the 'Agreement' within the above stipulated period, shall constitute sufficient grounds for forfeiture of EMD/Security Deposit / Action as per Bid Security declaration.
- 37.3 Bidders can request Bilingual (Hindi & English) Contract Agreement. The format for signing Contract Agreement in English is attached with this Bidding Document.

38 CONTRACT PERFORMANCE SECURITY / SECURITY DEPOSIT [CPS/SD]

- 38.1 Within 30 days of the receipt of the notification of award/ Fax of Acceptance from GAIL/BANDR, the successful bidder shall furnish the Contract Performance Security (CPS) in accordance with of General Conditions of the Contract. The CPS shall be in the form of either Banker's Cheque or Demand Draft or Insurance Surety Bond or Fixed Deposit Receipt or Bank Guarantee (including e- bank guarantee) or Letter of Credit and shall be in the currency of the Contract. However, CPS shall not be applicable in cases where in the individual contract value as specified in Notification of Award is less than INR 5 Lakh (exclusive of GST).
- 38.2 The contract performance security shall be for an amount equal to specified in Bidding Data Sheet (BDS) towards faithful performance of the contractual obligations and performance of equipment. For the purpose of CPS, Contract/order value shall be exclusive of **GST (CGST & SGST/UTGST or IGST)**.
Bank Guarantee towards CPS shall be from any Indian scheduled bank (excluding Co-operative banks and Regional Rural bank) or a branch of an International bank situated in India and registered with Reserve bank of India as scheduled foreign bank. However, in case of bank guarantees from banks other than the Nationalized Indian banks, the bank must be a commercial bank having net worth in excess of Rs 100 crores and a declaration to this effect should be made by such commercial bank either in the Bank Guarantee itself or separately on its letterhead.
- 38.3 Failure of the successful bidder to comply with the requirements of this article shall constitute sufficient grounds for consideration of the annulment of the award and forfeiture of the EMD / action as per declaration for Bid Security.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

- 38.4 The CPS has to cover the entire contract value including extra works/services also. As long as the CPS submitted at the time of award take cares the extra works/ services executed and total executed value are within the awarded contract price, there is no need for additional CPS. As soon as the total executed value is likely to burst the ceiling of awarded contract price, the contractor should furnish additional CPS.
- 38.5 Further, Ministry of Finance (MOF) Department of financial service has issued direction for submission of Bank Guarantee through online vide letter ref number F.No.7/112/2011-BOA dated 17th July 2012. The successful bidder can submit CPS online through issuing bank to GAIL directly as per the above direction including its revisions, if any. In such cases confirmation will not be sought from issuing banker by GAIL/BANDR.
- 38.6 In addition to existing specified form (i.e. Demand Draft (DD)/ Banker's Cheque/ Bank Guarantee/Letter of Credit) mentioned in tender documents for submission of Security Deposit/ Contract Performance Security, the successful bidder can also submit the Security Deposit/ Contract Performance Security through online banking transaction i.e. IMPS/NEFT/RTGS/SWIFT etc. For this purpose, the details of GAIL's Bank Account is mentioned in BDS. Further, in case a successful Bidder is willing to furnish CPS through SWIFT, the details may be obtained from Purchase Officer immediately after receipt of FOA.

While remitting such online transaction, the bidder must indicate **"Security Deposit/ Contract Performance Security against FOA/DLOA no. _____ (contractor to specify the FOA/DLOA No.)"** under remarks column of such transaction of respective bank portal. The contractor/vendor shall be required to submit the successful transaction details to the dealing officer immediately through email/letter and necessarily within 30 days from the date of Fax of Acceptance.

- 38.7 In case of forfeiture of Contract Performance Security/ Security Deposit in terms of GCC, the forfeited amount will be considered inclusive of tax and tax invoice will be issued by GAIL. The forfeiture amount will be subject to final decision of GAIL based on other terms and conditions of order/ contract.
- 38.8 The Contractor will also submit covering letter along with CPS as per format at F-4.
- 38.9 CPBG/Security Deposit will not be accepted in case the same has reference of 'remitter'/'financer' other than bidder on the aforementioned financial instrument of CPBG/ Security Deposit submitted by the Contractor.
- 38.10 The first payment to vendor is to be released only after submission of CPS / Security Deposit (SD).
- 38.11 Before the CPS / Security Deposit (SD) is released a "No Claim Certificate" is to be submitted by the supplier/vendor.
- 38.12 The CPBG/Security Deposit submitted should have a validity of at least 'three [03] months' beyond the Warranty Period/Defect Liability Period and claim period 03 month beyond CPBG/Security Deposit validity.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- 38.13 In case, GAIL allows additional time for submission of CPBG/SD beyond 30 days, a penal interest of Marginal Cost of Fund based Lending Rate (MCLR) for one year charged by SBI (applicable on due date of submission of CPBG/SD i.e. 30th day after issuance of FOA/Notification of award) plus 4.0% p.a (on CPBG/SD amount) shall be charged for delay beyond 30 days i.e. from 31st days after issuance of FOA”.

38.13 Fixed Deposit Receipt (FDR) as CPS:

- 38.13.1 The Fixed Deposit Receipt (FDR) submitted by Vendor/Contractor from a Bank based in India shall be duly pledged / lien in favour of “GAIL (India) Limited”(GAIL).

The FDR shall be in the name of the GAIL (India) Limited A/c(Name of Vendor/Contractor) and the Vendor/Contractor cannot encash / pre-mature this FDR without the discharge letter / NOC/approval of GAIL. However, GAIL can encash this FDR without the approval of the Vendor/Contractor in case of non-compliance of the terms of the order/contract.

The original FDR shall be accompanied by a confirmation letter in original on letter head from the issuing bank to GAIL as per the format of “Third Party Deposit Confirmation Letter” placed as Annexure-III To Section-III.

Note : FDR (free from any encumbrance payable at place mentioned in BDS) along with original confirmation letter in the manner mentioned above shall be submitted by the Vendor/Contractor within 30 days of the receipt of the notification of award/ FOA from GAIL.

Here Bank means - Any Indian scheduled Bank (excluding Co-operative banks and Regional Rural bank) or a branch of an International Bank situated in India and registered with ‘Reserve Bank of India’ as Scheduled Foreign Bank. However, in case of “Fixed Deposit” from Banks other than the Nationalized Indian Banks, the Bank must be commercial Bank having net worth in excess of Rs. 100 Crores [Rupees One Hundred Crores] and a declaration to this effect should be made by such commercial Bank either in the “Fixed Deposit” itself or separately on its letterhead. GAIL will verify the Fixed Deposit Receipt from issuing bank.

- 38.13.2 The FDR submitted should have a validity of at least ‘three [03] months’ beyond the Warranty Period/Defect Liability Period.
- 38.13.3 Any dispute arising out of or in relation to the said FDR shall be subject to the exclusive jurisdiction of courts at New Delhi.
- 38.13.4 FDR in Original and Third Party Deposit Confirmation Letter in Original has to be kept in Custody of GAIL.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

38.14 GAIL's vendor(s)/contractor(s) can submit contract performance security in the form of digital CPBG through SWIFT channel from the following banks. These banks are live with GAIL on SWIFT platform and directly push your digital CPBG from their system to GAIL without any manual intervention.

- a) Axis Bank
- b) HDFC Bank
- c) ICICI Bank
- d) State Bank of India

To facilitate the seamless submission of digital CPBG through SWIFT platform, please provide the following information while advising digital CPBG through any of the above Bank.

Details related to e-BG such as GAIL Identification No. (SWIFT Field No. BIC Code), SAP PO No. (SWIFT Field No. - 72Z-First Line) & Claim Expiry Date (SWIFT Field No. - 72Z-Second Line) shall be provided to successful bidder

39 PROCEDURE FOR ACTION IN CASE CORRUPT/ FRAUDULENT/ COLLUSIVE/ COERCIVE PRACTICES

- 39.1 Procedure for action in case Corrupt/ Fraudulent/Collusive/Coercive Practices is enclosed at Annexure-I.
- 39.2 The Fraud Prevention Policy document is available on GAIL's website (www.gailonline.com)
- 39.3 Name and contact details of nodal officer- Refer BDS for details

39.4 NON-APPLICABILITY OF ARBITRATION CLAUSE IN CASE OF BANNING OF VENDORS/ SUPPLIERS / CONTRACTORS/BIDDERS/ CONSULTANTS INDULGED IN FRAUDULENT/ COERCIVE PRACTICES

Notwithstanding anything contained contrary in GCC and other "CONTRACT DOCUMENTS", in case it is found that the Contractors / Bidders indulged in fraudulent/ coercive practices at the time of bidding, during execution of the contract etc., and/or on other grounds as mentioned in GAIL's "Procedure for action in case Corrupt/Fraudulent/Collusive/Coercive Practices" (Annexure-I to Section-III), the contractor/bidder shall be banned (in terms of aforesaid procedure) from the date of issuance of such order by GAIL (India) Ltd., to such Contractors/Bidders.

The Contractor/ Bidder understands and agrees that in such cases where Contractor/ Bidder has been banned (in terms of aforesaid procedure) from the date of issuance of such order by GAIL (India) Limited, such decision of GAIL (India) Limited shall be final and binding on such Contractor/ Bidder and the 'Arbitration clause' in the GCC and other "CONTRACT



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



DOCUMENTS" shall not be applicable for any consequential issue /dispute arising in the matter.

40 PUBLIC PROCUREMENT POLICY FOR MICRO AND SMALL ENTERPRISES

40.1 Exemption of EMD and benefits of purchase preference is not applicable to participating MSE's being a works tender.

40.2 It may be noted that Government of India has implemented Trade Receivable Discounting System (TReDS) to address challenges faced by MSMEs in delayed payments (after receipt/acceptance of Material/Services) from Government buyers leading to shortfall of Working Capital. TReDS is an online electronic institutional mechanism for facilitating the financing of trade receivables of MSMEs through multiple financiers. GAIL is already registered on the following TReDS platform:

- M/s Receivable Exchange of India (RXIL), Mumbai
- M/s Mynd Solutions Private Limited (Mynd), New Delhi
- M/s A. TREDIS (Invoicemart), Mumbai

MSME Bidders are required to register on the TReDS platform. The MSME vendors can avail the TReDS facility, if they want to.

40.3 Interest payment on delayed payments to MSME is payable in line with Micro, Small and Medium Enterprises Development Act, 2006

41 AHR ITEMS [FOR APPLICABILITY REFER BDS]

In item rate contract where the quoted rates for the items exceed 50% of the estimate rates, such items will be considered as Abnormally High Rates (AHR) items and payment of AHR items beyond the SOR stipulated quantities shall be made at the lowest amongst the following rates:

- I) Rates as per SOR, quoted by the Contractor.
- II) Rate of the item, which shall be derived as follows:
 - a. Based on rates of Machine and labour as available from the contract (which includes contractor's supervision, profit, overheads and other expenses).
 - b. In case rates are not available in the contract, rates will be calculated based on prevailing market rates of machine, material and labour plus 15% to cover contractor's supervision profit, overhead & other expenses.

42 VENDOR PERFORMANCE EVALUATION

Shall be as stipulated Annexure II to ITB herewith.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

43 INCOME TAX & CORPORATE TAX

43.1 Income tax deduction shall be made from all payments made to the contractor as per the rules and regulations in force and in accordance with the Income Tax Act prevailing from time to time.

43.2 Corporate Tax liability, if any, shall be to the contractor's account.

43.3 TDS

(i) TDS, wherever applicable, shall be deducted as per applicable act/law/rule.

(ii) Higher rate of TDS for non-filers of ITR

As per Section 206AB of Income Tax Act, 1961, in case of any vendor/customer who does not file their Income Tax Return for both of the two previous years preceding to current year and aggregate amount of TDS is more than or equal to 50,000/- in each of those previous two years (or limit defined by Govt. from time to time), then TDS will be deducted at the higher of following rates:

(I) Twice the rate mentioned in relevant TDS section.

(II) Twice the rate or rates in force

(III) 5%

43.4 MENTIONING OF PAN NO. IN INVOICE/BILL

As per CBDT Notification No. 95/2015 dated 30.12.2015, mentioning of PAN no. is mandatory for procurement of goods / services/works/consultancy services exceeding Rs. 2 Lacs per transaction or as amended from time to time.

Accordingly, contractor should mention their PAN no. in their invoice/ bill for any transaction exceeding Rs. 2 lakhs or as amended from time to time. As provided in the notification, in case contractor do not have PAN no., they have to submit declaration in Form 60 along with invoice/ bill for each transaction.

Payment of contractor shall be processed only after fulfillment of above requirement

44 DISPUTE RESOLUTION MECHANISM

44.1 QUARTERLY CLOSURE OF THE CONTRACT AND SAMADHAN MECHANISM

During execution of orders, various issues may arise. In order to timely detect and to address the contractual issue(s) during the execution of contracts, GAIL has introduced a mechanism of Quarterly Closure of the contract, under which all the related issues /disputes will be monitored and addressed on quarterly basis for resolution. Vendor (hereinafter referred 'Vendor') should first refer any issues/disputes to Engineer-in-Charge (EIC) for LOA/contracts/ Dealing C&P Executive for Purchase Orders and co-operate them for smooth execution of the contract and to timely address the issues, if any. For applicability of 'Quarterly Closure', please refer BDS.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



In case issue is not resolved by above, Supplier may submit their issue(s) to Vendor Grievance Portal “Samadhan”, which will be addressed by GAIL within 15 days. The Samadhan Portal is available at <https://gailebank.gail.co.in/grievance/welcome.aspx>.

Accordingly, the methodology for resolution of issue(s)/ grievance (s) of Vendor/Supplier shall be as under:

- (i) Any issue should be first referred to EIC for LOA/contracts/ Dealing C&P Executive for Purchase Orders.
- (ii) In case issue is not resolved, Vendor may submit their issue/ grievance through online Vendor Grievance Portal-“Samadhan”.
- (iii) In case, Vendor is not satisfied, there is a provision of escalation of issue to higher authority in GAIL. This option is available two times to vendor.
- (iv) Further, issue(s) can only be submitted upto 1 month after closure of respective Contract.
- (v) Vendor should refer their issue/ grievance through above mode only. Issue/ grievance received through any other mode shall not be entertained.

44.2 CONCILIATION AND ARBITRATION

1.0 CONCILIATION

GAIL (India) Limited has framed the Conciliation Rules 2010 in conformity with Part – III of the Arbitration and Conciliation Act 1996 as amended from time to time for speedier, cost effective and amicable settlement of disputes through conciliation. All issue(s)/dispute(s) arising under the Contract, which cannot be mutually resolved within a reasonable time as per clause no. 44.1, may be referred for conciliation in accordance with GAIL Conciliation Rules 2010 as amended from time to time. A copy of the said rules have been made available on GAIL’s web site i.e www.gailonline.com.

Where invitation for Conciliation has been accepted by the other party, the Parties shall attempt to settle such dispute(s) amicably under Part-III of the Arbitration and Conciliation Act, 1996 and GAIL (India) Limited Conciliation Rules, 2010. It would be only after exhausting the option of Conciliation as an Alternate Dispute Resolution Mechanism that the Parties hereto shall invoke Arbitration Clause. For the purpose of this clause, the option of ‘Conciliation’ shall be deemed to have been exhausted, even in case of rejection of ‘Conciliation’ by any of the Parties.

2.0 ARBITRATION

All issue(s)/dispute(s) excluding the matters that have been specified as excepted matters and listed at clause no. 2.6 and which cannot be resolved through Conciliation, such issue(s)/dispute(s) shall be referred to arbitration for adjudication by Sole Arbitrator.

The party invoking the Arbitration shall have the option to either opt for Ad-hoc Arbitration as provided at Clause 2.1 below or Institutionalized Arbitration as provided at Clause 2.2 be-



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

low, the remaining clauses from 2.3 to 2.7 shall apply to both Ad-hoc and Institutional Arbitration:-

- 2.1 On invocation of the Arbitration clause by either party, GAIL shall suggest a panel of three independent and distinguished persons (Retd Supreme Court & High Court Judges only) to the other party from the Panel of Arbitrators maintained by 'Delhi International Arbitration Centre (DIAC)' to select any one among them to act as the Sole Arbitrator. In the event of failure of the other party to select the Sole Arbitrator within 30 days from the receipt of the communication from GAIL suggesting the panel of arbitrators, the right of selection of the sole arbitrator by the other party shall stand forfeited and GAIL shall appoint the Sole Arbitrator from the suggested panel of three Arbitrators for adjudication of dispute(s). The decision of GAIL on the appointment of the sole arbitrator shall be final and binding on the other party. The fees payable to Sole Arbitrator shall be governed by the fee Schedule of 'Delhi International Arbitration Centre'.

OR

- 2.2 If a dispute arises out of or in connection with this contract, the party invoking the Arbitration shall submit that dispute to any one of the Arbitral Institutions i.e ICADR/ICA/DIAC/SFCA and that dispute shall be adjudicated in accordance with their respective Arbitration Rules. The matter shall be adjudicated by a Sole Arbitrator who shall necessarily be a Retd Supreme Court/High Court Judge to be appointed/nominated by the respective institution. The cost/expenses pertaining to the said Arbitration shall also be governed in accordance with the Rules of the respective Arbitral Institution. The decision of the party invoking the Arbitration for reference of dispute to a specific Arbitral institution for adjudication of that dispute shall be final and binding on both the parties and shall not be subject to any change thereafter. The institution once selected at the time of invocation of dispute shall remain unchanged.
- 2.3 The cost of arbitration proceedings shall be shared equally by the parties.
- 2.4 The Arbitration proceedings shall be in English language and the seat, venue and place of Arbitration shall be New Delhi, India only.
- 2.5 Subject to the above, the provisions of Arbitration & Conciliation Act 1996 and any amendment thereof shall be applicable. All matter relating to this Contract and arising out of invocation of Arbitration clause are subject to the exclusive jurisdiction of the Court(s) situated at New Delhi.
- 2.6 List of Excepted matters:
- Dispute(s)/issue(s) involving claims below Rs 25 lakhs and above Rs 25 crores.
 - Dispute(s)/issue(s) relating to indulgence of Contractor/Vendor/Bidder in corrupt/fraudulent/collusive/coercive practices and/or the same is under investigation by CBI or Vigilance or any other investigating agency or Government.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



c) Dispute(s)/issue(s) wherein the decision of Engineer-In-Charge/owner/GAIL has been made final and binding in terms of the Contract.

2.7. Disputes involving claims below Rs 25 Lakhs and above Rs. 25 crores:- Parties mutually agree that dispute(s)/issue(s) involving claims below Rs 25 Lakhs and above Rs 25 crores shall not be subject matter of Arbitration and are subject to the exclusive jurisdiction of the Court(s) situated at New Delhi.

3. GOVERNING LAW AND JURISDICTION:

The Contract shall be governed by and construed in accordance with the laws in force in India. The Parties hereby submit to the exclusive jurisdiction of the Courts situated at New Delhi for adjudication of disputes, injunctive reliefs, actions and proceedings, if any, arising out of this Contract.

45. DISPUTES BETWEEN CPSE'S/ DEPARTMENT'S/ ORGANIZATIONS

Subject to conciliation as provided above, in the event of any dispute (other than those related to taxation matters) or difference relating to the interpretation and application of the provisions of commercial contract(s) between Central Public Sector Enterprises (CPSEs/ Port Trusts) inter se and also between CPSEs and Government Departments /Organizations), such dispute or difference shall be taken up by either party for resolution only through AMRCD as mentioned in OPE OM No. 4(1)/2013-DPE(GM)/FTS-1835 dated 22-05-2018.

Any party aggrieved with the decision of the Committee at the First level (tier) may prefer an appeal before the Cabinet Secretary at the Second level (tier) within 15 days from the date of receipt of decision of the Committee at First level, through its administrative Ministry/Department, whose decision will be final and binding on all concerned.

The above provisions mentioned at clause no.44 & 45 shall supersede provisions relating to Conciliation, Arbitration, Governing Law & Jurisdiction and Disputes between CPSE's/ Government Department's/ Organizations mentioned in General Conditions of Contract (GCC) and elsewhere in tender document.

46.0 INAM-PRO (PLATFORM FOR INFRASTRUCTURE AND MATERIALS PROVIDERS)

INAM-Pro (Platform for infrastructure and materials providers) is a web based platform for infrastructure providers and materials suppliers and was developed by Ministry of Road Transport and Highways (MoRT&H) with a view to reduce project execution delays on account of supply shortages and inspire greater confidence in contractors to procure cement to start with directly from the manufacturers. Presently, numerous cement companies are registered in the portal and offering cement for sale on the portal with a commitment period of 3 years. These companies have bound themselves by ceiling rates for the entire commitment period, wherein



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

they are allowed to reduce or increase their cement rates any number of times within the ceiling rate, but are not permitted to exceed the said ceiling rate.

MoRT&H is expanding the reach of this web-portal by increasing both the product width as well as the product depth. They are working on incorporating 60 plus product categories. The product range will span from large machineries like Earth Movers and Concrete Mixers, to even the smallest items like road studs. MoRT&H intend to turn it into a portal which services every infrastructure development related need of a modern contractor.

GAIL's contractors may use this innovative platform, wherever applicable. The usage of web – Portal is a completely voluntary exercise. The platform, however, can serve as a benchmark for comparison of offered prices and products.

47. PROMOTION OF PAYMENT THROUGH CARDS AND DIGITAL MEANS

To promote cashless transactions, the onward payments by Contractors to their employees, service providers, sub-contractors and suppliers may be made through Cards and Digital means to the extent possible

48. CONTRACTOR TO ENGAGE CONTRACT MANPOWER BELONGING TO SCHEDULED CASTES AND WEAKER SECTIONS OF THE SOCIETY

While engaging the contractual manpower, Contractors are required to make efforts to provide opportunity of employment to the people belonging to Scheduled Castes and weaker sections of the society also in order to have a fair representation of these sections.

49. PROVISIONS FOR STARTUPS (AS DEFINED IN GAZETTE NOTIFICATION NO. D.L-33004/99 DATED 18.02.2016 AND 23.05.2017 OF MINISTRY OF COMMERCE AND INDUSTRY AND AS AMENDED FROM TIME TO TIME) [FOR APPLICABILITY REFER BDS]

As mentioned in Section-II, relaxation for Prior turnover and prior experience to Start-ups is not allowed in this tender.

However, the Startups are exempted from submission of EMDs (if applicable).

50. PROVISION REGARDING INVOICE FOR REDUCED VALUE OR CREDIT NOTE TOWARDS PRS

PRS is the reduction in the consideration / contract value for the services covered under this contract. In case of delay in execution of contract, service provider should raise invoice for reduced value as per Price Reduction Schedule Clause (PRS clause). If service provider has



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

raised the invoice for full value, then service provider should issue Credit Note towards the applicable PRS amount with applicable taxes.

In such cases if service provider fails to submit the invoice with reduced value or does not issue credit note as mentioned above, GAIL will release the payment to service provider after giving effect of the PRS clause with corresponding reduction of taxes charged on service provider's invoice, to avoid delay in payment.

In case any financial implication arises on GAIL due to issuance of invoice without reduction in price or non-issuance of Credit Note, the same shall be to the account of service provider. GAIL shall be entitled to deduct / setoff / recover such GST amount (CGST & SGST/UTGST or IGST) together with penalties and interest, if any, against any amounts paid or becomes payable by GAIL in future to the service provider under this contract or under any other contract.

51. UNIQUE DOCUMENT IDENTIFICATION NUMBER BY PRACTICING CHARTERED ACCOUNTANTS

Practicing Chartered Accountants shall generate Unique Document Identification Number (UDIN) for all certificates issued by them as per provisions of Tender Document.

However, UDIN may not be required for documents being attested by Chartered Accountants in terms of provisions of Tender Document.

52. ANJANI PORTAL

GAIL has implemented "Anjani" e-Measurement Book & e-Billing Portal for ease in submission of measurement book/bill and reduction in paper transaction.

Accordingly, GAIL will process the Bill with Measurement Book through "Anjani" e-Measurement Book & e-Billing Portal (link: <https://gailebank.gail.co.in/MBAutomation/frmlogin.aspx>). Accordingly, Contractor/ Service Provider/ Consultant is requested to forward the RA Bill on "Anjani" e-Measurement Book & e-Billing Portal through concerned EIC/CIC/SIC, whichever is applicable.

Further, User Manual is also available on aforesaid portal.

53. DOCUMENTS FOR PAYMENT:

Payment terms shall be as mentioned in GCC-Works/SCC.

However, for release of payment, Contractor is required to submit invoice along with other documents as mentioned in SCC. The final bill is to be submitted within one month after completion.

Further, GAIL is in process of implementing Vendor Invoice Management (VIM). After implementation of same (to be communicated separately), Contractor/ Vendor to forward



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



the invoice on VIM Collection Center or upload digital invoice on Portal (details of same will be provided separately). The copy of invoice and all other document mentioned above or in order/ contract is to be forwarded to address provided in order/contract.

54. ORDER TRANSMITTAL SYSTEM:

The complete PO/LOA along with all annexures including tender document shall be shared through order/contract transmittal system after intimation through email.

Supplier/Contractor is requested to visit <https://gailonline.com/home.html> and click on link order/contract transmittal system (It can be found under Vendor Zone (Portal For Suppliers)) or https://gailebank.gail.co.in/GOGA_AUDIT/frmUserLogin.aspx.

Therein, in order to access the detailed order/contract, supplier/contractor shall be prompted to enter your email id. Further an OTP shall be sent on your registered mobile number. After entering OTP, supplier/contractor shall be allowed to download complete PO/LOA along with all annexures including tender document. After downloading the documents, the supplier/contractor shall be required to digitally sign the document (by authorized signatory) for uploading the documents on order/contract transmittal system towards acknowledgement of the same.

55. SUB-LETTING OF WORKS

The following is added to the Clause no. 37 of General Conditions of Contract (GCC)-Works:

- (i) Procurement of material, hire of equipment or engagement of labour will not mean sub-contracting.
- (ii) Sub-contracting by the contractor without the approval of GAIL shall be a breach of contract, unless explicitly permitted in the contract.
- (iii) However, If specified in SCC Sub-contracting for Specialized Items of Work is allowed upto certain percentage of work

56. VENDOR INVOICE MANAGEMENT (VIM)

GAIL has implemented Vendor Invoice Management (VIM) system titled as #SARATHI# for automation, digitization & centralization of Account Payable process w.e.f. 01.04.2023.

Accordingly, Supplier/ Contractor/Service Provide/ Consultant is required to upload digital invoice on 'Sparsh' portal. The system optimizes and simplifies the process of receiving, managing, monitoring and forwarding invoices for payment process. The link of 'Sparsh' portal is as under:

<https://sparsh.gail.co.in/flipper/#/login>



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



The 'Help Manual' hyperlink to access the detailed User Manual, Demo Videos, FAQ#s and other relevant information is available on 'Sparsh' portal.

Only digital invoice is to be uploaded on 'Sparsh' portal and all other supporting documents along with copy of invoice are to be submitted to concerned as defined in Purchase Order (PO)/ Letter of Acceptance (LoA).

Further, vendors/contractors would be required to mention details of Purchase Order/ Letter of Acceptance number on the face of Invoice.

Invoices should be system generated and no handwritten invoices shall be eligible for OCR conversion.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Annexure-I to Section-III

**PROCEDURE FOR ACTION IN CASE CORRUPT/FRAUDULENT/COLLUSIVE/COERCIVE
PRACTICES**

A Definitions:

- A.1 “Corrupt Practice” means the offering, giving, receiving or soliciting, directly or indirectly, anything of value to improperly influence the actions in selection process or in contract execution.
“Corrupt Practice” also includes any omission for misrepresentation that may mislead or attempt to mislead so that financial or other benefit may be obtained or an obligation avoided.
- A.2 “Fraudulent Practice” means and include any act or omission committed by a agency or with his connivance or by his agent by misrepresenting/ submitting false documents and/ or false information or concealment of facts or to deceive in order to influence a selection process or during execution of contract/ order.
- A.3 “Collusive Practice amongst bidders (prior to or after bid submission)” means a scheme or arrangement designed to establish bid prices at artificial non-competitive levels and to deprive the Employer of the benefits of free and open competition.
- A.4 “Coercive practice” means impairing or harming or threatening to impair or harm directly or indirectly, any agency or its property to influence the improperly actions of an agency, obstruction of any investigation or auditing of a procurement process.
- A.5 “Vendor/Supplier/Contractor/Consultant/Bidder” is herein after referred as “Agency”
- A.6 “Appellate Authority” shall mean Committee of Directors consisting of Director (Finance) and Director (BD) for works centers under Director (Projects). For all other cases committee of Directors shall consist of Director (Finance) & Director (Projects).
- A.7 “Competent Authority” shall mean the authority, who is competent to take final decision for Suspension of business dealing with an Agency/ (ies) and Banning of business dealings with Agency/ (ies) and shall be the “Director” concerned.
- A.8 “Allied Agency” shall mean all concerns which come within the sphere of effective influence of the banned/suspended agency shall be treated as allied agency. In determining this, the following factors may be taken into consideration:
- a) Whether the management is common;
 - b) Majority interest in the management is held by the partners or directors of banned/ suspended agency;
 - c) Substantial or majority shares are owned by the banned/ suspended agency and by virtue of this it has a controlling voice.
 - d) Directly or indirectly controls, or is controlled by or is under common control with another bidder.
 - e) All successor agency will also be considered as allied agency.
- A.9 “Investigating Agency” shall mean any department or unit of GAIL investigating into the conduct of Agency/ party and shall include the Vigilance Department of the GAIL, Central Bureau



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

of Investigation, State Police or any other agency set up by the Central or state government having power to investigate.

- A.10 "Obstructive practice": materially impede the procuring entity's investigation into allegations of one or more of the above mentioned practices either by deliberately destroying, falsifying, altering; or by concealing of evidence material to the investigation; or by making false statements to investigators and/ or by threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation; or by impeding GAIL's rights of audit or access to information.

B Actions against bidder(s) indulging in corrupt /fraudulent/ collusive/ coercive practice

B.1 Irregularities noticed during the evaluation of the bids :

If it is observed during bidding process/ bids evaluation stage that a bidder has indulged in corrupt/fraudulent /collusive/coercive practice, the bid of such Bidder (s) shall be rejected and its Earnest Money Deposit (EMD) shall be forfeited.

Further, such agency shall be banned for future business with GAIL for a period specified in para B 2.2 below from the date of issue of banning order.

B.2 Irregularities noticed after award of contract

(i) During execution of contract:

If an agency, is found to have indulged in corrupt/fraudulent/ collusive/coercive practices, action shall be initiated for putting the agency on banning list.

After conclusion of process and issuance of Speaking order for putting party on banning list, the order (s)/ contract (s) where it is concluded that such irregularities have been committed shall be terminated and Contract cum Performance Bank Guarantee (CPBG) submitted by agency against such order (s)/ contract (s) shall also be forfeited. Further such order/ contract will be closed following the due procedure in this regard.

The amount that may have become due to the contractor on account of work already executed by him shall be payable to the contractor and this amount shall be subject to adjustment against any amounts due from the contractor under the terms of the contract. No risk and cost provision will be enforced in such cases.

Suspension of order/ contract:

Further, only in the following situations, the concerned order (s)/ contract(s) (where Corrupt/Fraudulent/ Collusive/ Coercive Practices are observed) and payment shall be suspended after issuance of Suspension cum Show Cause Notice:



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- (i) Head of Corporate Vigilance Department/CVO based on the investigation by them, recommend for specific immediate action against the agency.
- (ii) Head of Corporate Vigilance Department/CVO based on the input from investigating agency, forward for specific immediate action against the agency.

Suspension cum Show Cause Notice being issued in above cases after approval of the competent authority (as per provisions mentioned under Clause no. D) shall also include the provision for suspension of Order (s)/ Contract (s) and payment. Accordingly, after issuance of Suspension cum Show Cause Notice, the formal communication for suspension of Order (s)/ Contract (s) and payment with immediate effect will be issued by the concerned person of GAIL.

During suspension, Contractor/ Service Providers will be allowed to visit the plant/ site for upkeep of their items/ equipment, GAIL's issued materials (in case custody of same is not taken over), demobilizing the site on confirmation of EIC, etc.

In addition to above, Recovery of payments (other than due payments) including balance advance payments, if any, made by along with interest thereon at the prevailing rate shall be recovered.

(ii) After execution of contract and during Defect liability period (DLP)/ Warranty/Guarantee Period:

If an agency is found to have indulged in corrupt/fraudulent/ collusive/coercive practices, after execution of contract and during DLP/ Warranty/Guarantee Period, the agency shall be banned for future business with GAIL for a period specified in para B 2.2 below from the date of issue of banning order.

Further, the Contract cum Performance Bank Guarantee (CPBG)/Contract Performance Security (CPS) submitted by agency against such order (s)/ contract (s) shall be forfeited.

(iii) After expiry of Defect liability period (DLP)/ Warranty/Guarantee Period

If an agency is found to have indulged in corrupt/fraudulent/ collusive/coercive practices, after expiry of Defect liability period (DLP)/ Warranty/Guarantee Period, the agency shall be banned for future business with GAIL for a period specified in para B 2.2 below from the date of issue of banning order.

B.2.2 Period of Banning



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

The period of banning of agencies indulged in Corrupt/ Fraudulent/ Collusive/Coercive Practices shall be as under and to be reckoned from the date of banning order:

S. No.	Description	Period of banning from the date of issuance of Banning order
1	Misrepresentation/False information other than pertaining to BEC of tender but having impact on the selection process. For example, if an agency confirms not being in holiday in GAIL/PSU's PMC or banned by PSUs/ Govt. Dept., liquidation, bankruptcy & etc. and subsequently it is found otherwise, such acts shall be considered in this category.	06 Months
2	Corrupt/Fraudulent (except mentioned sl. no. 1 above) /Collusive/Coercive Practices	01 year
2.1	If an agency again commits Corrupt/Fraudulent (except mentioned sl. no. 1 above) /Collusive/ Coercive Practices in subsequent cases after their banning, such situation of repeated offense to be dealt with more severity	2 years (in addition to the period already served)
3	Indulged in unauthorized disposal of materials provided by GAIL	2 years
4	If act of vendor/ contractor is a threat to the National Security	2 years

C Effect of banning on other ongoing contracts/ tenders

- C.1 If an agency is put on Banning, such agency should not be considered in ongoing tenders/future tenders.
- C.2 However, if such an agency is already executing other order (s)/ contract (s) where no corrupt/fraudulent/ collusive/coercive practice is found, the agency should be allowed to continue till its completion without any further increase in scope except those incidental to original scope mentioned in the contract.
- C.3 If an agency is put on the Banning List during tendering and no irregularity is found in the case under process:



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- C.3.1 after issue of the enquiry /bid/tender but before opening of Technical bid, the bid submitted by the agency shall be ignored.
- C.3.2 after opening Technical bid but before opening the Price bid, the Price bid of the agency shall not be opened and BG/EMD submitted by the agency shall be returned to the agency.
- C.3.3 after opening of price, BG/EMD made by the agency shall be returned; the offer of the agency shall be ignored & will not be further evaluated. . In case such agency is lowest (L-1), next lowest bidder shall be considered as L-1.

D. Procedure for Suspension of Bidder

D.1 Initiation of Suspension

Action for suspension business dealing with any agency/(ies) shall be initiated by Corporate C&P Department when

- (i) Corporate Vigilance Department based on the fact of the case gathered during investigation by them recommend for specific immediate action against the agency.
- (ii) Corporate Vigilance Department based on the input from Investigating agency, forward for specific immediate action against the agency.
- (iii) Non performance of Vendor/Supplier/Contractor/Consultant leading to termination of Contract/ Order.

D.2 Suspension Procedure:

- D.2.1 The order of suspension would operate initially for a period not more than six months and is to be communicated to the agency and also to Corporate Vigilance Department. Period of suspension can be extended with the approval of the Competent Authority by one month at a time with a ceiling of six months pending a conclusive decision to put the agency on banning list.
- D.2.2 During the period of suspension, no new business dealing may be held with the agency.
- D.2.3 Period of suspension shall be accounted for in the final order passed for banning of business with the agency.
- D.2.4 The decision regarding suspension of business dealings should also be communicated to the agency.
- D.2.5 If a prima-facie, case is made out that the agency is guilty on the grounds which can result in banning of business dealings, proposal for issuance of suspension order and show cause notice shall be put up to the Competent Authority. The suspension order and show cause notice must include that (i) the agency is put on suspension list and (ii) why action should not be taken for banning the agency for future business from GAIL.
The competent authority to approve the suspension will be same as that for according approval for banning.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



D 3 Effect of Suspension of business:

Effect of suspension on other on-going/future tenders will be as under:

- D.3.1 No enquiry/bid/tender shall be entertained from an agency as long as the name of agency appears in the Suspension List.
- D.3.2 If an agency is put on the Suspension List during tendering:
 - D.3.2.1 after issue of the enquiry /bid/tender but before opening of Technical bid, the bid submitted by the agency shall be ignored.
 - D.3.2.2 after opening Technical bid but before opening the Price bid, the Price bid of the agency shall not be opened and BG/EMD submitted by the agency shall be returned to the agency.
 - D.3.2.3 after opening of price, BG/EMD made by the agency shall be returned; the offer of the agency shall be ignored & will not be further evaluated. In case such agency is lowest (L-1), next lowest bidder shall be considered as L-1. .
- D.3.3 The existing contract (s)/ order (s) under execution shall continue.
- D.3.4 Tenders invited for procurement of goods, works and services shall have provision that the bidder shall submit a undertaking to the effect that (i) neither the bidder themselves nor their allied agency/(ies) are on banning list of GAIL or the Ministry of Petroleum and Natural Gas and (ii) bidder is not banned by any Government department/ Public Sector.

F. Appeal against the Decision of the Competent Authority:

- F.1 The agency may file an appeal against the order of the Competent Authority for putting the agency on banning list. The appeal shall be filed to Appellate Authority. Such an appeal shall be preferred within one month from the of receipt of banning order.
- F.2 Appellate Authority would consider the appeal and pass appropriate order which shall be communicated to the party as well as the Competent Authority.
- F.3 Appeal process may be completed within 45 days of filing of appeal with the Appellate Authority.

G. Wherever there is contradiction with respect to terms of 'Integrity pact' , GCC and 'Procedure for action in case of Corrupt/Fraudulent/ Collusive/Coercive Practice', the provisions of 'Procedure for action in case of Corrupt/Fraudulent/ Collusive/Coercive Practice' shall prevail.

H. Wherever there is contradiction with respect to terms of 'Integrity pact' , GCC and 'Procedure for action in case of Corrupt/Fraudulent/ Collusive/Coercive Practice', the provisions of 'Procedure for action in case of Corrupt/Fraudulent/ Collusive/Coercive Practice' shall prevail.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Annexure-II to Section III

**PROCEDURE FOR EVALUATION OF PERFORMANCE OF VENDORS/ SUPPLIERS/
CONTRACTORS/ CONSULTANTS**

1.0 GENERAL

A system for evaluation of Vendors/ Suppliers/Contractors/ Consultants and their performance is a key process and important to support an effective purchasing & contracting function of an organization.

Performance of all participating Vendors/ Suppliers/Contractors/ Consultants need to be closely monitored to ensure timely receipt of supplies from a Vendor, completion of an assignment by a Consultant or complete execution of order by a contractor within scheduled completion period. For timely execution of projects and meeting the operation & maintenance requirement of operating plants, it is necessary to monitor the execution of order or contracts right from the award stage to completion stage and take corrective measures in time.

2.0 OBJECTIVE

The objective of Evaluation of Performance aims to recognize, and develop reliable Vendors/ Suppliers/Contractors/ Consultants so that they consistently meet or exceed expectations and requirements. The purpose of this procedure is to put in place a system to monitor performance of Vendors/ Suppliers/Contractors/ Consultants associated with GAIL so as to ensure timely completion of various projects, timely receipt of supplies including completion of works & services for operation and maintenance of operating plants and quality standards in all respects.

3.0 METHODOLOGY

i) Preparation of Performance Rating Data Sheet

Performance rating data Sheet for each and every Vendor/ Supplier/Contractor/Consultant for all orders/Contracts with a value of Rs. 50 Lakhs and above is recommended to be drawn up. Further, Performance rating data Sheet for orders/contracts of Vendor/Supplier/Contractor/ Consultant who are on watch list/holiday list/ banning list shall be prepared irrespective of order/ contract value. These data sheets are to be separately prepared for orders/ contracts related to Projects and O&M. Format, Parameters, Process, responsibility for preparation of Performance Rating Data Sheet are separately mentioned.

ii) Measurement of Performance

Based on the parameters defined in Data Sheet, Performance of concerned Vendor/ Supplier/Contractor/ Consultant would be computed and graded accordingly. The measurement of the performance of the Party would be its ability to achieve the minimum scoring of 60% points in the given parameters.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

- iii) Initiation of Measures:
Depending upon the Grading of Performance, corrective measures would be initiated by taking up the matter with concerned Vendor/ Supplier/Contractor/ Consultant. Response of Vendor/ Supplier/Contractor/ Consultant would be considered before deciding further course of action.
- iv) Implementation of Corrective Measures:
Based on the response of Vendor/ Supplier/Contractor/ Consultant, concerned Engineer-in-Charge for the Projects and/or OIC in case of O&M would recommend for continuation or discontinuation of such party from the business of GAIL.
- v) Orders/contracts placed on Proprietary/OEM basis for O&M will be evaluated and, if required, corrective action will be taken for improvement in future.

4.0 EXCLUSIONS:

The following would be excluded from the scope of evaluation of performance of Vendors/ Suppliers/Contractors/ Consultants :

- i) Orders/Contracts below the value of Rs. 50 Lakhs if Vendor/ Supplier/Contractor/ Consultant is not on watch list/ holiday list/ banning list.
- ii) Orders for Misc./Administrative items/ Non stock Non valued items (PO with material code ending with 9).

However, concerned Engineer-in-Charge /OICs will continue to monitor such cases so as to minimize the impact on Projects/O&M plants due to non performance of Vendors/ Suppliers/Contractors/ Consultants in all such cases.

5.0 PROCESS OF EVALUATION OF PERFORMANCE OF VENDORS/ SUPPLIERS/ CONTRACTORS/ CONSULTANTS

5.1 FOR PROJECTS

- i) Evaluation of performance of Vendors/ Suppliers/Contractors/ Consultants in case of PROJECTS shall be done immediately with commissioning of any Project.
- ii) On commissioning of any Project, EIC (Engineer-in-charge)/ Project-in-charge shall prepare a Performance Rating Data Sheet (Format at Annexure-1) for all Orders and Contracts.
- iii) Depending upon the Performance Rating, following action shall be initiated by Engineer-in-charge/Project-in-charge:

Sl.No.	Performance Rating	Action
1	POOR	Seek explanation for Poor performance
2	FAIR	Seek explanation for Fair performance



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

3	GOOD	Letter to the concerned for improving performance in future
4	VERY GOOD	No further action

- iv) Reply from concerned Vendor/ Supplier/Contractor/ Consultant shall be examined. In case of satisfactory reply, Performance Rating data Sheet to be closed with a letter to the concerned for improving performance in future.
- v) When no reply is received or reasons indicated are unsatisfactory, the following actions need to be taken:

- A) Where performance rating is “POOR” (as per Performance Rating carried out after execution of Order/ Contract and where no reply/ unsatisfactory reply is received from party against the letter seeking the explanation from Vendor/Supplier/Contractor/ Consultant along with sharing the performance rating)

Recommend such defaulting Vendor / Supplier / Contractor / Consultant for the following action:

1. Poor Performance on account of Quality (if marks obtained against Quality parameter is less than 20):
 - (a) **First Instance: Holiday (Red Card) for One Year**
 - (b) **Subsequent instance (s) in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: Holiday (Red Card) for Two Years**
2. Poor Performance on account of other than Quality (if marks obtained against Quality parameter is more than 20):
 - (a) **First such instance: Advisory notice (Yellow Card)** shall be issued and Vendor/Supplier/Contractor/ Consultant shall be put on watch list for a period of Two (2) Years.
 - (b) **Second such instance in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: Putting on Holiday (Red Card) for a period of One Year**
 - (c) **Subsequent instances (more than two) in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: Putting on Holiday (Red Card) for a period of Two Years.**



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



B) Where Poor/Non-Performance leading to termination of contract or Offloading of contract due to poor performance attributable to Vendor/Supplier/ Contractor/Consultant (under clause no. 32 (C) of GCC-Works)

(a) **First instance: Advisory notice (Yellow Card)** shall be issued and Vendor/Supplier/Contractor /Consultant shall be put on watch list for a period of Two (2) Years.

Further such vendor will not be allowed to participate in the re-tender of the same supply/work/services of that location which has terminated / offloaded. Moreover, it will be ensured that all other action as per provision of contract including forfeiture of Contract Performance Security (CPS) etc. are undertaken.

However, such vendor will be allowed to participate in all other tenders and to execute other ongoing order/ contract (s) or new contract/ order (s).

The Yellow card will be automatically revoked after a period of two years unless the same is converted into Red Card due to subsequence instances of poor/ non-performance in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant.

(b) **Second instances** in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: **Holiday (Red Card)** for period of One Year and they shall also to be considered for Suspension.

(c) **Subsequent instances (more than two)** in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: **Holiday (Red Card) for period of Two Years and they shall also to be considered for Suspension.**

(C) Where Performance rating is “FAIR”:
Issuance of warning to such defaulting Vendor/ Supplier/Contractor/ Consultant to improve their performance.

5.2 FOR CONSULTANCY JOBS

Monitoring and Evaluation of consultancy jobs will be carried out in the same way as described in para 5.1 for Projects.

5.3 FOR OPERATION & MAINTENANCE



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

- i) Evaluation of performance of Vendors/ Suppliers/Contractors/ Consultants in case of Operation and Maintenance shall be done immediately after execution of order/ contract.
- ii) After execution of orders a Performance Rating Data Sheet (Format at Annexure-2) shall be prepared for Orders by Site C&P and for Contracts/Services by respective Engineer-In-Charge.
- iii) Depending upon Performance Rating, following action shall be initiated by EIC:

Sl. No.	Performance Rating	Action
1	POOR	Seek explanation for Poor performance
2.	FAIR	Seek explanation for Fair performance
3	GOOD	Letter to the concerned for improving performance in future.
4	VERY GOOD	No further action

- iv) Reply from concerned Vendor/ Supplier/Contractor/ Consultant shall be examined. In case of satisfactory reply, Performance Rating data Sheet to be closed with a letter to the concerned for improving performance in future.
- v) When no reply is received or reasons indicated are unsatisfactory, the following actions need to be taken:

A) Where performance rating is “POOR” (as per Performance Rating carried out after execution of Order/ Contract and where no reply/ unsatisfactory reply is received from party against the letter seeking the explanation from Vendor/Supplier/Contractor/ Consultant along with sharing the performance rating)
Recommend such defaulting Vendor / Supplier / Contractor / Consultant for the following action:

- 1. Poor Performance on account of Quality (if marks obtained against Quality parameter is less than 20):
 - (a) **First Instance: Holiday (Red Card) for One Year**
 - (b) **Subsequent instance (s) in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: Holiday (Red Card) for Two Years**
- 2. Poor Performance on account of other than Quality (if marks obtained against Quality parameter is more than 20):
 - (a) **First such instance: Advisory notice (Yellow Card)** shall be issued and Vendor/Supplier/Contractor/ Consultant shall be put on watch list for a period of Two (2) Years.



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- (b) Second such instance in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: Putting on Holiday (Red Card) for a period of One Year
 - (c) Subsequent instances (more than two) in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: Putting on Holiday (Red Card) for a period of Two Years.
- B) Where Poor/Non-Performance leading to termination of contract or Offloading of contract due to poor performance attributable to Vendor/Supplier/ Contractor/Consultant (under clause no. 32 (C) of GCC-Works)
 - (a) **First instance: Advisory notice (Yellow Card)** shall be issued and Vendor/Supplier/Contractor /Consultant shall be put on watch list for a period of Two (2) Years.
Further such vendor will not be allowed to participate in the re-tender of the same supply/work/services of that location which has terminated / offloaded. Moreover, it will be ensured that all other action as per provision of contract including forfeiture of Contract Performance Security (CPS) etc. are undertaken.
However, such vendor will be allowed to participate in all other tenders and to execute other ongoing order/ contract (s) or new contract/ order (s).
The Yellow card will be automatically revoked after a period of two years unless the same is converted into Red Card due to subsequence instances of poor/ non-performance in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant.
 - (b) **Second instances** in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: **Holiday (Red Card)** for period of One Year and they shall also to be considered for Suspension.
 - (c) **Subsequent instances (more than two)** in other ongoing order (s)/ contract (s) or new order (s) /contact (s) on such Vendor/ Supplier/ Contractor/ Consultant: **Holiday (Red Card) for period of Two Years and they shall also to be considered for Suspension.**
- (C) Where Performance rating is “FAIR”



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Issuance of warning to such defaulting Vendors/Contractors/Consultants to improve their performance.

6.0 REVIEW & RESTORATION OF PARITES PUT ON HOLIDAY

- 6.1 An order for Holiday passed for a certain specified period shall deemed to have been automatically revoked on the expiry of that specified period and it will not be necessary to issue a specific formal order of revocation.

Further, in case Vendor/ Supplier/Contractor/ Consultant is put on holiday due to quality, and new order is placed on bidder after restoration of Vendor/ Supplier/Contractor/ Consultant, such order will be properly monitored during execution stage by the concerned site.

7.0 EFFECT OF HOLIDAY

- 7.1 If a Vendor/ Supplier/Contractor/ Consultant is put on Holiday, such Vendor/ Supplier/Contractor/ Consultant shall not be considered in ongoing tenders/future tenders.
- 7.2 However, if such Vendor/ Supplier/Contractor/ Consultant is already executing any other order/ contract and their performance is satisfactory in terms of the relevant contract, should be allowed to continue till its completion without any further increase in scope except those incidental to original scope mentioned in the contract. In such a case CPBG will not be forfeited and payment will be made as per provisions of concerned contract. However, this would be without prejudice to other terms and conditions of the contract.
- 7.3. Effect on other ongoing tendering:
- 7.3.1 after issue of the enquiry /bid/tender but before opening of Technical bid, the bid submitted by the party shall be ignored.
- 7.3.2 after opening Technical bid but before opening the Price bid, the Price bid of the party shall not be opened and BG/EMD submitted by the party shall be returned to the party.
- 7.3.3 after opening of price, BG/EMD made by the party shall be returned; the offer of the party shall be ignored & will not be further evaluated. In case such agency is lowest (L-1), next lowest bidder shall be considered as L-1..
- 8.0 While putting the Vendor/ Supplier/Contractor/ Consultant on holiday as per the procedure, the holding company, subsidiary, joint venture, sister concerns, group division of the errant Vendor/ Supplier/Contractor/ Consultant shall not be considered for putting on holiday list. Any bidder, put on holiday, will not be allowed to bid through consortium route also in new tender during the period of holiday.
- 9.0 If an unsuccessful bidder makes any vexatious, frivolous or malicious complaint against the tender process with the intention of delaying or defeating any procurement or causing loss to GAIL or any other bidder, such bidder will be put on holiday for a period of six months, if such complaint is proved to be vexatious, frivolous or malicious, after following the due procedure.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



10. APPEAL AGAINST THE DECISION OF THE COMPETENT AUTHORITY:

- (a) The party may file an appeal against the order of the Competent Authority for putting the party on Holiday list. The appeal shall be filed to Appellate Authority. Such an appeal shall be preferred within one month from the of receipt of Holiday order.
- (b) Appellate Authority would consider the appeal and pass appropriate order which shall be communicated to the party as well as the Competent Authority.
- (c) Appeal process may be completed within 45 days of filing of appeal with the Appellate Authority.
- (d) “Appellate Authority” shall mean Committee of Directors consisting of Director (Finance) and Director (BD) for works centers under Director (Projects). For all other cases committee of Directors shall consist of Director (Finance) & Director (Projects).

11. ERRANT BIDDER

In case after price bid opening the lowest evaluated bidder (L1) is not awarded the job for any mistake committed by him in bidding or withdrawal of bid or modification of bid or varying any term in regard thereof leading to re-tendering, GAIL shall forfeit EMD if paid by the bidder and such bidders shall be debarred from participation in retendering of the same job(s)/item(s).

Further, such bidder will be put on Watch List (Yellow Card) for a period of two years after following the due procedure. However, during the period in watch list such vendor will be allowed to participate in all other tenders and to execute other ongoing order/ contract (s) or new contract/ order (s).

In case of subsequent instances of default in other tender(s) during aforesaid watch list period, the action shall be initiated as per provision of sl. no. 2 of para A of Clause no. 5.1 (v) and 5.3 (v).

The Yellow card will be automatically revoked after specified period unless the same is converted into Red Card

12. In case CBIC (Central Board of Indirect Taxes and Customs)/ any tax authority / any equivalent government agency brings to the notice of GAIL that the Supplier has not remitted the amount towards GST (CGST & SGST/UTGST or IGST) collected from GAIL to the government exchequer, then, that Supplier shall be put under Holiday list of GAIL for period of six months after following the due procedure. This action will be in addition to the right of recovery of financial implication arising on GAIL.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

Annexure-1

**GAIL (India) Limited
PERFORMANCE RATING DATA SHEET
(FOR PROJECTS/ CONSULTANCY JOBS)**

- i) Project/Work Centre :
- ii) Order/ Contract No. & date :
- iii) Brief description of Items :
Works/Assignment
- iv) Order/Contract value (Rs.) :
- v) Name of Vendor/Supplier/ :
Contractor/ Consultant
- vi) Contracted delivery/ :
Completion Schedule
- vii) Actual delivery/ :
Completion date

Performance Pa- rameter	Delivery/ Completion Per- formance	Quality Perfor- mance	Reliability Perfor- mance#	Total
Maximum Marks	40	40	20	100
Marks Allocated				

Note:

Remarks (if any)

PERFORMANCE RATING (**)

Note :

(#) Vendor/Supplier/Contractor/Consultant who seek repeated financial assistance or deviation beyond contract payment term or seeking direct payment to the sub-vendor/sub-contractor due to financial constraints, then '0' marks should be allotted against Reliability Performance.

(*) Allocation of marks should be as per enclosed instructions

(**) Performance rating shall be classified as under :

Sl. No.	Range (Marks)	Rating
1	60 & below	POOR
2	61-75	FAIR
3	76-90	GOOD
4	More than 90	VERY GOOD

Signature of
Authorised Signatory:

Name:

Designation:



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

Instructions for allocation of marks

1. Marks are to be allocated as under :

1.1 DELIVERY/ COMPLETION PERFORMANCE 40 Marks

Delivery Period/ Completion Schedule	Delay in Weeks	Marks
a) Upto 3 months	Before CDD	40
	Delay upto 4 weeks	35
	” 8 weeks	30
	” 10 weeks	25
	” 12 weeks	20
	” 16 weeks	15
	More than 16 weeks	0
b) Above 3 months	Before CDD	40
	Delay upto 4 weeks	35
	” 8 weeks	30
	” 10 weeks	25
	” 16 weeks	20
	” 20 weeks	15
	” 24 weeks	10
	More than 24 weeks	0

1.2 QUALITY PERFORMANCE 40 Marks

For Normal Cases : No Defects/ No Deviation/ No failure:		40 marks
i) Rejection/Defects	Marks to be allocated on prorata basis for acceptable quantity as compared to total quantity for normal cases	10 marks
ii) When quality failure endanger system integration and safety of the system	Failure of severe nature	0 marks
	- Moderate nature	5 marks
	- low severe nature	10-25 marks
iii) Number of	1. No deviation	5 marks



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

deviations

2. No. of deviations ≤ 2

2 marks

3. No. of deviations > 2

0 marks

1.3 RELIABILITY PERFORMANCE

20 Marks

A.	FOR WORKS/CONTRACTS	
i)	Submission of order acceptance, agreement, PBG, Drawings and other documents within time	4 marks
ii)	Mobilization of resources as per Contract and in time	4 marks
iii)	Liquidation of Check-list points	4 marks
iv)	Compliance to statutory and HS&E requirements or Reliability of Estimates/Design/Drawing etc. in case of Consultancy jobs	4 marks
v)	Timely submission of estimates and other documents for Extra, Substituted & AHR items	4 marks
B.	FOR SUPPLIES	
i)	Submission of order acceptance, PBG, Drawings and other documents within time	5 marks
ii)	Attending complaints and requests for after sales service/ warranty repairs and/ or query/ advice (upto the evaluation period).	5 marks
iii)	Response to various correspondence and conformance to standards like ISO	5 marks
iv)	Submission of all required documents including Test Certificates at the time of supply	5 marks



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

Annexure-2

**GAIL (India) Limited
PERFORMANCE RATING DATA SHEET
(FOR O&M)**

- i) Location :
- ii) Order/ Contract No. & date :
- iii) Brief description of Items :
Works/Assignment
- iv) Order/Contract value (Rs.) :
- v) Name of Vendor/Supplier/ :
Contractor/ Consultant
- vi) Contracted delivery/ :
Completion Schedule
- vii) Actual delivery/ :
Completion date

Performance Parameter	Delivery Performance	Quality Performance	Reliability Performance#	Total
Maximum Marks	40	40	20	100
Marks Allocated (*)				

Remarks (if any)

PERFORMANCE RATING (**)

Note :

- (#) Vendor/Supplier/Contractor/Consultant who seek repeated financial assistance or deviation beyond contract payment term or seeking direct payment to the sub-vendor/sub-contractor due to financial constraints, then '0' marks should be allotted against Reliability Performance
- (*) Allocation of marks should be as per enclosed instructions
- (**) Performance rating shall be classified as under :

Sl. No.	Range (Marks)	Rating
1	60 & below	POOR
2	61-75	FAIR
3	76-90	GOOD
4	More than 90	VERY GOOD

Signature of
Authorised Signatory:

Name:

Designation:



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Instructions for allocation of marks (For O&M)

1. Marks are to be allocated as under :

1.1 DELIVERY/ COMPLETION PERFORMANCE 40 Marks

Delivery Period/ Completion Schedule	Delay in Weeks	Marks
a) Upto 3 months	Before CDD	40
	Delay upto 4 weeks	35
	” 8 weeks	30
	” 10 weeks	25
	” 12 weeks	20
	” 16 weeks	15
	More than 16 weeks	0
b) Above 3 months	Before CDD	40
	Delay upto 4 weeks	35
	” 8 weeks	30
	” 10 weeks	25
	” 16 weeks	20
	” 20 weeks	15
	” 24 weeks	10
	More than 24 weeks	0

1.2 QUALITY PERFORMANCE 40 Marks

For Normal Cases : No Defects/ No Deviation/ No failure: 40 marks

i) Rejection/Defects	Marks to be allocated on prorata basis for acceptable quantity as compared to total quantity for normal cases	10 marks
ii) When quality failure endanger system integration and safety of the system	Failure of severe nature - Moderate nature - low severe nature	0 marks 5 marks 10-25 marks
iii) Number of	1. No deviation	5 marks



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

deviations

2. No. of deviations ≤ 2

2 marks

3. No. of deviations > 2

0 marks

1.3 RELIABILITY PERFORMANCE

20 Marks

A.	FOR WORKS/CONTRACTS	
i)	Submission of order acceptance, agreement, PBG, Drawings and other documents within time	4 marks
ii)	Mobilization of resources as per Contract and in time	4 marks
iii)	Liquidation of Check-list points	4 marks
iv)	Compliance to statutory and HS&E requirements or Reliability of Estimates/Design/Drawing etc. in case of Consultancy jobs	4 marks
v)	Timely submission of estimates and other documents for Extra, Substituted & AHR items	4 marks
B.	FOR SUPPLIES	
i)	Submission of order acceptance, PBG, Drawings and other documents within time	5 marks
ii)	Attending complaints and requests for after sales service/ warranty repairs and/ or query/ advice (upto the evaluation period).	5 marks
iii)	Response to various correspondence and conformance to standards like ISO	5 marks
iv)	Submission of all required documents including Test Certificates at the time of supply	5 marks



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Annexure-III to Section-III

**ADDENDUM TO INSTRUCTIONS TO BIDDERS
(INSTRUCTIONS FOR PARTICIPATION IN E-TENDER)**

Detailed instructions regarding bid submission procedure under e-tendering system (e-tender portal) is available on <https://gailtenders.in/Gailtenders/Home.asp> as detailed below:



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

ANNEXURE-IV to Section-III

BIDDING DATA SHEET (BDS)

ITB TO BE READ IN CONJUNCTION WITH THE FOLLOWING:

A. GENERAL	
ITB clause	Description
1.1	The Employer/Owner is: GAIL (India) Limited
2.1	The name of the Works/Services to be performed is: TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION NETWORK (1 YEAR ARC).
3	BIDS FROM CONSORTIUM/ JOINT VENTURE : Not Applicable
B. BIDDING DOCUMENT	
ITB clause	Description
8.1	<p>For <u>clarification purposes</u> only, the communication address is:</p> <p>Sri. Rahul Kumar [Dy. Manager (commercial)] Mobile No.: 8709391189 E-mail: kumar.rahul95@bridgeroof.co.in</p> <p>Sri. Vijayakrishnan V [Manager] Mobile No.: 9961207810 E-mail: vijayakrishnan.v@bridgeroof.co.in</p> <p>Sri. Mreenmoy Halder [Senior Manager (Co-Ordination)/SBU-IV] Mobile No.: 9744764501 E-mail: mreenmoy.halder05@bridgeroof.co.in</p> <p>Address: Bridge And Roof Company (India) Limited., Kankaria Center (5th Floor), 2/1 Russel Street, Kolkata – 700071, West Bengal (India).</p>
C. PREPARATION OF BIDS	
ITB clause	Description
11.1.1 (u)	Additional documents to be submitted by the Bidder with its Part-I (Techno-commercial/ Unpriced bid) : SCC/Scope of Work refers
12	Additional Provision for Schedule of Rate/ Bid Price are as under: As per Schedule of Rates (SOR) / BOQ



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

12 & 13	Whether GAIL will be able to avail input tax credit in the instant tender <table border="1"> <tr> <td align="center">YES</td><td></td></tr> <tr> <td align="center">NO</td><td align="center">√</td></tr> </table>	YES		NO	√																
YES																					
NO	√																				
14	The currency of the Bid shall be INR																				
15	The bid validity period shall be THREE MONTHS from final 'Bid Due Date'.																				
16.1, 16.10 and 38.6	<p>In case 'Earnest Money / Bid Security' or "Contract Performance Security" is in the form of 'Demand Draft' or 'Banker's Cheque' or 'Insurance Surety Bond' / 'Fixed Deposit Receipt', the same should be favor of GAIL (India) Limited, payable at Noida</p> <p>In case of submission through online banking transaction i.e. IMPS / NEFT / RTGS / SWIFT, etc, the details of GAIL's Bank account are as under:</p> <table border="1"> <tr> <td>Correspondence address</td><td>STATE BANK OF INDIA Corporate Accounts Group II. 4th & 5th Floor, Red Fort Capital, Parsvnath Towers, Bhai Veer Singh Marg, Near Gole Market, New Delhi 110 001.</td></tr> <tr> <td>Account no.</td><td>00000032849362991</td></tr> <tr> <td>Branch Code</td><td>17313</td></tr> <tr> <td>IFSC CODE</td><td>SBIN0017313</td></tr> <tr> <td>SWIFT CODE</td><td>SBININBB824</td></tr> <tr> <td>MICR CODE</td><td>110002562</td></tr> <tr> <td>PAN No. (SBI)</td><td>AAACS8577K</td></tr> <tr> <td>TAN No.</td><td>DELS55939C</td></tr> <tr> <td>Fax no. :</td><td>011-23745580</td></tr> <tr> <td>Email</td><td>Agmib.cag2del@sbi.co.in</td></tr> </table> <p>Bidder to mention reference no. "EMD/ TENDER NO." in narration while remitting the EMD / Bid Security amount and to mention reference no. "CPS/ TENDER NO." in narration while remitting the CPS amount in GAIL's Bank Account.</p>	Correspondence address	STATE BANK OF INDIA Corporate Accounts Group II. 4 th & 5 th Floor, Red Fort Capital, Parsvnath Towers, Bhai Veer Singh Marg, Near Gole Market, New Delhi 110 001.	Account no.	00000032849362991	Branch Code	17313	IFSC CODE	SBIN0017313	SWIFT CODE	SBININBB824	MICR CODE	110002562	PAN No. (SBI)	AAACS8577K	TAN No.	DELS55939C	Fax no. :	011-23745580	Email	Agmib.cag2del@sbi.co.in
Correspondence address	STATE BANK OF INDIA Corporate Accounts Group II. 4 th & 5 th Floor, Red Fort Capital, Parsvnath Towers, Bhai Veer Singh Marg, Near Gole Market, New Delhi 110 001.																				
Account no.	00000032849362991																				
Branch Code	17313																				
IFSC CODE	SBIN0017313																				
SWIFT CODE	SBININBB824																				
MICR CODE	110002562																				
PAN No. (SBI)	AAACS8577K																				
TAN No.	DELS55939C																				
Fax no. :	011-23745580																				
Email	Agmib.cag2del@sbi.co.in																				
D. SUBMISSION AND OPENING OF BIDS																					
ITB clause	Description																				
18	In addition to the original of the Bid, the number of copies required is one. Not applicable in case of e-tendering.																				



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

22.3, 26 and 4.0 of IFB	For <u>bid submission purposes</u> only (Manual) or the submission of physical document as per clause no. 4.0 of IFB, and Bid Opening Purpose the PMC address is : Sanjoy Bhattacharyya, ED (Engineering) Bridge And Roof Company (India) Limited., Kankaria Center (5th Floor), 2/1 Russel Street, Kolkata – 700071, West Bengal (India)				
E. EVALUATION, AND COMPARISON OF BIDS					
ITB clause	Description				
32	Evaluation Methodology is mentioned in Section-II.				
33	Compensation for Extended Stay: <table border="1"> <tr> <td>APPLICABLE</td> <td><input type="text"/></td> </tr> <tr> <td>NOT APPLICABLE</td> <td><input checked="" type="checkbox"/></td> </tr> </table>	APPLICABLE	<input type="text"/>	NOT APPLICABLE	<input checked="" type="checkbox"/>
APPLICABLE	<input type="text"/>				
NOT APPLICABLE	<input checked="" type="checkbox"/>				
34	The following Purchase Preference Policy will be applicable as per provisions mentioned in tender: Policy to Provide Purchase Preference as per Public Procurement (Preference to Make in India), Order 2017				
F. AWARD OF CONTRACT					
ITB clause	Description				
37	State of India of which stamp paper is required for Contract Agreement: Any State				
38	Contract Performance Security/ Security Deposit <table border="1"> <tr> <td>APPLICABLE</td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>NOT APPLICABLE</td> <td><input type="text"/></td> </tr> </table> <p><u>The value/ amount of Contract Performance Security/ Security Deposit:</u></p> <p>SD / CPBG @ 10% of Annualized Order / Contract value. OR Initial security deposit (ISD) @ 2.5% of Annualized Order / Contract within 30 days of FOA/notification of award and deduction @ 7.5% of the RA bill subsequently from RA bills till the total amount of security deposit (including ISD and deducted amount) reaches 10% of Annualized Order / Contract value. The Contract Performance Guarantee will be for a period of 90 days beyond the contract period/ duration and applicable Warranty/ Guarantee /Defect Liability</p>	APPLICABLE	<input checked="" type="checkbox"/>	NOT APPLICABLE	<input type="text"/>
APPLICABLE	<input checked="" type="checkbox"/>				
NOT APPLICABLE	<input type="text"/>				



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

	Period (if any) plus claim period 03 months thereafter. For this tender, CPBG shall be valid for 27 months from the date of FOA, with a claim period of 3 months thereafter.				
39.2	Name and contact details of nodal officer are as under: Sh. Sushil Kumar Gupta, CGM (C&P) Email: sk.gupta@gail.co.in				
40	Whether tendered item is non-split able or not-divisible : Refer section-II for Evaluation methodology & distribution of work.				
41	Provision of AHR Item : <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>APPLICABLE</td><td><input type="checkbox"/></td></tr> <tr> <td>NOT APPLICABLE</td><td><input checked="" type="checkbox"/></td></tr> </table>	APPLICABLE	<input type="checkbox"/>	NOT APPLICABLE	<input checked="" type="checkbox"/>
APPLICABLE	<input type="checkbox"/>				
NOT APPLICABLE	<input checked="" type="checkbox"/>				
44.1	Quarterly Closure of Contract <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>APPLICABLE</td><td><input checked="" type="checkbox"/></td></tr> <tr> <td>NOT APPLICABLE</td><td><input type="checkbox"/></td></tr> </table>	APPLICABLE	<input checked="" type="checkbox"/>	NOT APPLICABLE	<input type="checkbox"/>
APPLICABLE	<input checked="" type="checkbox"/>				
NOT APPLICABLE	<input type="checkbox"/>				
Clause no. 27.3 of GCC	Bonus for Early Completion: <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>APPLICABLE</td><td><input type="checkbox"/></td></tr> <tr> <td>NOT APPLICABLE</td><td><input checked="" type="checkbox"/></td></tr> </table>	APPLICABLE	<input type="checkbox"/>	NOT APPLICABLE	<input checked="" type="checkbox"/>
APPLICABLE	<input type="checkbox"/>				
NOT APPLICABLE	<input checked="" type="checkbox"/>				
49	Applicability of provisions relating to Startups: <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>APPLICABLE</td><td><input type="checkbox"/></td></tr> <tr> <td>NOT APPLICABLE</td><td><input checked="" type="checkbox"/></td></tr> </table>	APPLICABLE	<input type="checkbox"/>	NOT APPLICABLE	<input checked="" type="checkbox"/>
APPLICABLE	<input type="checkbox"/>				
NOT APPLICABLE	<input checked="" type="checkbox"/>				
53	Applicability of provisions relating to Order Transmittal System: <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>APPLICABLE</td><td><input checked="" type="checkbox"/></td></tr> <tr> <td>NOT APPLICABLE</td><td><input type="checkbox"/></td></tr> </table>	APPLICABLE	<input checked="" type="checkbox"/>	NOT APPLICABLE	<input type="checkbox"/>
APPLICABLE	<input checked="" type="checkbox"/>				
NOT APPLICABLE	<input type="checkbox"/>				
SCC	Documents required for accepting the works: Refer SCC/PJS.				



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



ANNEXURE-V TO SECTION-III

**POLICY TO PROVIDE PURCHASE PREFERENCE AS PER PUBLIC PROCUREMENT
(PREFERENCE TO MAKE IN INDIA), ORDER 2017**

1.0 Ministry of Petroleum & Natural Gas vide Notification No. FP-20013/2/2017-FP-PNG-Part(4) (E-41432) dated 26.04.2022 has notified that Public Procurement (Preference to Make in India), Order 2017 (PPP-MII) issued by DPIIT and as amended from time to time shall be applicable to all the Public Sector Undertakings and their wholly owned subsidiaries under MoP&NG with certain modifications.

- Limit for exemption of small purchase under para 4 of the PPP-MII Order, 2017 shall be Rs. 1 Crore.
- HP-HT operation in upstream oil and gas turbines activities shall be exempted from applicability of the Order.

Whereas, in respect of Local value addition through services, as per communication no. F.No. FP-20013/2/2017-FP-PNG-Part(4) (E-41432) dated 26.03.2024 of MoP&NG, the same is modified as under:

Local Value addition through services such as transportation, insurance, installation, commissioning, training and after sales services support like AMC/CMC etc. shall continue to be considered in local content calculation and the scope of this relaxation shall be limited to the items (as per list enclosed) to be installed/operated in flammable environment of Oil and Gas processing industry.

2.0 The Public Procurement (Preference to Make in India), Order 2017 (PPP-MII) issued by DPIIT to encourage 'Make in India' and promote manufacturing & production of goods and services in India with a view to enhancing income and employment.

3.0 DEFINITIONS:-

(i) **Local Content** means the amount of value added in India which shall, unless otherwise prescribed by the Nodal Ministry, be the total value of item procured (excluding net domestic in-



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

direct taxes) minus the value of imported content in the item (including all custom duties) as a proportion of the total value, in percent.

Local Value addition through services such as transportation, insurance, installation, commissioning, training and after sales services support like AMC/CMC etc. shall continue to be considered in local content calculation and the scope of this relaxation shall be limited to the items (as per list enclosed) to be installed/operated in flammable environment of Oil and Gas processing industry.

Explanatory notes for calculation of local content given below:

- a) Imported items sourced locally from resellers/distributors shall be excluded from calculation of local content.
- b) The license fees/royalties paid/ technical charges paid out of India shall be excluded from local content calculation.
- c) Procurement/Supply of repackaged/refurbished/rebranded imported products as understood commonly shall be treated as reselling of imported products and shall be excluded from calculation of local content. The definition of repackaged/refurbished/rebranded imported products is as follows :

'Refurbishing' means repair or reconditioning of an imported product does not amount to manufacture because no new goods come into existence.

'Repackaging' means repacking of imported goods from bulk pack to smaller packs would not ordinarily amount to manufacture of a new item.

'Rebranding' means relabeling or renaming or change in symbol or logo/ makes or corporate image of a company/ organization/ firm for an imported product would amount to rebranding.

- d) To ensure that imported items sourced locally from resellers/distributors are excluded from calculation of local content, procuring entities to obtain from



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



bidders, the cost of such locally-sourced imported items (Inclusive of taxes) along with break-up on license/royalties paid/technical expertise cost etc. sourced from outside India. For items sold by bidder as reseller, OEM certificate for country of origin to be submitted.

e) For contracts involving supply of multiple items, weighted average of all items to be taken while calculating the local content.

(ii) **‘Class-I local supplier’** means a supplier or service provider, whose goods, services or works offered for procurement, meets the minimum local content of equal to or more than 50%.

‘Class-II local supplier’ means a supplier or service provider, whose goods, services or works offered for procurement, meets the minimum local content of more than 20% but less than 50%.

‘Non - Local supplier’ means a supplier or service provider, whose goods, services or works offered for procurement, has local content less than or equal to 20%.

(iii) **L1** mean the lowest tender or lowest bid or the lowest quotation received in a tender, bidding process or other procurement solicitation as adjudged in the evaluation process as per tender or other procurement solicitation.

(iv) **Margin of Purchase Preference:** means the maximum extent to which the price quoted by a Class-I local supplier may be above the L1 for purpose of purchase Preference.

(v) **Nodal Ministry** means the Ministry of Petroleum & Natural Gas

(vi) **Procuring Entity** means GAIL (India) Limited (GAIL)

(vi) **Works** means all the works as per Rule 130 of GFR-2017 also include ‘turnkey works’

3A Special treatment for items covered under PLI Scheme

The manufacturers manufacturing an item under PLI scheme shall be treated as deemed Class II local supplier for that item unless they have minimum local content equal to or higher than that notified for Class-I local supplier for that item, provided the manufacturer has received incentive from the concerned PLI Ministry for the Item. The above shall be applicable for the specific time period only, as notified by concerned PLI Ministry.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



4.0 Margin of Purchase Preference: The margin of purchase preference shall be 20%.

**5.0 ELIGIBILITY OF ‘CLASS-I LOCAL SUPPLIER’/ ‘CLASS-II LOCAL SUPPLIER’/
‘NON-LOCAL SUPPLIERS’ FOR DIFFERENT TYPES OF PROCUREMENT**

- (a) In procurement of all goods, services or works in respect of which the Nodal Ministry / Department has communicated that there is sufficient local capacity and local competition, only 'Class-I local supplier', shall be eligible to bid irrespective of purchase value.
- (b) Only 'Class-I local supplier' and 'Class-II local supplier', shall be eligible to bid in procurements undertaken by procuring entities, except when Global tender enquiry/ International Competitive bidding has been issued. In global tender enquiries/ International Competitive bidding 'Non local suppliers' shall also be eligible to bid along with 'Class-I local suppliers' and 'Class-II local suppliers'.
- (c) Works includes Engineering, Procurement and Construction (EPC) contracts and services include System Integrator (SI) contracts
- (d) HP-HT Operations in upstream oil and gas business activities shall be exempted from this order.

6.0 MANDATORY SOURCING OF ITEMS, WITH SUFFICIENT LOCAL CAPACITY AND COMPETITION, FROM CLASS-I LOCAL SUPPLIERS IN SI/EPC/TURNKEY CONTRACTS/SERVICE TENDERS

- (a) The items, notified as having sufficient local capacity and competition, shall mandatory be sourced from Class-I local suppliers in SI/EPC/Turnkey Contracts/ Services tenders. This provision will be applicable only for those items which have been notified by the Nodal Ministry as Class I i.e. having sufficient local capacity and competition, with specific HSN codes."
- (b) Notwithstanding above, if in any project, it is considered that it is not practically feasible to source such items from Class I local suppliers, it may take relaxation from such stipulation with the approval of Secretary of the administrative Ministry/ Department concerned or with the approval of the Competent Authority specified by the Administrative Ministry/Department, on case-specific basis.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



**7.0 PURCHASE PREFERENCE METHODOLOGY UNDER PPP-MII (SUBJECT TO
QUANTITY DISTRIBUTION APPLICABLE TO MSES AS PER PUBLIC PROCUREMENT
POLICY FOR MSE 2012, REFER EXAMPLES GIVEN BELOW):**

- (a) Purchase preference shall be given to 'Class-I local supplier' in procurements in the manner specified here under.
- (b) In the procurements of goods or works which are cover by para 5 (b) above and which are divisible in nature, the 'Class-I local supplier' shall get purchase preference over 'Class-II local supplier' as well as 'Non-local supplier', as per following procedure:
 - i. Among all qualified bids, the lowest bid will be termed as L1. If L1 is 'Class-I local supplier', the contract for full quantity will be awarded to L1.
 - ii. If L1 bid is not a 'Class-I local supplier', 50% of the order quantity shall be awarded to L1. Thereafter, the lowest bidder among the 'Class-I local supplier' will be invited to match the L1 price for the remaining 50% quantity subject to the Class-I local supplier's quoted price falling within the margin of purchase preference, and contract for that quantity shall be awarded to such 'Class-I local supplier' subject to matching the L1 price. In case such lowest eligible 'Class-I local supplier' fails to match the L1 price or accepts less than the offered quantity, the next higher 'Class-I local supplier' within the margin of purchase preference shall be invited to match the L1 price for remaining quantity and so on, and contract shall be awarded accordingly. In case some quantity is still left uncovered on Class-I local suppliers, then such balance quantity may also be ordered on the L1 bidder.
- (c) In the procurements of goods or works which are covered by para 5 (b) and which are not divisible in nature, and in procurement of services where the bid is evaluated on price alone, the 'Class-I local supplier' shall get purchase preference over 'Class-II local supplier' as well as 'Non-local supplier', as per following procedure:
 - i. Among all qualified bids, the lowest bid will be termed as L1. If L1 is 'Class-I local supplier', the contract will be awarded to L1.
 - ii. If L1 is not 'Class-I local supplier', the lowest bidder among the 'Class-I local supplier', will be invited to match the L1 price subject to Class-I local supplier's quoted price falling within the margin of purchase preference, and the contract shall be awarded to such 'Class-I local supplier' subject to matching the L1 price.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

iii. In case such lowest eligible 'Class-I local supplier' fails to match the L1 price, the 'Class-I local supplier' with the next higher bid within the margin of purchase preference shall be invited to match the L1 price and so on and contract shall be awarded accordingly. In case none of the 'Class-I local supplier' within the margin of purchase preference matches the L1 price, the contract may be awarded to the L1 bidder.

iv. "Class-II local supplier" will not get purchase preference in any procurement.

(d) Applicability in tenders where contract is to be awarded to multiple bidders –

In tenders where contract is awarded to multiple bidders subject to matching of L1 rates or otherwise which are covered by para 5 (b), the 'Class-I local supplier' shall get purchase preference over 'Class II- local supplier' as well as 'Non-local supplier', as per following procedure:

- i) If 'Class-I Local suppliers' qualify for award of contract for at least 50% of the tendered quantity in any tender, the contract may be awarded to all the qualified bidders as per award criteria stipulated in the bid documents. However, in case 'Class-I Local suppliers' do not qualify for award of contract for at least 50% of the tendered quantity, purchase preference should be given to the 'Class-I local supplier' over 'Class-II local suppliers'/ 'Non local suppliers' provided that their quoted rate falls within 20% margin of purchase preference of the highest quoted bidder considered for award of contract so as to ensure that the 'Class-I Local suppliers' taken in totality are considered for award of contract for at least 50% of the tendered quantity.
- ii) First purchase preference has to be given to the lowest quoting 'Class-I local supplier', whose quoted rates fall within 20% margin of purchase preference, subject to its meeting the prescribed criteria for award of contract as also the constraint of maximum quantity that can be sourced from any single supplier. If the lowest quoting 'Class-I local supplier', does not qualify for purchase preference because of afore-said constraints or does not accept the offered quantity, an opportunity may be given to next higher 'Class-I local supplier', falling within 20% margin of purchase preference, and so on.

**8.0 EXEMPTION IN SOURCING OF SPARES AND CONSUMABLES OF CLOSED SYSTEMS
FOR PURCHASE PREFERENCE**



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Procurement of spare parts/consumables and Maintenance/ Service contracts with Original Equipment Manufacturer/Original Equipment Supplier/Original Part Manufacturer shall be exempted from this Order.

9.0 VERIFICATION OF LOCAL CONTENT/ DOMESTIC VALUE ADDITION

- a. The 'Class-I local supplier'/ 'Class-II local supplier' at the time of tender, bidding or solicitation shall require to indicate percentage of local content and provide **self-certification** (as per proforma at Form-2) that the item offered meets the minimum local content for 'Class-I local supplier'/ 'Class-II local supplier' as the case may be and shall give details of the location(s) at which the local value addition is made.
- b. In cases of procurement for a value in excess of Rs. 10 crores, in addition to Form-2 'Class-I local supplier'/ 'Class-II local supplier' shall be required to provide a certificate from the statutory auditor or cost auditor of the company (in the case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) giving the percentage of local content as per proforma at Form -3.
- c. In case a complaint is received by the procuring agency relating to implementation of this order including the claim of a bidder regarding local content/ domestic value addition, the same shall be referred to Competent Authority who is empowered to look into procurement related complaints.
- d. Nodal Ministry may constitute committees with internal and external experts for independent verification of self-declarations and auditor's/accountant's certificates on random basis and in the case of complaints. A complaint fee of Rs.2 Lakh or 1% of the value of the domestically manufactured products being procured (subject to a maximum of Rs. 5 Lakh), whichever is higher, shall be paid by Demand Draft to be deposited with GAIL. In case, the complaint is found to be incorrect, the complaint fee shall be forfeited. In case, the complaint is upheld and found to be substantially correct, deposited fee of the complainant would be refunded without any interest.
- e. In case of false declarations, GAIL shall initiate action for banning such manufacturer/supplier/service provider as per as per GAIL's extant "Procedure for action in case Corrupt/Fraudulent/Collusive/Coercive Practices"
- f. A supplier who has been debarred by any procuring entity for violation of this Order shall not be eligible for preference under this Order for procurement by any other procuring entity for the duration of the debarment. The debarment for such other procuring entities shall take ef-



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



fect prospectively from the date on which it comes to the notice of other procurement entities, in the manner prescribed under paragraph below.

- g. The Department of Expenditure shall issue suitable instructions for the effective and smooth operation of this process, so that:
- i. The fact and duration of debarment for violation of this Order by any procuring entity are promptly brought to the notice of the Member-Convenor of the Standing Committee and the Department of Expenditure through the concerned Ministry /Department or in some other manner;
 - ii. on a periodical basis such cases are consolidated and a centralized list or decentralized lists of such suppliers with the period of debarment is maintained and displayed on website(s);
 - iii. in respect of procuring entities other than the one which has carried out the debarment, the debarment takes effect prospectively from the date of uploading on the website(s) in the such a manner that ongoing procurements are not disrupted.

10.0 RECIPROCITY CLAUSE

- i. When a Nodal Ministry/Department identifies that Indian suppliers of an item are not allowed to participate and/ or compete in procurement by any foreign government, due to restrictive tender conditions which have direct or indirect effect of barring Indian companies such as registration in the procuring country, execution of projects of specific value in the procuring country etc., it shall provide such details to all its procuring entities including CMDs/CEOs of PSEs/PSUs, State Governments and other procurement agencies under their administrative control and GeM for appropriate reciprocal action.
- ii. Entities of countries which have been identified by the nodal Ministry/Department as not allowing Indian companies to participate in their Government procurement for any item related to that nodal Ministry shall not be allowed to participate in Government procurement in India for all items related to that nodal Ministry/ Department, except for the list of items published by the Ministry/ Department permitting their participation.
- ii. The term 'entity' of a country shall have the same meaning as under the FDI Policy of DPIIT as amended from time to time.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

ANNEXURE - I

No.: FP-20013/24/2017-FP-PNG (E-17013)
Government of India
Ministry of Petroleum and Natural Gas
(Flagship Programme Cell)

Shastri Bhawan, New Delhi
Dated 21st August, 2024

To

1. Chairman, IOCL
2. C&MD, ONGC/ BPCL/ HPCL/ OIL/ GAIL/ EIL/ Balmer Lawrie
3. Managing Director, CPCL/ NRL/ MRPL/ BCPL/ OVL
4. DG, DGH
5. DG, PPAC
6. Secretary, OIDB
7. ED, OISD
8. ED, CHT
9. Director, RGIPT/ IIPE
10. Secretary, PNGRB
11. CEO & MD, ISPRL

**Subject: Revised Public Procurement (Preference to Make in India) Order, 2017-
regarding**

Sir/ Madam,

I am directed to forward revised Public Procurement (Preference to Make in India) Order, 2017 dated 19.7.2024 issued by Department for Promotion of Industries and Internal Trade (DPIIT), for information and necessary action.

Yours faithfully

Kala
(Kala)

Under Secretary to the Govt. of India
Tel.: 011-23381029

Encl.: as above

Copy to:

- a. PPS/ PS to Secretary, P&NG
- b. PPS/ PS to AS&FA/ AS, MoPNG
- c. PPS/ PS to JS (G)/ JS(M&OR)/ JS (GPY) JS (IC)/ JS (IFD)/ DDG, MoPNG



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

No. P-45021/2/2017-PP (BE-II)-Part(4)/Vol.II
Government of India
Ministry of Commerce and Industry
Department for Promotion of Industry and Internal Trade
(Public Procurement Section)

Vaniya Bhawan, New Delhi
Dated: 19 July, 2024

To

All Central Ministries/Departments/CPSUs/All concerned

ORDER

Subject: Public Procurement (Preference to Make in India), Order 2017-
Revision; regarding.

Department for Promotion of Industry and Internal Trade, in partial modification [Paras 2, 3, 5, 10 & 13] of Order No.P-45021/2/2017-B.E.-II dated 15.8.2017 as amended by Order No.P-45021/2/2017-B.E.-II dated 28.05.2018, Order No.P-45021/2/2017-B.E.-II dated 28.05.2018, Order No.P-45021/2/2017-B.E.-II dated 04.06.2020 and Order No.P-45021/2/2017-B.E.-II dated 18.09.2020 hereby issues the revised 'Public Procurement (Preference to Make in India), Order 2017' dated 19.07.2024 effective with immediate effect.

Whereas it is the policy of the Government of India to encourage 'Make in India' and promote manufacturing and production of goods and services in India with a view to enhancing income and employment, and

Whereas procurement by the Government is substantial in amount and can contribute towards this policy objective, and

Whereas local content can be increased through partnerships, cooperation with local companies, establishing production units in India or Joint Ventures (JV) with Indian suppliers, increasing the participation of local employees in services and training them,

Now therefore the following Order is issued:

1. This Order is issued pursuant to Rule 153 (II) of the General Financial Rules 2017.
2. Definitions: For the purposes of this Order:
'Local content' means the amount of value added in India which shall, unless otherwise prescribed by the Nodal Ministry, be the total value of the item procured (excluding net domestic indirect taxes) minus the value of imported content in the item (including all customs duties) as a proportion of the total value, in percent.

Explanatory notes for calculation of local content given above

- a. Imported items sourced locally from resellers/distributors shall be excluded from calculation of local content.
- b. The license fees/royalties paid/ technical charges paid out of India shall be excluded from local content calculation.



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

- c. Procurement/Supply of repackaged/refurbished/rebranded imported products as understood commonly shall be treated as reselling of imported products and shall be excluded from calculation of local content. The definition of repackaged/refurbished/rebranded imported products is as follows;

'Refurbishing' means repair or reconditioning of an imported product does not amount to manufacture because no new goods come into existence.

'Repackaging' means repacking of imported goods from bulk pack to smaller packs would not ordinarily amount to manufacture of a new item.

'Rebranding' means relabeling or renaming or change in symbol or logo/makes or corporate image of a company/organization/ firm for an imported product would amount to rebranding.

- d. To ensure that imported items sourced locally from resellers/distributors are excluded from calculation of local content, procuring entities to obtain from bidders, the cost of such locally-sourced imported items (inclusive of taxes) along with break-up on license/royalties paid/technical expertise cost etc. sourced from outside India. For items sold by bidder as reseller, OEM certificate for country of origin to be submitted.
- e. For contracts involving supply of multiple items, weighted average of all items to be taken while calculating the local content.

'Class-I local supplier' means a supplier or service provider, whose goods, services or works offered for procurement, meets the minimum local content as prescribed for 'Class-I local supplier' under this Order.

'Class-II local supplier' means a supplier or service provider, whose goods, services or works offered for procurement, meets the minimum local content as prescribed for 'Class-II local supplier' but less than that prescribed for 'Class-I local supplier' under this Order.

'Non - Local supplier' means a supplier or service provider, whose goods, services or works offered for procurement, has local content less than that prescribed for 'Class-II local supplier' under this Order.

'L1' means the lowest tender or lowest bid or the lowest quotation received in a tender, bidding process or other procurement solicitation as adjudged in the evaluation process as per the tender or other procurement solicitation.

'Margin of purchase preference' means the maximum extent to which the price quoted by a 'Class-I local supplier' may be above the L1 for the purpose of purchase preference.

'Nodal Ministry' means the Ministry or Department identified pursuant to this order in respect of a particular item of goods or services or works.

'Procuring entity' means a Ministry or department or attached or subordinate office of, or autonomous body controlled by, the Government of India and includes Government companies as defined in the Companies Act.

✓



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

'Works' means all works as per Rule 130 of GFR- 2017, and will also include 'turnkey works'.

2A. Special treatment for items covered under PLI Scheme

The manufacturers manufacturing an item under PLI scheme shall be treated as deemed Class II local supplier for that item unless they have minimum local content equal to or higher than that notified for Class-I local supplier for that item, provided the manufacturer has received incentive from the concerned PLI Ministry for the item. The above shall be applicable for the specific time period only, as notified by concerned PLI Ministry.

1. Eligibility of 'Class-I local supplier'/'Class-II local supplier'/'Non-local suppliers' for different types of procurement

(a) In procurement of all goods, services or works in respect of which the Nodal Ministry / Department has communicated that there is sufficient local capacity and local competition, only 'Class-I local supplier', as defined under the Order, shall be eligible to bid irrespective of purchase value.

(b) Only 'Class-I local supplier' and 'Class-II local supplier', as defined under the Order, shall be eligible to bid in procurement undertaken by procuring entities, except when Global tender enquiry has been issued. In global tender enquiries, 'Non-local suppliers' shall also be eligible to bid along with 'Class-I local suppliers' and 'Class-II local suppliers'. In procurement of all goods, services or works, not covered by sub-para 3(a) above, and with estimated value of purchases less than Rs. 200 Crore, in accordance with Rule 181(iv) of GFR, 2017, Global tender enquiry shall not be issued except with the approval of competent authority as designated by Department of Expenditure.

(c) For the purpose of this Order, works includes Engineering, Procurement and Construction (EPC) contracts and services include System Integrator (SI) contracts.

3.1 Mandatory sourcing of items, with sufficient local capacity and competition, from Class-I local suppliers in SI/EPC/Turnkey Contracts/Service Tenders

a. The items, notified as having sufficient local capacity and competition, shall mandatory be sourced from Class-I local suppliers in SI/EPC/Turnkey Contracts/ Services tenders. This provision will be applicable only for those items which have been notified by the Nodal Ministry as Class I i.e. having sufficient local capacity and competition, with specific HSN codes."

b. Notwithstanding above, if in any project, it is considered that it is not practically feasible to source such items from Class I local suppliers, it may take relaxation from such stipulation with the approval of Secretary of the administrative Ministry/ Department concerned or with the approval of the Competent Authority specified by the Administrative Ministry/Department, on case-specific basis.

3A. Purchase Preference

(a) Subject to the provisions of this Order and to any specific instructions issued by the Nodal Ministry or in pursuance of this Order, purchase preference shall be given to 'Class-I local supplier' in procurement undertaken by procuring entities in the manner specified here under.

(b) In the procurement of goods or works, which are covered by para 3(b)



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

above and which are divisible in nature, the 'Class-I local supplier' shall get purchase preference over 'Class-II local supplier' as well as 'Non-local supplier', as per following procedure:

- i. Among all qualified bids, the lowest bid will be termed as L1. If L1 is 'Class-I local supplier', the contract for full quantity will be awarded to L1.
 - ii. If L1 bid is not a 'Class-I local supplier', 50% of the order quantity shall be awarded to L1. Thereafter, the lowest bidder among the 'Class-I local supplier' will be invited to match the L1 price for the remaining 50% quantity subject to the Class-I local supplier's quoted price falling within the margin of purchase preference, and contract for that quantity shall be awarded to such 'Class-I local supplier' subject to matching the L1 price. In case such lowest eligible 'Class-I local supplier' fails to match the L1 price or accepts less than the offered quantity, the next higher 'Class-I local supplier' within the margin of purchase preference shall be invited to match the L1 price for remaining quantity and so on, and contract shall be awarded accordingly. In case some quantity is still left uncovered on Class-I local suppliers, then such balance quantity may also be ordered on the L1 bidder.
- (c) In the procurement of goods or works, which are covered by para 3(b) above and which are not divisible in nature, and in procurement of services where the bid is evaluated on price alone, the 'Class-I local supplier' shall get purchase preference over 'Class-II local supplier' as well as 'Non-local supplier', as per following procedure:
- i. Among all qualified bids, the lowest bid will be termed as L1. If L1 is Class-I local supplier, the contract will be awarded to L1.
 - ii. If L1 is not 'Class-I local supplier', the lowest bidder among the 'Class-I local supplier', will be invited to match the L1 price subject to Class-I local supplier's quoted price falling within the margin of purchase preference, and the contract shall be awarded to such 'Class-I local supplier' subject to matching the L1 price.
 - iii. In case such lowest eligible 'Class-I local supplier' fails to match the L1 price, the 'Class-I local supplier' with the next higher bid within the margin of purchase preference shall be invited to match the L1 price and so on and contract shall be awarded accordingly. In case none of the 'Class-I local supplier' within the margin of purchase preference matches the L1 price, the contract may be awarded to the L1 bidder.
- (d) 'Class-II local supplier' will not get purchase preference in any procurement, undertaken by procuring entities.

3B. Applicability in tenders where contract is to be awarded to multiple bidders- In tenders where contract is awarded to multiple bidders subject to matching of L1 rates or otherwise, the 'Class-I local supplier' shall get purchase preference over 'Class-II local supplier' as well as 'Non-local supplier', as per following procedure:

- a. In case there is sufficient local capacity and competition for the item to be procured, as notified by the nodal Ministry, only Class I local suppliers shall be eligible to bid. As such, the multiple suppliers, who would be awarded the contract, should be all and only 'Class I Local suppliers'.
- b. In other cases, 'Class II local suppliers' and 'Non local suppliers' may also participate in the bidding process along with 'Class I Local suppliers' as per provisions of this Order.
- c. If 'Class I Local suppliers' qualify for award of contract for at least



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

50% of the tendered quantity in any tender, the contract may be awarded to all the qualified bidders as per award criteria stipulated in the bid documents. However, in case 'Class I Local suppliers' do not qualify for award of contract for at least 50% of the tendered quantity, purchase preference should be given to the 'Class I local supplier' over 'Class II local suppliers'/'Non local suppliers' provided that their quoted rate falls within 20% margin of purchase preference of the highest quoted bidder considered for award of contract so as to ensure that the 'Class I Local suppliers' taken in totality are considered for award of contract for at least 50% of the tendered quantity.

- d. First purchase preference has to be given to the lowest quoting 'Class-I local supplier', whose quoted rates fall within 20% margin of purchase preference, subject to its meeting the prescribed criteria for award of contract as also the constraint of maximum quantity that can be sourced from any single supplier. If the lowest quoting 'Class-I local supplier', does not qualify for purchase preference because of aforesaid constraints or does not accept the offered quantity, an opportunity may be given to next higher 'Class-I local supplier', falling within 20% margin of purchase preference, and so on.
- e. To avoid any ambiguity during bid evaluation process, the procuring entities may stipulate its own tender specific criteria for award of contract amongst different bidders including the procedure for purchase preference to 'Class-I local supplier' within the broad policy guidelines stipulated in sub- paras above.

4. **Exemption of small purchases:** Notwithstanding anything contained in paragraph 3, procurement where the estimated value to be procured is less than Rs. 5 lakhs shall be exempt from this Order. However, it shall be ensured by procuring entities that procurement is not split for the purpose of avoiding the provisions of this Order.

4A. Exemption in sourcing of spares and consumables of closed systems:

Procurement of spare parts, consumables for closed systems and Maintenance/Service contracts with Original Equipment Manufacturer/Original Equipment Supplier/Original Part Manufacturer shall be exempted from this Order.

5. **Minimum local content:** The 'local content' requirement to categorize a supplier as 'Class-I local supplier' is minimum 50%. For 'Class-II local supplier', the 'local content' requirement is minimum 20%. Nodal Ministry/ Department may prescribe only a higher percentage of minimum local content requirement to categorize a supplier as 'Class-I local supplier'/'Class- II local supplier'. For the items, for which Nodal Ministry/ Department has not prescribed higher minimum local content notification under the Order, it shall be 50% and 20% for 'Class-I local supplier'/'Class-II local supplier' respectively.
6. **Margin of Purchase Preference:** The margin of purchase preference shall be 20%.
7. **Requirement for specification in advance:** The minimum local content, the margin of purchase preference and the procedure for preference to Make in India shall be specified in the notice inviting tenders or other form of procurement solicitation and shall not be varied during a particular procurement transaction.
8. **Government E-marketplace:** In respect of procurement through the Government E-marketplace (GeM) shall, as far as possible, specifically mark the items which meet the minimum local content while registering the item for

Page 5 of 10

✓



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

display, and shall, wherever feasible, make provision for automated comparison with purchase preference and without purchase preference and for obtaining consent of the local supplier in those cases where purchase preference is to be exercised.

9. Verification of local content:

- a. The 'Class-I local supplier'/'Class-II local supplier' at the time of tender, bidding or solicitation shall be required to indicate percentage of local content and provide self-certification that the item offered meets the local content requirement for 'Class-I local supplier'/'Class-II local supplier', as the case may be. They shall also give details of the location(s) at which the local value addition is made.
- b. In cases of procurement for a value in excess of Rs. 10 crores, the 'Class-I local supplier'/'Class-II local supplier' shall be required to provide a certificate from the statutory auditor or cost auditor of the company (In the case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) giving the percentage of local content.
- c. The bidder shall give self-certification for local content in the quoted item (goods/works/services) at the time of tendering. However, at the time of execution of the project, for all contracts above INR 10 Crore, the contractor/ supplier shall be required to give local content certification duly certified by cost/ chartered accountant in practice. For cases where it is not possible to provide certification by Cost/Chartered Accountant at the time of execution of project, the supplier shall be permitted to provide the certificate for local content from Cost/ Chartered Accountant after completion of the contract, within time limit acceptable to the procuring entity. In case the contractor/ supplier does not meet the stipulated local content requirement and the category of the supplier changes from Class-I to Class-II/ Non-local or from Class-II to Non-local, a penalty upto 10% of the contract value may be imposed. However, contract once awarded shall not be terminated on this account.
- d. Decisions on complaints relating to implementation of this Order shall be taken by the competent authority which is empowered to look into procurement-related complaints relating to the procuring entity.
- e. Nodal Ministries may constitute committees with internal and external experts for independent verification of self-declarations and auditor's/ accountant's certificates on random basis and in the case of complaints.
- f. Nodal Ministries and procuring entities may prescribe fees for such complaints.
- g. False declarations will be in breach of the Code of Integrity under Rule 175(1)(i)(h) of the General Financial Rules for which a bidder or its successors can be debarred for up to two years as per Rule 151 (iii) of the General Financial Rules along with such other actions as may be permissible under law.
- h. A supplier who has been debarred by any procuring entity for violation of this Order shall not be eligible for preference under this Order for procurement by any other procuring entity for the duration of the debarment. The debarment for such other procuring entities shall take effect prospectively from the date on which it comes to the notice of other procurement entities, in the manner prescribed under paragraph 9



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

i below.

- i. The Department of Expenditure shall issue suitable instructions for the effective and smooth operation of this process, so that:
 - i. The fact and duration of debarment for violation of this Order by any procuring entity are promptly brought to the notice of the Member-Convenor of the Standing Committee and the Department of Expenditure through the concerned Ministry /Department or in some other manner;
 - ii. On a periodical basis such cases are consolidated and a centralized list or decentralized lists of such suppliers with the period of debarment is maintained and displayed on website(s);
 - iii. In respect of procuring entities other than the one which has carried out the debarment, the debarment takes effect prospectively from the date of uploading on the website(s) in the such a manner that ongoing procurement are not disrupted.

10. Specifications in Tenders and other procurement solicitations:

- a. Every procuring entity shall ensure that the eligibility conditions in respect of previous experience fixed in any tender or solicitation do not require proof of supply in other countries or proof of exports.
- b. Procuring entities shall endeavour to see that eligibility conditions, including on matters like turnover, production capability and financial strength do not result in unreasonable exclusion of 'Class-I local supplier' / 'Class-II local supplier' who would otherwise be eligible, beyond what is essential for ensuring quality or creditworthiness of the supplier.
- c. Procuring entities shall, within 2 months of the issue of this Order review all existing eligibility norms and conditions with reference to subparagraphs 'a' and 'b' above.

d. Reciprocity Clause

- i. When a Nodal Ministry/Department identifies that Indian suppliers of an item are not allowed to participate and/ or compete in procurement by any foreign government, due to restrictive tender conditions which have direct or indirect effect of barring Indian companies such as registration in the procuring country, execution of projects of specific value in the procuring country etc., it shall provide such details to all its procuring entities including CMDs/CEOs of PSEs/PSUs, State Governments and other procurement agencies under their administrative control and GeM for appropriate reciprocal action.
 - ii. Entities of countries which have been identified by the nodal Ministry/Department as not allowing Indian companies to participate in their Government procurement for any item related to that nodal Ministry shall not be allowed to participate in Government procurement in India for all items related to that nodal Ministry/ Department, except for the list of items published by the Ministry/ Department permitting their participation.
 - iii. The stipulation in (ii) above shall be part of all tenders invited by the Central Government procuring entities stated in (i) above. All purchases on GeM shall also necessarily have the above provisions for items identified by nodal Ministry/ Department.
 - iv. State Governments should be encouraged to incorporate similar provisions in their respective tenders.
 - v. The term 'entity' of a country shall have the same meaning as under the FDI Policy of DPIIT as amended from time to time.
- a. Specifying foreign certifications/ unreasonable technical specifications/



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

brands/ models in the bid document is restrictive and discriminatory practice against local suppliers. If foreign certification is required to be stipulated because of non-availability of Indian Standards and/or for any other reason, the same shall be done only after written approval of Secretary of the Department concerned or any other Authority having been designated such power by the Secretary of the Department concerned.

- f. "All administrative Ministries/Departments whose procurement exceeds Rs. 1000 Crore per annum shall notify/update their procurement projections every year, including those of the PSEs/PSUs, for the next 5 years on their respective website."

10A. Action for non-compliance of the Provisions of the Order: In case restrictive or discriminatory conditions against domestic suppliers are included in bid documents, an inquiry shall be conducted by the Administrative Department undertaking the procurement (including procurement by any entity under its administrative control) to fix responsibility for the same. Thereafter, appropriate action, administrative or otherwise, shall be taken against erring officials of procurement entities under relevant provisions. Intimation on all such actions shall be sent to the Standing Committee.

11. **Assessment of supply base by Nodal Ministries:** The Nodal Ministry shall keep in view the domestic manufacturing / supply base and assess the available capacity and the extent of local competition while identifying items and prescribing the higher minimum local content or the manner of its calculation, with a view to avoiding cost increase from the operation of this Order.
12. **Increase in minimum local content:** The Nodal Ministry may annually review the local content requirements with a view to increasing them, subject to availability of sufficient local competition with adequate quality.
13. **Manufacture under license/ technology collaboration agreements with phased indigenization:** While notifying the minimum local content, Nodal Ministries may make special provisions for exempting suppliers from meeting the stipulated local content if the product is being manufactured in India under a license from a foreign manufacturer who holds intellectual property rights and where there is a technology collaboration agreement / transfer of technology agreement for indigenous manufacture of a product developed abroad with clear phasing of increase in local content.

13A. In procurement of all goods, services or works in respect of which there is substantial quantity of public procurement and for which the nodal ministry has not notified that there is sufficient local capacity and local competition, the concerned nodal ministry shall notify an upper threshold value of procurement beyond which foreign companies shall enter into a joint venture with an Indian company to participate in the tender. Procuring entities, while procuring such items beyond the notified threshold value, shall prescribe in their respective tenders that foreign companies may enter into a joint venture with an Indian company to participate in the tender. The procuring Ministries/Departments shall also make special provisions for exempting such joint ventures from meeting the stipulated minimum local content requirement, which shall be increased in a phased manner.

14. **Powers to grant exemption and to reduce minimum local content:** The administrative Department undertaking the procurement (including

Page 8 of 10

2



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

procurement by any entity under its administrative control), with the approval of their Minister-in-charge, may by written order, for reasons to be recorded in writing,

- a. reduce the minimum local content below the prescribed level; or
- b. reduce the margin of purchase preference below 20%; or
- c. exempt any particular item or supplying entities from the operation of this Order or any part of the Order.

The Administrative Department, while seeking exemption under this para, shall certify that such an item(s) has not been notified by Nodal Ministry/ Department concerned under para 3 (a) of the Order.

A copy of every such order shall be provided to the Standing Committee and concerned Nodal Ministry / Department. The Nodal Ministry / Department concerned will continue to have the power to vary its notification on Minimum Local Content.

15. **Directions to Government companies:** In respect of Government companies and other procuring entities not governed by the General Financial Rules, the administrative Ministry or Department shall issue policy directions requiring compliance with this Order.
16. **Standing Committee:** A standing committee is hereby constituted with the following membership:
Secretary, Department for Promotion of Industry and Internal Trade - Chairman
Secretary, Commerce—Member
Secretary, Ministry of Electronics and Information Technology—Member Joint
Secretary (Public Procurement), Department of Expenditure—Member Joint
Secretary (DPIT)—Member-Convenor

The Secretary of the Department concerned with a particular item shall be a member in respect of issues relating to such item. The Chairman of the Committee may co-opt technical experts as relevant to any issue or class of issues under its consideration.

17. **Functions of the Standing Committee:** The Standing Committee shall meet as often as necessary, but not less than once in six months. The Committee
 - a. shall oversee the implementation of this order and issues arising therefrom, and make recommendations to Nodal Ministries and procuring entities.
 - b. shall annually assess and periodically monitor compliance with this Order
 - c. shall identify Nodal Ministries and the allocation of items among them for issue of notifications on minimum local content
 - d. may require furnishing of details or returns regarding compliance with this Order and related matters
 - e. may, during the annual review or otherwise, assess issues, if any, where it is felt that the manner of implementation of the order results in any restrictive practices, cartelization or increase in public expenditure and suggest remedial measures
 - f. may examine cases covered by paragraph 13 above relating to manufacture under license/ technology transfer agreements with a view to satisfying itself that adequate mechanisms exist for enforcement of such agreements and for attaining the underlying objective of progressive indigenization



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

g. may consider any other issue relating to this Order which may arise.

18. **Removal of difficulties:** Ministries /Departments and the Boards of Directors of Government companies may issue such clarifications and instructions as may be necessary for the removal of any difficulties arising in the implementation of this Order.

19. **Ministries having existing policies:** Where any Ministry or Department has its own policy for preference to local content approved by the Cabinet after 1st January 2015, such policies will prevail over the provisions of this Order. All other existing orders on preference to local content shall be reviewed by the Nodal Ministries and revised as needed to conform to this Order, within two months of the issue of this Order.

20. **Transitional provision:** This Order shall not apply to any tender or procurement for which notice inviting tender or other form of procurement solicitation has been issued before the issue of this Order.

(Himani Pande)
Additional Secretary to the Government of India
Tel: 011-23038888
E-mail: ashp.dpiit@gov.in



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

No.F.1/4/2021-PPD
Government of India
Ministry of Finance
Department of Expenditure
Public Procurement Division

264-C, North Block, New Delhi.
18.05.2023.

OFFICE MEMORANDUM

Subject: Concurrent application of Public Procurement Policy for Micro and Small Enterprises Order, 2012 and Public Procurement (Preference to Make in India) Order, 2017.

The undersigned is directed to refer two Preferential Procurement Orders mandated for the Public Procurement in India, namely:

- i. Public Procurement Policy for Micro and Small Enterprises (MSEs) Order dated 23.03.2012 (PPP-MSE Order) issued by Ministry of Micro, Small and Medium Enterprises (MoMSME) in exercise of the powers conferred in Section 11 of the MSME Development Act, 2006. (Last revised on 09.11.2018)
- ii. Public Procurement (Preference to Make in India) Order, 2017 (PPP-MII order), under Rule 153(iii) of the General Financial Rules (GFRs) 2017, approved by the Cabinet. Implementation of this PPP-MII order is monitored by Department for Promotion of Industry and Internal Trade (DPIIT). (Last revised on 16.09.2020.)

2. It has been brought to the notice of this Department that concurrent application of these two orders are creating confusion to the procuring entities and different procuring entities interpret them differently. In order to bring predictability both to the procuring entities as well as bidders, following guidelines are being issued.

Guidelines

3. The Class-I local suppliers, under PPP-MII Order, participating in any government tender, may or may not be MSEs, as defined under the MSME Act. Similarly, MSEs participating in any government tender, may or may not be Class-I local suppliers. Suppliers may be categorised in following four broad categories for consideration or applicability of purchase preference:

Category	Terminology
Supplier is both MSE & Class-I local supplier.	"MSE Class-I local supplier"
Supplier is MSE but not Class-I local supplier.	"MSE but non-Class-I local supplier"
Supplier is not MSE but is Class-I local supplier.	"Non-MSE but Class-I local supplier"
Supplier is neither MSE nor Class-I local.	"Non-MSE non-Class-I local supplier"



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

above" as per PPP- MII Order. For the balance quantity, contract is to be awarded to L-1 bidder. (Kindly refer to the illustrative example in the annexure).

c (b) Items covered under Para 3A(c) of PPP-MII Order, 2017 are non-divisible items and both MSEs as well as Class-I local suppliers are eligible for purchase preference. Possible scenarios can be as under:

- (i) L-1 is "MSE Class-I local supplier" - Contract is awarded to L-1.
- (ii) L-1 is not "MSE Class-I local supplier" but the "MSE Class-I local supplier" falls within 15% margin of purchase preference - Purchase preference is to be given to lowest quoting "MSE Class-I local supplier". If lowest quoting "MSE Class-I local supplier" does not accept the L-1 rates, the next higher "MSE Class-I local supplier" falling within 15% margin of purchase preference is to be given purchase preference and so on.
- (iii) If conditions mentioned in sub paras (i) and (ii) above are not met i.e. L-1 is neither "MSE Class-I local supplier" nor "MSE Class-I local supplier" is eligible to take benefit of purchase preference, the contract is to be awarded/ purchase preference to be given in different possible scenarios as under:
 - A. L1 is "MSE but non-Class-I local supplier" or "Non-MSE but Class-I local supplier" – Contract is awarded to L1.
 - B. L1 is "Non-MSE non-Class-I local supplier" - First purchase preference to be given to MSE as per PPP-MSE Order. If MSE not eligible/ does not accept - purchase preference to be given to Class- I Local supplier as per PPP-MII Order. If Class-I Local supplier also not eligible/ does not accept – contract to be awarded to L-1.

- d) *Items reserved for both MSEs and Class-I local suppliers:* These items are reserved exclusively for purchase from MSEs as well as Class-I local suppliers. Hence, only "MSE Class-I local supplier" are eligible to bid for these items. Non-MSEs/Class-II local suppliers/ Non-local suppliers cannot bid for these items. Hence the question of purchase preference does not arise.
- e) Non-local suppliers, including MSEs falling in the category of Non-local suppliers, shall be eligible to bid only against Global Tender Enquiry.

(Signature)
(Kanwalpreet)
Director

Tel.: -223093811; email: - kanwal.irss@gov.in

To

1. Secretaries of all Central Government Ministries/ Departments.
2. Secretary Department of Public Enterprises with a request for issuing suitable instructions to all Central Public Sector Enterprises in this regard.

Page 3 of 4



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

Annexure

Example explaining applicability in scenario explained in para 4 c (a)(iv)

(Scenario: Divisible items, both MSEs as well as Class-I local suppliers eligible for purchase preference and L-1 is "Non-MSE non-Class-I local supplier")

Item – Desktop computer

Qty – 50 Nos.

Details of bids received

Sr. No.	Name of bidder	Rates quoted	Price Ranking	Status of bidder
1.	A	100	L1	"Non-MSE non- Class-I local supplier"
2.	B	110	L2	"Non-MSE but Class-I local supplier"
3.	C	112	L3	"MSE but non- Class-I local supplier"
4.	D	115	L4	"Non-MSE but Class-I local supplier"
5.	E	118	L5	"MSE but non- Class-I local supplier"
6.	F	120	L6	"MSE Class-I local supplier"

1. In this case, first purchase preference is to be given to MSEs as per PPP-MSE Order for 25% of tendered quantity of 50 Nos. i.e. 12.5 Nos. (rounded off to the next whole number say 13 Nos). Accordingly, invite L3 (bidder C), whose quoted rates falls within 15% margin of purchase preference to match L1 price i.e. Rs. 100/- for quantity of 13 Nos. Bidder "E" and "F", although MSEs, will not get purchase preference since their quoted rates don't fall within 15% margin of purchase preference. Bidder C will be considered for order of 13 Nos. on confirmation of reduction of price.
2. For 50% of balance quantity of 37 number (tendered quantity of 50 – 13 awarded to bidder C; assuming bidder C has confirmed to accept L1 rates), purchase preference will be given to lowest Class-I local supplier as per PPP-MII Order. Accordingly, bidder B will be invited to match L-1 price for 50% of 37 Nos i.e. 18.5 (say 19 Nos of computers). If bidder "B" does not accept the L1 price i.e. price of Rs. 100/- per unit, next higher Class-I local supplier falling within 20% margin of purchase preference, i.e. bidder "D", may be invited to match L-1 price for 19 Nos. of computers and so on.
3. For remaining quantity i.e. 18 Nos (50-13-19), the contract will be awarded to lowest quoting bidder i.e. Bidder "A", who is L-1 in the example.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

File No: FP-20013/2/2017-FP-PNG-Part (4) (E-41432)

Government of India

**Ministry of Petroleum and Natural Gas
(Flagship Programme Cell)**

Shastri Bhawan, New Delhi

Dated 26th April, 2022

To,

1. Chairman, IOCL
2. C&MD, BPCL/ HPCL/ ONGC/ OIL/ GAIL/ EIL/ Balmer Lawrie
3. Managing Director, MRPL/NRL/CPCL// BCPL/ OVL
4. DG, DGH
5. DG, PPAC
6. Secretary, OIDB
7. ED, PCRA
8. ED, OISD
9. ED, CHT
10. Director, RGIPT
11. Secretary, PNGRB
12. CEO & MD, ISPRL

Sub: Public Procurement (Preference to Make in India) (PPP-MII) Order, 2017-reg.

Sir/Madam,

I am directed to refer to this Ministry's letter of even number dated 23.02.2022 regarding Policy to Provide Purchase Preference (linked with local content) (PP-LC) in all Public Sector Undertakings under the Ministry of Petroleum and Natural Gas (MoP&NG) and to say that Public Procurement (Preference to Make in India) Order, 2017 issued by DPIIT and as amended time to time shall be applicable to all the Public Sector Undertakings and their wholly owned subsidiaries under MoP&NG; Joint Ventures that have 51% or more equity by one or more Public Sector Undertakings under MoP&NG; attached and subordinate offices of MoPNG w.e.f. 01.04.2022.

2. Moreover, as per para 14 of the PPP-MII Order, the following modifications in the order shall be applicable on the procuring entities under this Ministry:

- a. Limit for exemption of small purchase under para 4 of the PPP-MII Order, 2017 shall be Rs. 1 crore.
- b. Local value addition through services such as transportation, insurance, installation, commissioning, training and after sales services support like AMC/ CMC etc. shall continue to be considered in local content calculation.
- c. HP-HT operations in upstream oil and gas business activities shall be exempted from applicability of the Order.

3. This issues with the approval of Hon'ble Minister, Petroleum and Natural Gas.

Yours faithfully

(Santanu Dhar)

Under Secretary to the Govt. of India
Tel.: 011-23388652

Copy to:

- a. PS to Minister, PNG
- b. PPS/ PS to Secretary/ AS&FA/ Sr. Economic Advisor, MoPNG
- c. PPS/ PS to AS (E)/ JS(R)/ JS (M& GP)/ OSD (IC)/ JS (G)/ JS (IFD)/ DDG (ED), MoPNG
- d. PPS/PS to Dir.(BR)/Dir.(E-II)/Dir.(E-I)/DS(GP)/DS(Mkt.)/DS(LPG)/DS(Admn.)/DS(RTI)/ DS (Gen) MoPNG

Copy for information to:



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

Items specifically to be used in flammable environment of oil and gas process industry in which value addition through services such as transportation, insurance installation, commissioning, training and after sales service support like AMC/CMC shall be continued to be conserved while computing Local Content:

Sl.	Items Category of procurement
1	Instrumentation items like DCS/ ESD/ PLC, Emission Monitoring System, Machine Monitoring System, Condition Monitoring System, Fire Detection & Alarm System, Gas & Liquid Metering Systems, Mass Flow Meter, Process Analysers, Ultrasonic flowmeter, Anti surge & Governor Control system, Master control station for MOVs, Actuators, Transmitters, Radar gauges, multi-spot temperature sensors, Batch Controller unit, Additive blocks, Hydrocarbon detectors, Field instruments like Radar Gauges, Nucleonic gauges, Servo level gauging, Hydrastep, SMART Positioner in control valves, Multi point Reactor Thermocouple, Flame scanner, Viscosity cum Density meter, High Pressure/Temperature Special type valves, IS Test Equipment, Flare flow meter, Tank Farm Management System, Loading Automation System, Gas Detection System, Corrosion Monitoring System, Wireless Instrumentation, Surge Relief Valve Skid, Meter Provers, Pipeline Leak detection system (Negative Pressure wave type) etc
2	Equipment involved in drilling, completion, testing and production of oil and gas wells, Electronic carousel, Safety Relief valves, Compressors, turbines and blowers, heat ejectors, exchangers, condensers where SITC and / Expert Supervisory Services are involved, Equipment for which Life Cycle cost evaluation is done considering AMC/CAMC etc.
3	Electrical Equipment like Flameproof Plant Communication system, GIS (Gas Insulated Switchgear), Numerical Relays, Flameproof and/or explosion proof CCTV, Synchronous Machines, TETRA System etc
4	Laboratory and R&D Equipment like Gas Chromatographs, Spectrometers, Analytical equipment, Automatic liquid sampler, Dry colorimetric (tape) detectors; Mercury Free PVT Equipment; HT-HP Corrosion cell; Wheel Test Machine; Atmospheric and HT-HP- Consistometer; Ultra Sonic Cement Analyzer / HT-Ultra Sonic Cement Analyzer; Compressive strength tester; Stirred fluid loss apparatus; Total Sulfur analyzer; Colony counter; Laminar flow systems; Microscope with digital camera; Anaerobic Chamber; RockEval; TOC analyser; Simdist analyser; Cold Finger test apparatus; Microcoulometer; Atomic Absorption Spectrometer; High Performance Ion Chromatograph; Permeameter; Helium Porosimeter; Laser Scattering Particle Size Distribution Analyser; Microscope high magnification; Flame Photometer; U.V.- Visible Spectrophotometers; EP Lube tester; Differential sticking tester; Electrical stability Meter; Stemi-2000 microscope/ equivalent; Core Gama Logger; Energy Dispersive Spectrometer; Thin Section Machine; X-Ray Diffractometer; Wettability tester; Ambient Resistivity System; Fluorescope; Spin Drop Tensiometer; Fluid Eval; Mercury Inclusion Porosity meter; Tri-Axial test machine; Smoke point detector; Vitrinite Reflectance VRo Microscope; Curing Chamber/ HT curing chamber; Source Rock Pyrolyser with Sulphur/ without sulphur; NGA Gas Analyzer Flash Point Apparatus/ automatic; Compressive Strength Analyser; HT-HP Curing Chamber; Crush resistance test equipment; Manual Dry bath pore point Apparatus; Bench Type Dissolved Oxygen meter; Bench Type GRAIN Moisture meter; Rotational Viscometer; Capillary pressure instrument; Core Plugging Machine; Core Trimming machine; HP-HT filter press; BENCH TOP DENSITY METER; HP-HT ROLLER OVEN with AGING CELLS; Crude Oil Analyser; Static Gel Strength analyser; Oilwell cement Mechanical properties analyser; Poroperm; Acoustic velocity system; Auto Saturator; Porosimeter cum permeameter; Rock Testing System; Auto Core Saturator; Auto Imbibimeter for reverse permeability; Proppant Conductivity Tester etc



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

5	Pipeline Intrusion and Detection System (PIDS), SCADA & APPS system; Rim seal protection system, Chemical Treatment program which involves supply of Process chemicals, Dosing & monitoring the parameters etc
6	Geophysical Services Seismic Data Acquisition System; VSP Data Acquisition System; Field Processing Unit; Geophysical equipment (non-Seismic including Gravity Magnetic, MT, EM etc.); Seismic Data Processing Software ; Seismic Data Interpretation Software ; Hydrocarbon Reservoir Software ; Seismic Data Archival Software ; Petro -Physical Software
7	Geophysical Equipment Field Processing Unit, Global Navigation Satellite System, Specialised Geological Lab Equipment, Seismic Data Acquisition System, Seismic Data Processing/ Imaging Software, Tape Drive Unit, VSP Data Acquisition System, VSP Processing Software; High-End Servers for G&G Applications. HPCC Solution; Virtualization and Container Software
8	Logging Services Logging unit, equipment and tools rated for hostile HPHT environment (Temperature > 300°F & Pressure > 10,000 psi).



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



FORM-1

**SELF CERTIFICATION BY BIDDER WHO CLASS-I LOCAL SUPPLIER/ CLASS-II LO-
CAL SUPPLIER TOWARDS MANDATORY MINIMUM LOCAL CONTENT/ DOMESTIC
VALUE ADDITION
(APPLICABLE FOR ALL BIDDERS INCLUDING MSEs)**

To,

M/s GAIL (INDIA) LIMITED

SUB:

TENDER NO:

Dear Sir

We, M/s _____ (*Name of Bidder*) confirm that as per the definition of policy we are:

Class-I Local supplier []

Class-II Local Supplier []

(Bidder is to tick appropriate option (✓) above).

It is further confirm that M/s _____ (*Name of Bidder*) meet the mandatory minimum Local content/Domestic Value Addition requirement for Class-I Local supplier/ Class-II Local supplier (as the case may be) under Public Procurement (Preference to Make in India), Order 2017 (PPP-MII) and has value addition of%.

The details of the location (s) at which the local value addition is made is as under:

.....
.....
.....

We further confirm that in case we fail to meet the minimum local content/domestic value addition, the same shall be treated false information and GAIL will take action as per provision of tender document.

Place:

Date:

[Signature of Authorized Signatory of Bidder]

Name:

Designation:

Seal:



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



FORM-2

**CERTIFICATE BY STATUTORY AUDITOR/COST AUDITOR/ CHARTERED ACCOUNT-
ANT OF BIDDER TOWARDS MANDATORY MINIMUM LOCAL CONTENT/ DOMESTIC
VALUE ADDITION (IN CASE BIDDER IS CLASS-I LOCAL SUPPLIER/ CLASS-II LOCAL
SUPPLIER)**

NOT APPLICABLE



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Annexure-VI to Section-III

Third Party Deposit Confirmation Letter

Date: _ _ / _ _ / _ _

To,

GAIL (India) Limited,

.....

Dear Sir/ Madam

Sb: Issuance of Cumulative FDR..... amounting to ₹.....valid till.....

It is hereby certified that Cumulative Fixed Deposit Receipt (FDR) bearing number.....dated..... amounting to ₹..... (Amount in figure and words) has been issued by (Name of the Bank) branch address..... The maturity value is ₹..... on dated.....

This FDR has been issued on the request of M/s.....(Name of the contractor) under the PO no. / W.O. No/Tender no.....This FDR can be encashed/ redeemed without any consent/ letter from the contractor M/s.....(Name of the contractor) on the demand by M/s GAIL (India) Limited and the payment will be made to M/s GAIL (India) Limited excluding the interest earned thereon. The Contractor cannot encash/ premature above FDR unless above original FDR is accompanied by the discharge letter/NOC/approval of GAIL.

If the FDR is not withdrawn, till date of maturity, it may be renewed or treated as instructed by the Contractor & GAIL for renewal.

This FDR has been issued by authorized signatory of the Bank.

For or on behalf of..... [Name of the Bank & Branch details (Including IFS Code)]

Signature.....

Name:.....

Designation:.....

Contact no.

Email Id.

Stamp of Bank.....

Note:

- (i) This letter forms an integrated part of FDR**
- (ii) In case confirmation is required, the communication can be send to the following:**
Details for confirmations (including Address, Email Id, IFS Code and contact no.)



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



FORMS & FORMAT



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

LIST OF FORMS & FORMAT

Form No.	Description
F-1	BIDDER'S GENERAL INFORMATION
F-1A	ANNEXURE TO BIDDER'S GENERAL INFORMATION
F-2	PROFORMA OF "BANK GUARANTEE" FOR "EARNEST MONEY "
F-2A	PROFORMA OF DECLARATION FOR BID SECURITY
F-3	LETTER OF AUTHORITY
F-4	PROFORMA OF "BANK GUARANTEE" FOR "CONTRACT PERFORMANCE SECURITY / SECURITY DEPOSIT"
F-5	AGREED TERMS & CONDITIONS
F-6	ACKNOWLEDGEMENT CUM CONSENT LETTER
F-7	BIDDER'S EXPERIENCE
F-8	CHECK LIST
F-8B	CHECK LIST FOR BID EVALUATION CRITERIA (BEC) QUALIFYING DOCUMENTS
F-9	FORMAT FOR CERTIFICATE FROM BANK IF BIDDER'S WORKING CAPITAL IS INADEQUATE
F-10	FORMAT FOR CHARTERED ACCOUNTANT CERTIFICATE FOR FINANCIAL CAPABILITY OF THE BIDDER
F-11	FORMAT FOR CONSORTIUM/JV AGREEMENT
F-12	BIDDER'S QUERIES FOR PRE BID MEETING
F-13	REAL TIME GROSS SETTLEMENT (RTGS) / NATIONAL ELECTRONIC FUNDS TRANSFER (NEFT) MANDATE FORM
F-14	INTEGRITY PACT
F-15	INDEMNITY BOND
F-16	FREQUENTLY ASKED QUESTIONS (FAQs)
F-17	UNDERTAKING REGARDING SUBMISSION OF ELECTRONIC INVOICE (E-INVOICE AS PER GST LAWS)



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

F-18	FORMAT FOR NO CLAIM CERTIFICATE FOR RELEASE OF CPS/SECURITY DEPOSIT
F-19	PROFORMA OF "INSURANCE SURETY BOND" FOR "EARNEST MONEY DEPOSIT/ BID SECURITY "
F-20	PROFORMA OF "INSURANCE SURETY BOND" FOR "CONTRACT PERFORMANCE SECURITY/SECURITY DEPOSIT"



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

F-1

BIDDER'S GENERAL INFORMATION

To,
M/s GAIL (INDIA) LIMITED

TENDER NO: _____

1	Bidder Name	M/s.....
2	Status of Firm	Proprietorship Firm/Partnership firm/ Limited Liability Partnership (LLP) firm/Public Limited/ Pvt. Limited/ Govt. Dept. / PSU/ Others If Others Specify: _____ [Enclose relevant certificates / partnership deed/certificate of Registration, as applicable]
3a	Name of Proprietor/ Partners/ Directors of the firm/company including their Father's Name and residential address, Aadhar No., Pan Card Details & DIN Nos. [As per clause for 'One Bid Per Bidder' under Section-III of Tender Document] If required, a separate sheet may be enclosed for providing the above details.	
3b	Name of Power of Attorney holders of bidder	
4	Number of Years in Operation	
5	Address of Registered Office:	
		City:
		District:
		State:
		PIN/ZIP:
	Bidder's address where order/contract	



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

6	is to be placed	City:
		District:
		State:
		PIN/ZIP:
7	Office responsible for executing the contract with GST no. * (In case supply of works are from multiple locations, addresses and GST no. of all such locations are to be provided).	City: District: State: PIN/ZIP: GST No.:
8	Telephone Number/ Mobile no. of address where order is to be placed	(Country Code) (Area Code) (Telephone No.)
9	E-mail address	
10	Website	
11	Mobile Number:	
12	ISO Certification, if any	{If yes, please furnish details}
13	PAN No.	
14	GST No. (refer sl. no. 7 above)	
15	EPF Registration No.	
16	ESI code No.	
17	Whether Micro or Small Enterprise	Yes / No (If Yes, Bidder to submit requisite documents as specified in ITB: Clause No. 40)
	Whether MSE is owned by SC/ST Entrepreneur(s)	Yes / No (If Yes, Bidder to submit requisite documents as specified in ITB: Clause No. 40)
	Whether MSE is owned by Women	Yes / No (If Yes, Bidder to submit requisite documents as specified in ITB: Clause No. 40)
	Details of registration in TReDS	Yes / No If Yes, please provide the name of portal



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

18	Whether Bidder is Startups or not	Yes / No (If Yes, Bidder to submit requisite documents as specified in ITB: Clause No.50)
	In case of Start-up confirm the following: (i) Date of its incorporation/ registration [The certificate shall only be valid for the entity upto ten years from the date of its incorporation/ registration] (ii) Whether turnover for any financial years since incorporation/ registration has exceed Rs.100 Crores.	

Note: * GAIL intent to place the contract directly on the address from where Works are to be supplied. In case, bidder wants contract at some other address or Works are to be supplied from multiple locations, bidder is required to provide in their bid, the address on which contract is to be placed.

Place:
Date:

[Signature of Authorized Signatory of Bidder]
Name:
Designation:
Seal:



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



F-1(A)

Annexure to Bidder's General Information

To,
M/s GAIL (INDIA) LIMITED

Tender No. :
Tender Subject :
Name of Bidder :

Sl. No.	Name of Proprietor/ Partners/ Directors	Father's Name	Residential Address	Aadhar No.	Pan Card Details	DIN Nos. (if applicable)

Note: The corresponding documents i.e. Aadhar, PAN & DIN etc. are also to be provided

duly attested by Notary Public.

Place: [Signature of Authorized Signatory of Bidder]

Date: Name:

Designation:

Seal:



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

FORMAT F-2

**PROFORMA OF "BANK GUARANTEE"
FOR "EARNEST MONEY / BID SECURITY"**

(To be stamped in accordance with the Stamp Act)

To, M/s GAIL (India) Limited _____	Bank Guarantee No.	
	Date of BG	
	BG Valid up to	
	Claim period up to (There should be three months gap between expiry date of BG & Claim period)	
	Stamp Sl. No./e-Stamp Certificate No.	

Dear Sir(s),

In accordance with Tender Document under your reference No _____ M/s. _____ having their Registered / Head Office at _____ (hereinafter called the Tenderer/Bidder), wish to participate in the said tender for _____

As an irrevocable Bank Guarantee against Earnest Money Deposit for the amount of _____ is required to be submitted by the bidder as a condition precedent for participation in the said Tender Document which amount is liable to be forfeited on the happening of any contingencies mentioned in the Tender Document.

We, the _____ Bank at _____ having our Head Office _____ (Local Address) and having net worth more than Rs. 100,00,00,000.00 [Rupees One Hundred Crores] or its equivalent in foreign currency, guarantee and undertake to pay immediately on demand without any recourse to the Bidder by GAIL (India) Ltd., the amount _____ without any reservation, protest, demur and recourse. Any such demand made by GAIL (India) Ltd., shall be conclusive and binding on us irrespective of any dispute or difference raised by the Bidder.

This guarantee shall be irrevocable and shall remain valid up to _____ [this date should be two (02) months beyond the validity of the bid]. If any further extension of this guarantee is required, the same shall be extended to such required period on receiving instructions from Bidder M/s. _____ on whose behalf this guarantee is issued.

Notwithstanding anything contained herein:



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

a) The Bank's liability under this Guarantee shall not exceed (currency in figures)
(currency in words only)

b) This Guarantee shall remain in force upto _____ (this expiry date of BG should be two months beyond the validity of bid) and any extension(s) thereof; and

c) The Bank shall be released and discharged from all liability under this Guarantee unless a written claim or demand is issued to the Bank on or before the midnight of(indicate date of expiry of claim period which includes minimum three months from the expiry of this Bank Guarantee) and if extended, the date of expiry of the last extension of this Guarantee. If a claim has been received by us within the said date, all the rights of GAIL under this Guarantee shall be valid and shall not cease until we have satisfied that claim.

The Bank doth hereby declare that Shri /Ms. _____ who is the _____ (designation) of the Bank is authorized to sign this undertaking on behalf of the Bank and to bind the Bank thereby.

In witness whereof the Bank, through its authorized officer, has set its hand and stamp on this _____ day of _____ 20__ at _____.

Details of next Higher Authority of the Officials who have issued the Bank Guarantee:

Name

Designation

WITNESS:

(SIGNATURE)
(NAME)

(SIGNATURE)
(NAME)

Designation with Bank Stamp
E-Mail ID:
Telephone/Mobile No. :
Date:

(OFFICIAL ADDRESS)

Confirmation Email Id :

IFSC Code of Issuing Bank :



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

**INSTRUCTIONS FOR FURNISHING "BID SECURITY / EARNEST MONEY" BY "BANK
GUARANTEE"**

1. The Bank Guarantee by Bidders will be given on non-judicial stamp paper as per "Stamp Duty" applicable. The non-judicial stamp paper should be in the name of the issuing Bank.
2. The expiry date should be arrived at in accordance with "ITB: Clause-16.1".
3. The Bank Guarantee by bidders will be given from Bank as specified in "ITB: Clause-16.3".
4. A letter from the issuing Bank of the requisite Bank Guarantee confirming that said Bank Guarantee / all future communication relating to the Bank Guarantee shall be forwarded to the Purchaser at its address as mentioned at "ITB".
5. Bidder must indicate the full postal address of the Bank along with the Bank's E-mail / Fax / Phone from where the Bank Guarantee has been issued at sl.no.2 of Form F-5.
6. In case BG is issued directly by a bank outside India (if allowed), it should be executed on Letter Head of the Bank and should be advised and made payable through their Indian Branch/Corresponding Bank in India (Applicable for ICB tender)

**MATTER TO BE MENTIONED IN COVERING LETTER TO BE SUBMITTED BY
VENDOR ALONG WITH BANK GUARANTEE**

1	BANK GUARANTEE NO	:				
2	VENDOR NAME / VENDOR CODE	:	NAME			
			VENDOR CODE			
3	BANK GUARANTEE AMOUNT	:				
4	TENDER NO	:				
5	NATURE OF BANK GUARANTEE	:				
	(Please Tick (√) Whichever is Applicable)		PERFORMANCE BANK GUARANTEE	SECURITY DE- POSIT	EMD	ADVANCE
6	BG ISSUED BANK DETAILS					



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

		(A)	EMAIL ID :	
		(B)	ADDRESS :	
		(C)	PHONE NO :	
		(D)	IFSC DETAILS :	



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



FORMAT F-2A

DECLARATION FOR BID SECURITY

To,

M/s GAIL (INDIA) LIMITED

SUB:

TENDER NO:

Dear Sir

After examining / reviewing provisions of above referred tender documents (including all corrigendum/ Addenda), we M/s _____ (*Name of Bidder*) have submitted our offer/ bid no.

We, M/s _____ (*Name of Bidder*) hereby understand that, according to your conditions, we are submitting this Declaration for Bid Security.

We understand that we will be put on watch list/holiday/ banning list (as per policies of GAIL in this regard), if we are in breach of our obligation(s) as per following:

- (a) have withdrawn/modified/amended, impairs or derogates from the tender, my/our Bid during the period of bid validity specified in the form of Bid; or
- (b) having been notified of the acceptance of our Bid by the GAIL during the period of bid validity:
 - (i) fail or refuse to execute the Contract, if required, or
 - (ii) fail or refuse to furnish the Contract Performance Security, in accordance provisions of tender document.
 - (iii) fail or refuse to accept 'arithmetical corrections' as per provision of tender document.
- (c) having indulged in corrupt/fraudulent /collusive/coercive practice as per procedure.

Place:

[Signature of Authorized Signatory of Bidder]

Date:

Name:

Designation:

Seal:



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



F-3- LETTER OF AUTHORITY

[Pro forma for Letter of Authority for Attending 'Pre-Bid Meetings' / 'Un-priced Bid Opening' / 'Price Bid Opening']

Ref:
To,
M/s GAIL (INDIA) LIMITED

Date:

SUB:
TENDER NO:

Dear Sir,

I/We, _____ hereby authorize the following representative(s) for attending any 'Meetings [Pre-Bid Meeting]', 'Un-priced Bid Opening', and 'Price Bid Opening' against the above Tender Documents:

[1] Name & Designation _____ Signature _____
Phone/Cell: _____
E-mail: @

[2] Name & Designation _____ Signature _____
Phone/Cell: _____
E-mail: @

We confirm that we shall be bound by all commitments made by aforementioned authorised representative(s).

Place: _____ [Signature of Authorized Signatory of Bidder]
Date: _____ Name: _____
Designation: _____
Seal: _____

Note:

- (i) This "Letter of Authority" should be on the **"letterhead"** of the Bidder and should be signed by a person competent and having the 'Power of Attorney' to bind the Bidder. Not more than 'two [02] persons per Bidder' are permitted to attend 'Pre-Bid Meetings' / 'Un-priced Bid Opening' / 'Price Bid Opening'.
- (ii) Bidder's authorized representative is required to carry a copy of this authority letter while attending the 'Pre-Bid Meetings' / 'Un-priced Bid Opening'.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

F-4

**PROFORMA OF "BANK GUARANTEE" FOR "CONTRACT PERFORMANCE SECURITY /
SECURITY DEPOSIT"
(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)**

To, M/s GAIL (India) Limited _____	Bank Guarantee No.	
	Date of BG	
	BG Valid up to	
	Claim period up to (There should be three months gap between expiry date of BG & Claim period)	
	Stamp Sl. No./e-Stamp Certificate No.	

Dear Sir(s),

M/s. _____ having registered office at _____ (herein after called the “contractor/supplier/consultant” which expression shall wherever the context so require include its successors and assignees) have been placed/awarded the job/work of _____ vide PO/LOA /FOA No. _____ dated _____ for GAIL (India) Limited having registered office at 16, Bhikaiji Cama Place, R.K. Puram, New Delhi (herein after called the “GAIL” which expression shall wherever the context so require include its successors and assignees).

The Contract conditions provide that the Supplier/Contractor/Consultant shall pay a sum of Rs. _____ (Rupees _____) as full Contract Performance Guarantee in the form therein mentioned. The form of payment of Contract Performance Guarantee includes guarantee executed by Nationalized Bank/Scheduled Commercial Bank, undertaking full responsibility to indemnify GAIL (INDIA) LIMITED, in case of default.

The said M/s. _____ has approached us and at their request and in consideration of the premises we having our office at _____ have agreed to give such guarantee as hereinafter mentioned.

1. We _____ and having net worth more than Rs. 100,00,00,000.00 [Rupees One Hundred Crores] or its equivalent in foreign currency, hereby undertake to give the irrevocable & unconditional guarantee to you that if default shall be made by M/s. _____ in performing any of the terms and conditions of the tender/order/contract or in payment of any money payable to GAIL (INDIA) LIMITED we shall on first demand pay without demur, contest, protest and/ or without any recourse to the contractor to GAIL in such manner as GAIL may direct the said amount of



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

- Rupees _____ only or such portion thereof not exceeding the said sum as you may require from time to time.
2. You will have the full liberty without reference to us and without affecting this guarantee, postpone for any time or from time to time the exercise of any of the powers and rights conferred on you under the order/contract with the said _____ M/s. _____ and to enforce or to forbear from endorsing any powers or rights or by reason of time being given to the said M/s. _____ and such postponement forbearance would not have the effect of releasing the bank from its obligation under this debt.
3. Your right to recover the said sum of Rs. _____ (Rupees _____) from us in manner aforesaid is absolute & unequivocal and will not be affected or suspended by reason of the fact that any dispute or disputes have been raised by the said M/s. _____ and/or that any dispute or disputes are pending before any officer, tribunal or court or arbitrator or any other authority/forum and any demand made by you in the bank shall be conclusive and binding. The bank shall not be released of its obligations under these presents by any exercise by you of its liberty with reference to matter aforesaid or any of their or by reason or any other act of omission or commission on your part or any other indulgence shown by you or by any other matter or changed what so ever which under law would, but for this provision, have the effect of releasing the bank.
4. The guarantee herein contained shall not be determined or affected by the liquidation or winding up dissolution or changes of constitution or insolvency of the said Supplier/Contractor/Consultant but shall in all respects and for all purposes be binding and operative until payment of all money due to you in respect of such liabilities is paid.
5. The bank undertakes not to revoke this guarantee during its currency without your previous consent and further agrees that the guarantee shall continue to be enforceable until it is discharged by GAIL in writing. However, if for any reason, the Supplier/Contractor/Consultant is unable to complete the supply/work within the period stipulated in the order/contract and in case of extension of the date of delivery/completion resulting extension of defect liability period/guarantee period of the Supplier/Contractor/Consultant fails to perform the supply/work fully, the bank hereby agrees to further extend this guarantee at the instance of the Supplier/Contractor/Consultant till such time as may be determined by GAIL. If any further extension of this guarantee is required, the same shall be extended to such required period on receiving instruction from M/s. _____ (Supplier/Contractor/ Consultant) on whose behalf this guarantee is issued.
6. Bank also agrees that GAIL at its option shall be entitled to enforce this Guarantee against the bank (as principal debtor) in the first instant, without proceeding against the Supplier/Contractor/Consultant and notwithstanding any security or other guarantee that GAIL may have in relation to the Supplier's/Contractor's/Consultant's liabilities.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

7. The amount under the Bank Guarantee is payable forthwith without any delay by Bank upon the written demand raised by GAIL. Any dispute arising out of or in relation to the said Bank Guarantee shall be subject to the exclusive jurisdiction of courts at New Delhi.
8. Therefore, we hereby affirm that we are guarantors and responsible to you on behalf of the Supplier/Contractor/Consultant up to a total amount of _____ (amount of guarantees in words and figures) and we undertake to pay you, upon your first written demand declaring the Supplier/Contractor/Consultant to be in default under the order/contract and without caveat or argument, any sum or sums within the limits of (amounts of guarantee) as aforesaid, without your needing to prove or show grounds or reasons for your demand or the sum specified therein.
9. The Bank doth hereby declare that Shri /Ms. _____ who is the _____ (designation) of the Bank is authorized to sign this undertaking on behalf of the Bank and to bind the Bank thereby.
10. Notwithstanding anything contained herein:
 - a) The Bank's liability under this Guarantee shall not exceed (currency in figures)
... (currency in words only)
 - b) This Guarantee shall remain in force upto _____ (this date should be expiry date of defect liability period of the Contract) and any extension(s) thereof; and
 - c) The Bank shall be released and discharged from all liability under this Guarantee unless a written claim or demand is issued to the Bank on or before the midnight of (indicate date of expiry of claim period which includes minimum three months from the expiry of this Bank Guarantee) and if extended, the date of expiry of the last extension of this Guarantee. If a claim has been received by us within the said date, all the rights of GAIL under this Guarantee shall be valid and shall not cease until we have satisfied that claim.

Details of next Higher Authority of the Officials who have issued the Bank Guarantee:

Name

Designation

Yours faithfully,

Bank by its Constituted Attorney

Signature of a person duly
Authorized to sign on behalf of the Bank



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Confirmation Email Id :

IFSC Code of Issuing Bank :



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

INSTRUCTIONS FOR FURNISHING

"CONTRACT PERFORMANCE SECURITY / SECURITY DEPOSIT" BY "BANK GUARANTEE"

1. The Bank Guarantee by successful Bidder(s) will be given on non-judicial stamp paper as per 'stamp duty' applicable. The non-judicial stamp paper should be in name of the issuing bank.
2. The Bank Guarantee by Bidders will be given from bank as specified in cl.no. 38.2 of ITB [Section-III] of Tender Document.
3. A letter from the issuing bank of the requisite Bank Guarantee confirming that said Bank Guarantee and all future communication relating to the Bank Guarantee shall be forwarded to Purchaser.
4. Supplier/Contractor/Consultant shall submit attached cover letter (Annexure) while submitting Contract Performance Security / Security Deposit.
5. In case BG is issued directly by a bank outside India (if allowed), it should be executed on Letter Head of the Bank and should be advised and made payable through their Indian Branch/Corresponding Bank in India (Applicable for ICB tender).

MATTER TO BE MENTIONED IN COVERING LETTER TO BE SUBMITTED BY VENDOR ALONG WITH BANK GUARANTEE

1	BANK GUARANTEE NO	:				
2	VENDOR NAME / VENDOR CODE	:	NAME			
			VENDOR CODE			
3	BANK GUARANTEE AMOUNT	:				
4	PURCHASE ORDER/ LOA NO	:				
5	NATURE OF BANK GUARANTEE	:				
	(Please Tick (√) Whichever is Applicable)		PERFORMANCE BANK GUARANTEE	SECURITY DEPOSIT	EMD	ADVANCE
6	BG ISSUED BANK DETAILS					
(A)		EMAIL ID	:			
(B)		ADDRESS	:			
(C)		PHONE NO	:			
(D)		IFSC CODE	:			



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



F-5- AGREED TERMS & CONDITIONS

To,

M/s GAIL (INDIA) LIMITED

SUB:

TENDER NO:

This Questionnaire duly filled in, signed & stamped must form part of Bidder's Bid and should be returned along with Un-priced Bid. Clauses confirmed hereunder need not be repeated in the Bid.

Sl.	DESCRIPTION	BIDDER'S CONFIRMATION
1	Bidder's name, Vendor Code of GAIL (if any) and address (FOA/Order shall be released in this name)	Bidder's name : GAIL's Vendor Code: Address:
2.	Bidder confirms the currency of quoted prices is in Indian Rupees.	
3.	Bidder confirms quoted prices will remain firm and fixed till complete execution of the order (except where price escalation/variation is allowed in the Tender).	
4	Bidder confirms that they have quoted GST (CGST & SGST/ UTGST or IGST) in Price Schedule/ SOR of Price bid.	
4.1	Whether in the instant tender services/works are covered in reverse charge rule of GST (CGST & SGST/UTGST or IGST) If yes, Bidder confirms that they have quoted rate of applicable GST (CGST & SGST/ UTGST or IGST) in Price Schedule / Schedule of Rates of Price Bid	Yes/ No
4.2	Bidder confirms that they have mentioned Harmonized System Nomenclature (HSN)/Service Accounting Code (SAC) in Price Bid	
4.3	Bidder hereby confirms that the quoted prices are in compliance with the Section 171 of CGST Act/ SGST Act as mentioned as clause no. 13.10 of ITB (Anti-profiteering clause).	



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

Sl.	DESCRIPTION	BIDDER'S CONFIRMATION
4.4	Whether bidder is liable to raise E-Invoice as per GST Act. If yes, bidder will raise E-Invoice and confirm compliance to provision of tender in this regard.	
5.	Bidder confirms acceptance of relevant Terms of Payment specified in the Bid Document.	
6.	Bidder confirms that Contract Performance Security will be furnished as per Bid Document within 30 days of FOA in case of successful bidder.	
7.	Bidder confirms that Contract Performance Security shall be from any Indian scheduled bank (excluding Co-operative banks and Regional Rural bank) or a branch of an International bank situated in India and registered with Reserve bank of India as scheduled foreign bank. However, in case of bank guarantees from banks other than the Nationalised Indian banks, the bank must be a commercial bank having net worth in excess of Rs 100 crores and a declaration to this effect shall be made by such commercial bank either in the Bank Guarantee itself or separately on its letterhead.	
8.	Bidders confirms compliance to Completion Schedule as specified in Bid document and the same shall be reckoned from the date of Fax of Acceptance.	
9.	Bidders confirms acceptance of Price Reduction Schedule for delay in completion schedule specified in Bid document. In case of delay, the bills / invoices shall be submitted after reducing the price reduction due to delay (refer PRS Clause).	
10.	a) Bidder confirms acceptance of all terms and conditions of Bid Document (all sections). b) Bidder confirms that printed terms and conditions of bidder are not applicable.	
11.	Bidder confirms their offer is valid for period specified in BDS from Final/Extended due date of opening of Techno-commercial Bids.	
12.	Bidder have furnished EMD/Bid Security details as under: a) EMD/ Bid Security No. & date b) Value	



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

Sl.	DESCRIPTION	BIDDER'S CONFIRMATION
	c) Validity d) Bank Address/e-mail ID/Mobile no. [in case of BG] OR Bidder furnishes bid security declaration [applicable for Start-Ups and CPSEs (to whom exemption is allowed as per extant guidelines in vogue)]	
13.	As per requirement of tender, bidder (having status as Pvt. Ltd. or Limited company) must upload bid duly digitally signed on e-portal through class-3B digital signature (DS). In case, class of DS or name of employee or name of employer is not visible in the digitally signed documents, the bid digitally signed as submitted by the person shall be binding on the bidder.	
14.	Bidder confirms that (i) none of Directors (in Board of Director) of bidder is a relative of any Director (in Board of Director) of GAIL or (ii) the bidder is not a firm in which any Director (in Board of Director) of GAIL or their relative is a partner.	
15.	All correspondence must be in ENGLISH language only.	
16.	The contents of this Tender Document have not been modified or altered by Bidder. In case, it is found that the tender document has been modified / altered by the bidder, the bid submitted by them shall be liable for rejection.	
17.	Bidder confirms that all Bank charges associated with Bidder's Bank regarding release of payment etc. shall be borne by Bidder.	
18.	<u>No Deviation Confirmation:</u> It may be note that any 'deviation / exception' in any form may result in rejection of Bid. Therefore, Bidder confirms that they have not taken any 'exception / deviation' anywhere in the Bid. In case any 'deviation / exception' is mentioned or noticed, Bidder's Bid may be rejected.	
19.	If the Bidder becomes a successful Bidder pursuant to the provisions of the Tender Document, the following Confirmation shall be automatically become enforceable: "We agree and acknowledge that the Employer is entering into the Contract/Agreement solely on its own behalf and not	



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

Sl.	DESCRIPTION	BIDDER'S CONFIRMATION
	on behalf of any other person or entity. In particular, it is expressly understood & agreed that the Government of India is not a party to the Contract/Agreement and has no liabilities, obligations or rights thereunder. It is expressly understood and agreed that the Purchaser is authorized to enter into Contract/Agreement, solely on its own behalf under the applicable laws of India. We expressly agree, acknowledge and understand that the Purchaser is not an agent, representative or delegate of the Government of India. It is further understood and agreed that the Government of India is not and shall not be liable for any acts, omissions, commissions, breaches or other wrongs arising out of the Agreement. Accordingly, we hereby expressly waive, release and forego any and all actions or claims, including cross claims, VIP claims or counter claims against the Government of India arising out of the Agreement and covenants not to sue to Government of India as to any manner, claim, cause of action or things whatsoever arising of or under the Agreement."	
20.	Bidder to ensure all documents as per tender including clause 11 of Section III and all Formats are included in their bid	
21.	Bidder understands that Tender Document is not exhaustive. In case any activity though specifically not covered in description of 'Schedule of Rates' but is required to complete the work as per Scope of Work, Conditions of Contract, or any other part of Bidding document, the quoted rates will deemed to be inclusive of cost incurred for such activities unless otherwise specifically excluded. Bidder confirms to perform for fulfilment of the contract and completeness of the supplies in all respect within the scheduled time frame and quoted price.	
22.	Bidder hereby confirms that they are not on 'Holiday' by GAIL or Public Sector Project Management Consultant (like EIL, Mecon, BANDR only due to "poor performance" or "corrupt and fraudulent practices") or banned by Government department/ Public Sector on due date of submission of bid. Further, Bidder confirms that neither they nor their allied	



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

Sl.	DESCRIPTION	BIDDER'S CONFIRMATION
	<p>agency/(ies) (as defined in the Procedure for Action in case of Corrupt/ Fraudulent/ Collusive/ Coercive Practices) are on banning list of GAIL or the Ministry of Petroleum and Natural Gas.</p> <p>Bidder also confirms that they are not under any liquidation, court receivership or similar proceedings or 'bankruptcy'.</p> <p>In case it comes to the notice of GAIL that the bidder has given wrong declaration in this regard, the same shall be dealt as 'fraudulent practices' and action shall be initiated as per the Procedure for action in case of Corrupt/Fraudulent/Collusive/Coercive Practices.</p> <p>Further, Bidder also confirms that in case there is any change in status of the declaration prior to award of contract, the same will be promptly informed to GAIL by them.</p>	
23.	Bidder confirms that they have read and understood the General Conditions of Contract – Works available on GAIL's Tender website (http://gailtenders.in/Gailtenders/gccs.asp) & no 'exception / deviation' anywhere has been taken in the same and that they shall abide by provisions of relevant GCC.	
24.	Bidder certifies that they would adhere to the Fraud Prevention Policy of GAIL [available on GAIL's website (www.gailonline.com)] and shall not indulge themselves or allow others (working in GAIL) to indulge in fraudulent activities and that they would immediately apprise GAIL of the fraud/suspected fraud as soon as it comes to their notice. Concealment of facts regarding their involvement in fraudulent activities in connection with the business transaction(s) of GAIL is liable to be treated as crime and dealt with by the procedures of GAIL as applicable from time to time.	
25.	Bidder confirms that (i) any variation in GST at the time of supplies for any reasons, other than statutory, including variations due to turnover, shall be borne by them and (ii) any error of interpretation of applicability of rate of GST (CGST & SGST/ UTGST or IGST) on components of an item and/or various items of tender by them shall be dealt as per clause	



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

Sl.	DESCRIPTION	BIDDER'S CONFIRMATION
	no. 13.13 of Section-III.	
26.	Bidders confirm to submit signed copy of Integrity Pact (wherever included in tender). If Bidder is a partnership concern or a consortium, this agreement must be signed by all partners or consortium members.	
27.	Bidder confirms that there is no conflict of interest with other bidders, as per clause no.4.2 of Section-III (ITB) of Tender Document.	
28.	Bidder confirms that, in case of contradiction between the confirmations provided in this format and to the terms & conditions mentioned elsewhere in the offer, the confirmations given in this format shall prevail.	
29	Further, GAIL/PMC reserves the right to seek in physical form (original/notarized true copy) of any document(s) uploaded in digital form, at any time during the processing of tender and execution of contract. In the event of failure of a bidder/vendor/contractor to submit original/notarized true copy of any document(s) within the specified time schedule, EMD or CPS of the bidder/vendor/contractor shall be forfeited /Bid Security Declaration clause shall be invoked.	

Place:

[Signature of Authorized Signatory of Bidder]

Date:

Name:

Designation:

Seal:



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



F-6

ACKNOWLEDGEMENT CUM CONSENT LETTER

(On receipt of tender document/information regarding the tender, Bidder shall acknowledge the receipt and confirm his intention to bid or reason for non-participation against the enquiry /tender through e-mail to concerned executive in GAIL issued the tender, by filling up the Format)

To,

M/s GAIL (INDIA) LIMITED

SUB:

TENDER NO:

Dear Sir,

We hereby acknowledge receipt of a complete set of bidding document along with enclosures for subject item/job and/or the information regarding the subject tender.

- We intend to bid as requested for the subject item/job and furnish following details with respect to our quoting office:

Postal Address with Pin Code:

Telephone Number :

Contact Person :

E-mail Address :

Mobile No. :

Date :

Seal/Stamp :

- We are unable to bid for the reason given below:

Reasons for non-submission of bid:

Agency's Name :

Signature :

Name :

Designation :

Date :

Seal/Stamp :



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

F-7
BIDDER'S EXPERIENCE

To,

M/s GAIL (INDIA) LIMITED

SUB:

TENDER NO:

Sl. No	Description of the Services	LOA /WO No. and date	Full Postal Address & phone nos. of Client. <i>Name, designation and address of Engineer/ Officer-in-Charge (for cases other than purchase)</i>	Value of Contract/Order (<i>Specify Currency</i> Amount)	Date of Commencement of Services	Scheduled Completion Time (Months)	Date of Actual Completion	Reasons for delay in execution, if any
(1)	(2)	(3)	(5)	(6)	(7)	(8)	(9)	(10)

Place:

[Signature of Authorized Signatory of Bidder]

Date:

Name:

Designation:

Seal:

Note: As per Point No A.1 under technical note Clause no (v) of Section-II, only documents (Work Order, Completion certificate, Execution Certificate etc.) which have been referred/ specified in the bid shall be considered in reply to queries during evaluation of Bids.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

**F-8 (A)
CHECK LIST**

Bidders are requested to duly fill in the checklist. This checklist gives only certain important items to facilitate the bidder to make sure that the necessary data/information as called for in the bid document has been submitted by them along with their offer. This, however, does not relieve the bidder of his responsibilities to make sure that his offer is otherwise complete in all respects.

Please ensure compliance and tick (✓) against following points:

S. No.	DESCRIPTION	CHECK BOX	REFERENCE PAGE NO. OF THE BID SUBMITTED
1.0	Digitally Signing (in case of e-bidding)/ Signing and Stamping (in case of manual bidding) on each sheet of offer, original bidding document including SCC, ITB, GCC ,SOR drawings, corrigendum (if any)		
2.0	Confirm that the following details have been submitted in the Un-priced part of the bid		
i	Covering Letter, Letter of Submission		
ii	EMD / Declaration for Bid Security [as applicable] as per provisions of Tender		
iii	Digitally signed (in case of e-tendering) or 'signed & stamped (in case of Manual tender) tender document along with drawings and addendum (if any)		
iv	Power of Attorney in the name of person signing the bid.		
v	Confirm submission of document alongwith unpriced bid as per bid requirement (including cl.no.11.1.1 of Section-III).		
3.0	Confirm that all format duly filled in are enclosed with the bid duly Digitally Signed (in case of e-bidding)/ Signed and Stamped (in case of manual bidding) by authorised person(s)		



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

4.0	Confirm that the price part as per Price Schedule format submitted with Bidding Document/ uploaded in case of e-bid.		
5.0	Confirm that Undertaking as per <i>Form-2 to Annexure-V to Section-III</i> and Certification from the statutory auditor or cost auditor of the company (in the case of companies) o		
6.0	Confirm that Undertaking as per Form-1 to Section-II have been submitted by the bidder (Guidelines from Procurement from a Country sharing a Land Border with India)		
7.0	Confirm submission of Checklist against Bid Evaluation Criteria as per format F-8(B)		

Place:

Date:

[Signature of Authorized Signatory of Bidder]

Name:

Designation:



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION NETWORK (1 YEAR ARC)

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



F-8(B)

CHECKLIST FOR BID EVALUATION CRITERIA (BEC) QUALIFYING DOCUMENTS
(refer Section II of Tender document)

Sl No.	Description	Documents required for qualification	Documents Submitted by Bidder	Documents at-tested as per Section-II of Tender	Reference Page No. of the Bid submitted
	Technical BEC				
1.	Experience criteria	(a) Copy of detailed work order along Schedule of Rates. (b) Copy of completion certificate issued by end user / Owner (or their consultant who has been duly authorized by owner to issue such certificate) only after completion of work in all aspects. Execution certificate issued by the end user/owner/authorized consultant submitted by a bidder against work contracts can also be considered in place of a completion certificate for meeting the stipulated experience criteria provided that the certified work has been completed satisfactorily by the bidder and duly certified by the End User/ Owner/ Authorized Consultant.		Yes/No	



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

		Note: The completion/execution certificate(s) shall have details like work order no./date, the brief scope of work, completion date etc.			
2.	Job executed for Subsidiary / Fellow subsidiary/ Holding company.	Tax paid invoice(s) duly certified by statutory auditor of the bidder towards payments of statutory tax in support of the job executed for Subsidiary / Fellow subsidiary /Holding company.		Yes/No	
3	Experience criteria in case of the single bidder, having experience as a consortium member	a) Same documents as mentioned in above. b) Consortium Agreement/MOU clearly defining the scope and responsibility. Note: The completion/execution certificate(s) shall have details like work order no./date, the brief scope of work, completion date etc.		Yes/No	
FINANCIAL BEC					
1.	Average Annual Turn Over	Bidder(s) shall submit following documents: a) A certificate for financial capability of the bidder from Practicing CA/CPA on letterhead with UDIN in prescribed format [Format F-10] as provided in the Tender Document. b) Copy of Audited Annual Financial Statement [Balance Sheet and Profit & Loss Account statements including Auditor's Report] of three	Submitted <i>(Mention specific year.....)</i>	Yes/No	



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

		(3) preceding Financial Year(s).			
2.	Net Worth	<p>Bidder(s) shall submit following documents:</p> <p>a) A certificate for financial capability of the bidder from Practicing CA/CPA on letterhead with UDIN in prescribed format [Format F-10] as provided in the Tender Document.</p> <p>b) Copy of Audited Annual Financial Statement [Balance Sheet and Profit & Loss Account statements including Auditor's Report] of the last audited Financial Year.</p>	<p>Submitted</p> <p><i>(Mention specific year)</i></p>	Yes/No	
3.	Working Capital	<p>Bidder(s) shall submit following documents:</p> <p>a) A certificate for financial capability of the bidder from Practicing CA/CPA on letterhead with UDIN in prescribed format [Format F-10] as provided in the Tender Document.</p> <p>b) Copy of Audited Annual Financial Statement [Balance Sheet and Profit & Loss Account statements including Auditor's Report] of the</p>	<p>Submitted</p> <p><i>(Mention specific year)</i></p> <p>Submitted/ Not Applicable <i>(Bidder to tick appropriate option)</i></p>	Yes/No	



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



		<p>last audited Financial Year.</p> <p>Note: If the bidder's working capital is negative or inadequate, the bidder shall submit a letter from their bank having net worth not less than Rs.100 crores (or equivalent in USD), confirming the availability of line of credit for working capital amount mentioned herein above.</p> <p>The line of credit letter from bank to be submitted strictly as per format(F-9).</p> <p>Declaration Letter/Certificate for line of credit due to shortfall of working capital shall be from single bank only. Letters from multiple banks shall not be applicable. However, banking syndicate will also be acceptable wherein a group of banks can jointly provide line of credit to the bidder.</p> <p>The bank shall be required to issue the letter for declaration/certificate of line of credit on their letter head along with the contact details of the issuing authority like email id, contact number etc.</p> <p>The original document for "Line of Credit" should be submitted along with other physical documents required as per terms and conditions of tender.</p>			
--	--	---	--	--	--



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

4.	Format for Details of financial capability of Bidder	Bidder shall submit “Details of financial capability of Bidder” in prescribed format duly signed and stamped by a chartered accountant / Certified Public Accountant (CPA).	Submitted		
----	---	---	-----------	--	--

Place:

Date:

[Signature of Authorized Signatory of Bidder]

Name:

Designation:

Seal



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL
PIPELINE UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



F-9
FORMAT FOR CERTIFICATE FROM BANK IF BIDDER'S WORKING CAPITAL IS
INADEQUATE/NEGATIVE

(TO BE SUBMITTED IN ORIGINAL)

(To be provided on Bank's letter head)

Date:

To,
M/s. GAIL (India) Limited

Dear Sir,

This is to certify that M/s (name of the Bidder with address)
(hereinafter referred to as Customer) is an existing Customer of our Bank.

The Customer has informed that they wish to bid for GAIL's Tender No.
..... dated for
.....(Name of the supply/work/services/consultancy) and as per
the terms of the said Tender Document they have to furnish a certificate from their Bank con-
firming the availability of line of credit.

Accordingly M/s (name of the Bank with address) confirms availabil-
ity of line of credit to M/s (name of the Bidder) for at least an amount of
Rs. _____

It is also confirmed that the net worth of the Bank is more than Rs. 100 Crores (or Equivalent
USD) and the undersigned is authorized to issue this certificate.

Yours truly

for (Name & address of Bank)

(Authorized signatory)

Name of the signatory:

Designation :

Email Id :

Contact No. :

Stamp

Note:



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

This Declaration Letter for line of credit shall be from single bank only. Letters from multiple banks shall not be applicable. However, banking syndicate will be acceptable wherein a group of banks can jointly provide line of credit to the bidder.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



F-10

**FORMAT FOR CHARTERED ACCOUNTANT CERTIFICATE/ CERTIFIED PUBLIC
ACCOUNTANT (CPA) FOR FINANCIAL CAPABILITY OF THE BIDDER**
(BIDDER TO SUBMIT BOTH PAGES OF THIS FORM)

We have verified the Audited Financial Statements and other relevant records of M/s..... (Name of the bidder) and certify the following:

A. AUDITED ANNUAL TURNOVER* OF LAST 3 YEARS:

Year	Amount (Currency)
Year 1:	
Year 2:	
Year 3:	
Total (A)	
Average Annual Financial Turnover during the last three financial years (A/3)	

B. NETWORTH* AS PER LAST AUDITED FINANCIAL STATEMENT:

Description	Year ____
	Amount (Currency)
1. Net Worth	

C. WORKING CAPITAL* AS PER LAST AUDITED FINANCIAL STATEMENT :

Description	Year ____
	Amount (Currency)
1. Current Assets	
2. Current Liabilities	
3. Working Capital (Current Assets-Current liabilities)	

****Refer Instructions***

Note:

- 1.0** It is further certified that the above mentioned applicable figures are matching with the returns filed with Registrar of Companies (ROC) [Applicable only in case of Indian Companies]
- 2.0** We confirm that above figures are after referring instructions at page 2 of 2 of F-10.
- 3.0** Practicing Chartered Accountants shall generate Unique Document Identification Number (UDIN) for all certificates issued by them

Name of Audit Firm:
Chartered Accountant/CPA
Date:

[Signature of Authorized Signatory]
Name:
Designation:
Seal:
Membership No.:
UDIN:

(Page 1 of 2)



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Instructions:

1. The Separate Pro-forma shall be used for each member in case of JV/ Consortium.
2. The financial year would be the same as one normally followed by the bidder for its Annual Report.
3. The bidder shall provide the audited annual financial statements as required for this Tender document. Failure to do so would result in the Proposal being considered as non-responsive.
4. For the purpose of this Tender document:
 - (i) **Annual Turnover** shall be “Revenue from Operations” as per Profit & Loss account of audited annual financial statements
 - (ii) **Working Capital** shall be “Current Assets less Current liabilities” and
 - (iii) **Net Worth** shall be Aggregate value of the paid-upshare capital and all reserves created out of the profits and securities premium account, after deducting the aggregate value of the accumulated losses, deferred expenditure and miscellaneous expenditure not written off, if any, but does not include reserves created out of revaluation of assets, writeback of depreciation and amalgamation.

In case the date of constitution/incorporation of the bidder is less than 3 years old, the average turnover in respect of the completed financial years after the date of constitution/incorporation shall be taken into account for minimum Average Annual Financial Turnover criteria.

5. **Above figures shall be calculated after considering the qualification, if any, made by the statutory auditor on the audited financial statements of the bidder including quantified financial implication.**
6. This certificate is to be submitted on the letter head of Chartered Accountant/CPA.

(Page 2 of 2)



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



**F-11
FORMAT FOR CONSORTIUM AGREEMENT
(ON NON- JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)**

(DELETED)



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL
PIPELINE UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



F-12 BIDDER'S QUERIES FOR PRE BID MEETING

To,

M/s GAIL (INDIA) LIMITED

Sub :

Tender No :

SL. NO.	REFERENCE OF BIDDING DOCUMENT				BIDDER'S QUERY	GAIL'S REPLY
	SEC. NO.	Page No.	Clause No.	Subject		

NOTE: The Pre-Bid Queries may be sent by e-mail before due date for receipt of Bidder's queries.

SIGNATURE OF BIDDER: _____

NAME OF BIDDER : _____



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



F-13

**REAL TIME GROSS SETTLEMENT (RTGS) / NATIONAL ELECTRONIC FUNDS TRANSFER
(NEFT) MANDATE FORM**

(To be issued on vendors letter head)

1. Vendor/customer Name :
2. Vendor/customer Code:
3. Vendor /customer Address:
4. Vendor/customer e-mail id:
5. Particulars of bank account:
 - a) Account Holder / Beneficiary Name
 - b) Name of Bank:
 - c) Name of branch:
 - d) Branch code:
 - e) Address:
 - f) Telephone number:
 - g) Type of account (current/saving etc):
 - h) Account Number:
 - i) IFSC code of the bank branch:
 - j) Reason (if) Vendor (S.N.1) and Account Holder /
Beneficiary name (S.N. 5 (a)) is not the same

I/We hereby authorize GAIL (India) Limited & its wholly owned subsidiary to release any amount due to me/us in the bank account as mentioned above. I/We hereby declare that the particulars given above are correct and complete. If the transaction is delayed or lost because of incomplete or incorrect information, we would not hold the GAIL(India) Limited responsible.

(Signature of vendor/customer)

BANK CERTIFICATE

We certify that Account Holder/Beneficiary_____has an Ac-
count no. _____and IFSC Code : _____with us and we
confirm that the details given above are correct as per our records.

Bank stamp

Date

(Signature of authorized officer of bank)



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



F-14

INTEGRITY PACT

INTEGRITY PACT

(IP signed by GAIL's executive shall be made part of tender document)

INTEGRITY PACT

GAIL, as one of its endeavour to maintain and foster most ethical and corruption free business environment and to ensure transparency, equity & competitiveness in public procurement, has adopted Integrity Pact, to ensure that all activities and transactions between the Company (GAIL) and its Counterparties (Bidders, Contractors, Vendors, Suppliers, Service Providers/Consultants etc.) are handled in a fair and transparent manner, completely free of corruption.

The adoption and implementation of Integrity Pact is governed as per directives and Standard Operating Procedure (SoP) issued by Central Vigilance Commission from time to time.

Bidder is required to execute the Integrity Pact on plain paper as per format & terms and conditions enclosed with all tenders having estimated value of **Rs 1 Crore and above**. In case, a bidder does not sign the Integrity Pact, their bid shall be liable for rejection.

If a Counterparty commits a violation of its Commitments and Obligations under the Integrity Pact during bidding process, their entire Earnest Money Deposit/ Bid Security, would be forfeited and in addition, action shall be taken as per **"Procedure for action in case Corrupt /Fraudulent/ Collusive/Coercive Practices"**

In case of violation of the Integrity pact by Counterparty after award of the Contract, GAIL shall be entitled to terminate the Contract. Further, GAIL would forfeit the Security Deposit/ Contract Performance Security and in addition, action shall be taken as per **"Procedure for action in case Corrupt /Fraudulent/ Collusive/Coercive Practices"**

INDEPENDENT EXTRNAL MONITORS (IEMS)

Presently, the panel consisting of the following Independent External Monitors (IEMs) has been appointed by GAIL, in terms of Integrity Pact(IP) which forms part of GAIL Tenders / Contracts.

1. Shri Umakant Lal, (email id : umakantlal@yahoo.co.in)

This panel is authorized to examine / consider all references made to it under this tender/ contract till award of job.

The bidder(s), in case of any dispute(s) / complaint(s) pertaining to this tender falling under provisions of Integrity Pact may raise the same either directly with the IEMs on the panel or with CC to them through their Nodal Officer- Sh. T. Xalxo, GM (C&P)- Email txalxo@gail.co.in, GAIL (India) Limited, GAIL Bhawan, 16, Bhikaiji Cama Place, R.K. Puram, New Delhi – 110066.

On receipt of such complaints/representations, Nodal Officer shall coordinate with IEM Panel and GAIL authorities concerned for their disposal as per extant guidelines.



INTEGRITY PACT

(To be executed on plain paper)

Between

GAIL (India) Limited (hereinafter referred to as "The Principal").

and

_____ (hereinafter referred to as "The Bidder/ Contractor")

(The Principal and the Bidder / Contractor are hereinafter are referred to individually as "Party" or collectively as "Parties").

PREAMBLE

The Principal intends to award under laid down organizational procedures, contract(s) for _____ (name of the tender/contract). The Principal values full compliance with all relevant laws of the land, rules, regulations and economic use of resources and of fairness /transparency in its relations with its Bidder (s) and/or Contractor (s).

In order to achieve these goals, the Principal has appointed Independent External Monitors (IEMs) who will monitor the tender process for compliance with the principles mentioned in this Integrity Pact, the terms and conditions of which shall also be read as integral part and parcel of the tender document and contract between the parties.

Section 1 – Commitments of the Principal

1. The Principal commits itself to take all measures necessary to prevent corruption and to observe the following Principles:
 - i) No employee of the Principal, personally or through family members, will in connection with the tender for, or the execution of a contract, demand, take a promise for or accept, for self or a third person, any material or immaterial benefit which the person is not legally entitled to.
 - ii) The Principal will, during the tender process treat all Bidder(s) with equity, fairness and reason. The Principal will in particular, before and during the tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential / additional information through which the Bidder (s) could obtain an advantage in relation to the tender process or the contract execution.
 - iii) The Principal will exclude from the bid evaluation process all known prejudiced person(s).
2. If the Principal obtains information on the conduct of any of its employees which is a criminal offence under the relevant Bharatiya Nyaya Sanhita (BNS)/ Prevention of Corruption Act (PC Act), or if there be a substantive suspicion in this regard, the Principal will inform the Chief Vigilance Officer and in addition can also initiate disciplinary action(s) as per its internal laid down policy and procedure.



Section 2 – Commitments of the Bidder (s)/Contractor (s)

1. The Bidder (s) / Contractor (s) commits themselves to take all measures necessary to prevent corruption. The Bidder (s)/ Contractor (s) commits themselves to observe the following principles during participation in the tender process and during the Contract execution:
 - i) The Bidder(s) / Contractor(s) will not, directly or through any other person or firm, offer, promise or give to any of the Principal's employees involved in the tender process or the execution of the Contract or to any third person any material or other benefit which he / she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the tender process or during the execution of the Contract.
 - ii) The Bidder(s) / Contractor(s) will not enter with other Bidders into any illegal or undisclosed agreement or understanding, whether formal or informal, including but not limited to prices, specifications, scope of work, certifications, subsidiary contracts, submission or non-submission of bids or any other action(s) to restrict competitiveness or to introduce cartelization in the bidding process.
 - iii) The Bidder (s) / Contractor (s) will not commit any offence under the relevant BNS/PC Act. Further, the Bidder (s) / Contractor (s) will not use improperly, for purposes of competition or personal gain, or pass on to others, any information or document provided by the Principal as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.
 - iv) The Bidder (s)/ Contractor (s) of foreign origin shall disclose the name and address of the agents/ representatives in India, if any, involved directly or indirectly in the bidding. Similarly, the Bidder (s)/ Contractor (s) of Indian Nationality shall furnish the name and address of the foreign principals, if any, involved directly or indirectly in the bidding. Further, all the payments made to the Indian agent/ representative have to be in India Rupees only.
 - v) The Bidder (s) / Contractor (s) will, when presenting their bid, disclose any and all payments made, or committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the contract, and/or with the execution of the Contract.
 - vi) The Bidder(s)/Contractor(s) shall not misrepresent facts or furnish false/forged documents/information in order to influence the bidding process or the execution of the contract to the detriment of the Principal.
 - vii) Bidder(s) / Contractor(s) who have signed the Integrity Pact shall not approach the Courts while representing the matter to IEMs and shall wait for their decision in the matter.
2. The Bidder(s)/ Contractor(s) shall not instigate third person(s) to commit offences outlined above or be an accessory to such offences.



Section 3 – Disqualification from tender process and exclusion from future contracts

If the Bidder (s) / Contractor (s), before award or during execution has committed a transgression through a violation of Section 2 above or in any other form such as to put their reliability or credibility in question, the Principal is entitled to disqualify the Bidder (s) / Contractor (s) from the tender process and/or take action as per provisions of “**Procedure for action in case Corrupt /Fraudulent/ Collusive/Coercive Practices**”.

Section 4 – Compensation for Damages

1. If the Principal has disqualified the Bidder (s) from the tender process prior to the award in accordance with Section 3, the Principal is entitled to demand and recover the damages by forfeiting Earnest Money Deposit / Bid Security.
2. If the Principal has terminated the Contract in accordance with Section 3, or if the Principal is entitled to terminate the Contract in accordance with Section 3, the Principal shall be entitled to demand and recover from the Contractor the damages by forfeiting Contract Performance Security or its equivalent amount (in part/full), as may be decided by the Principal besides resorting to other remedies under the contract and as provided under law.

Section 5 – Previous transgression

1. Bidder(s) to disclose any transgressions with any other public/government organization that may impinge on the anti-corruption principle. The date of such transgression, for the purpose of disclosure by the bidders in this regard, would be the date on which cognizance of the said transgression was taken by the Competent Authority. The period for which such transgression(s) is/are to be reported by the bidders shall be the last three years to be reckoned from date of bid submission. The transgression(s), for which cognizance was taken even before the said period of three years, but are pending conclusion, shall also be reported by the bidders.
2. If the Bidder(s) make false statement on this subject, they can be disqualified from the tender process and/or actions can be taken as per provisions of “**Procedure for action in case Corrupt /Fraudulent/ Collusive/Coercive Practices**”

Section 6 – Equal treatment to all Bidder(s) / Contractor(s) / Subcontractor(s)

1. If the Bidder is a Partnership Firm, **Integrity Pact(IP)** is required to be signed by all the Partners. If the Bidder is a Consortium/ Unincorporated Joint Venture/Association of Persons, formed solely for the purpose of executing the tendered project, this Pact must be signed by all the Partners/ members of such Consortium/Unincorporated Joint Ventures/Association of Persons. In case Bidder is a Company, including Joint Venture Company, the Pact must be signed by a representative of the Company duly authorized by Board resolution.
2. The Bidder (s) / Contractor(s) shall alone be responsible for any compliance or violation (s) of the provisions laid down in the Pact by any/all of their sub-contractor (s) or sub-vendor (s).
3. The Principal will enter into agreements with identical conditions with all Bidders and Contractors as per this format..



4. The Principal will disqualify from the tender process all bidders who do not sign this Pact or violate its provisions.

Section 7 – Punitive Actions against violating Bidder (s) / Contractor (s) / Sub-contractor (s)

If the Principal obtains knowledge of conduct of a Bidder, Contractor or Subcontractor, or of an employee or a representative or an associate of a Bidder, Contractor or Subcontractor which constitutes corruption, or if the Principal has substantive suspicion in this regard, the Principal will inform the same to the Chief Vigilance Officer (CVO).

Section 8 –Independent External Monitor(s) / IEM(s)

1. The Principal appoints competent and credible Independent External Monitor(s)/IEM(s) for this Pact as nominated by Central Vigilance Commission(CVC). The task of the IEM(s) is to review independently and objectively, whether and to what extent the parties comply with the obligations under this agreement.
2. The IEM(s) are not subject to instructions by the representatives of the parties and performs his/her functions neutrally and independently. The IEM(s) would have right of access to all documents/records pertaining to the contract for which a complaint or issue is raised before them, as and when warranted. It will be obligatory for him/ her to treat the information and documents of the Bidders/ Contractors as confidential. IEM(s) report to the C&MD, GAIL.
3. The Bidder (s)/ Contractor (s) accepts that the IEM(s) have the right to access without restriction to all Project documentation of the Principal including that provided by the Contractor. The Contractor will also grant the IEM(s), upon his/her request and demonstration of a valid interest, unrestricted and unconditional access to their project documentation. The same is applicable to Sub-contractors and it shall be the responsibility of the Bidder(s) to ensure the compliance by their sub-contractor(s) appointed as per the provisions of tender as and when warranted..
4. The IEM(s) are under contractual obligation to treat the information and documents of the Bidder(s)/Contractor(s)/Subcontractor(s) with confidentiality. The IEM(s) have also signed declarations on 'Non-Disclosure of Confidential Information' and of 'Absence of Conflict of Interest'. In case of any conflict of interest arising at a later date, the IEM(s) shall inform C&MD, GAIL and recuse himself/herself from that case.
5. The Principal will provide to the IEM(s) sufficient information about all meetings among the parties related to the Project/tender provided such meetings could have an impact on the contractual relations between the Principal and the Contractor. The parties offer to the IEM(s) the option to participate in such meetings.
6. As soon as the IEM(s) notice, a violation of this agreement, they will so inform the Management of the Principal and request the Management to discontinue or to take corrective action, or to take other relevant action. The IEM(s) can in this regard submit non-binding recommendations. Beyond this, the IEM(s) have no right to demand from the parties that they act in a specific manner, refrain from action or tolerate action.



7. The IEM(s) will submit a written report to the C&MD, GAIL within 30 days from the date of reference or intimation to them by the 'Principal' and, should the occasion arise, submit proposals for correcting problematic situations.
8. If the IEM(s) has reported to the C&MD, GAIL, a substantiated suspicion of an offence under the relevant BNS/PC Act, and the C&MD, GAIL has not, within the reasonable time, taken visible action to proceed against such offence or reported it to the Chief Vigilance Officer, then only in case of very serious issue having a specific, verifiable Vigilance angle, the matter may be reported directly to the Central Vigilance Commission (CVC).
9. The word IEM(s) would include both singular and plural.
10. In case of any complaints is referred under IP Program accompanied by IP duly signed by an intending bidder, only then the same shall be taken into cognizance by the IEM(s). The role of IEM(s) is advisory and would not be legally binding and it is restricted to resolving the issues raised by an intending bidder regarding any aspect(s) of the tender which allegedly restricts competition or bias towards some bidder.
11. The IEM(s) shall examine all the representations/grievances/complaints received by them from the bidders or their authorized representative related to any discrimination on account of lack of fair play in modes of procurement and bidding systems, tendering method, eligibility conditions, bid evaluation criteria, commercial terms & conditions, choice of technology/specifications etc.

Section 9 – Pact Duration

This IP shall come into force when both parties have legally signed it. It expires for the Contractor 12 months after the last payment under the respective contract, and for all other Bidders 6 months after the contract has been awarded. Any violation to the same would entail disqualification of the bidders and exclusion from future business dealings as provided under the tender.

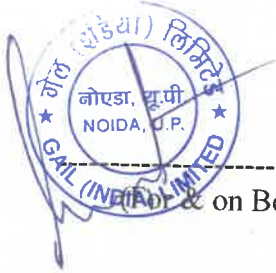
If any claim is made / lodged during this time, the same shall be binding and continue to be valid despite the lapse of this pact as specified above, unless it is discharged/determined by the C&MD, GAIL.

Section 10 – Other provisions

1. This agreement is subject to Indian Law. Place of performance and exclusive jurisdiction is the Registered Office of the Principal, i.e. New Delhi. The arbitration/conciliation clause provided in the main tender document/contract shall not be applicable for any issue/dispute arising under Integrity pact.
2. Changes and supplements as well as termination notices, if any, need to be made in writing. Side agreements have not been made.
3. Should one or several of the provisions of this agreement turn out to be invalid, the remainder of this agreement remains valid. In this case, the parties will strive to come to an agreement to their original intentions.



4. All rights and remedies of the parties hereto shall be in addition to all the other legal rights and remedies belonging to such parties under the Tender/Contract and/or law and the same shall be deemed to be cumulative and not alternative to such legal rights and remedies aforesaid. For the sake of brevity, both the Parties agree that this Pact will have precedence over the Tender/Contract documents with regard to any of the provisions covered under this Pact.



(For & on Behalf of Principal)

(Office Seal)

(For & on Behalf of Bidder/Contractor)

(Office Seal)

Place _____

Date _____

Witness 1:

(Name & Address)

.....
.....
.....

Witness 2:

(Name & Address)

.....
.....
.....



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



**F-15
INDEMNITY BOND**

WHEREAS GAIL (India) Ltd. (hereinafter referred to as “GAIL”) which expression shall, unless repugnant to the context include its successors and assigns, having its registered office at 16, Bhikaiji, Cama Place, R.K. Puram, New Delhi 110066 has entered into a contract with M/s*..... (hereinafter referred to as the “Contractor”) which expression shall unless repugnant to the context include its representatives, successors and assigns, having its registered office at *..... and on the terms and conditions as set out, inter-alia in the [*mention the work order/LOA/Tender No.*]and various documents forming part thereof, hereinafter collectively referred to as the ‘**CONTRACT**’ which expression shall include all amendments, modifications and / or variations thereto.

GAIL has also advised the Contractor to execute an Indemnity Bond in general in favour of GAIL indemnifying GAIL and its employees and Directors including Independent Directors from all consequences which may arise out of any prospective litigation or proceedings filed or may be initiated by any third party, including any Banker / financial institution / worker(s) / vendor(s)/ subcontractor(s) etc. who may have been associated or engaged by the Contractor directly or indirectly with or without consent of GAIL for above works.

NOW, THEREFORE, in consideration of the promises aforesaid, the Contractor hereby irrevocably and unconditionally undertakes to indemnify and keep indemnified GAIL and all its employees, Directors, including Independent Directors, from and against all/any claim(s), damages, loss, which may arise out of any litigations/ liabilities that may be raised by the Contractor or any third party against GAIL under or in relation to this contract. The Contractor undertakes to compensate and pay to GAIL and/or any of its employees, Directors including Independent Directors, forth with on demand without any protest the amount claimed by GAIL for itself and for and on behalf of its employees, Directors including Independent Directors together with direct/indirect expenses including all legal expenses incurred by them or any of them on account of such litigation or proceedings.

AND THE CONTRACTOR hereby further agrees with GAIL that:

(i) This Indemnity shall remain valid and irrevocable for all claims of GAIL and/or any of its employees and Directors including Independent Directors arising out of said contract with respect to any such litigation / court case for which GAIL and/or its employees and Directors including Independent Directors has been made party until now or here-in-after.

(ii) This Indemnity shall not be discharged/revoked by any change/ modification/amendment/assignment of the contract or any merger of the Contractor with other entity or any change in the constitution/structure of the Contractor’s firm/Company or any conditions thereof including insolvency etc. of the Contractor, but shall be in all respects and for all purposes binding and operative until any/all claims for payment of GAIL are settled by the Contractor and/or GAIL discharges the Contractor in writing from this Indemnity.

The undersigned has full power to execute this Indemnity Bond for and on behalf of the Contractor and the same stands valid.

SIGNED BY :

For [Contractor]

Authorised Representative



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Place:

Dated:

Witnesses:

- 1.
- 2



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



F-16

FREQUENTLY ASKED QUESTIONS (FAQs)

SL.NO.	QUESTION	ANSWER
1.0	Can any vendor quote for subject Tender?	Yes. A Vendor has to meet Bid Evaluation Criteria given under Section II of Tender document in addition to other requirements.
2.0	Should the Bid Evaluation Criteria documents be attested?	Yes. Please refer Section II of Tender document
3.0	Is attending Pre Bid Meeting mandatory.	No. Refer Clause No. 17 of Instruction to Bidders of Tender Document. However attending Pre Bid Meeting is recommended to sort out any issue before submission of bid by a Bidder.
4.0	Can a vendor submit more than 1 offer?	No. Please refer Clause No. 4 of Instruction to Bidders of Tender Document.
5.0	Is there any Help document available for e-Tender.	Refer FAQs as available on Govt. e-Procurement System of National Informatics Center (NIC) https://etenders.gov.in/eprocure/app
6.0	Are there are any MSE (Micro & Small Enterprises) benefits available?	Yes. Refer Clause No. 40 of Instructions to Bidders of Tender Document.
7.0	Are there are any benefits available to Startups?	Refer Clause No. 49 of Instructions to Bidders of Tender Document.

All the terms and conditions of Tender remain unaltered.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101





TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



F-17

**UNDERTAKING REGARDING SUBMISSION OF ELECTRONIC INVOICE (E-INVOICE AS
PER GST LAWS)**

(to be submitted on letter head along with documents for release of payment)

To,
M/s GAIL (INDIA) LIMITED

.....

SUB:
PO NO:

Dear Sir,

We _____ (Name of the Supplier) hereby confirm that E-Invoice provision as per the
GST Law is

- (i) Applicable to us []
- (ii) Not Applicable to us []

(Supplier is to tick appropriate option [✓]above).

In case, same is applicable to us, we confirm that we will submit E-Invoice after complying with all the requirements of GST Laws. If the invoice issued without following this process, such invoice can-not be processed for payment by GAIL as no ITC is allowed on such invoices. We also confirm that If input tax credit is not available to GAIL for any reason attributable to Supplier (both for E-invoicing cases and non-E-invoicing cases), then GAIL shall not be obligated or liable to pay or reimburse GST (CGST & SGST/UTGST or IGST) claimed in the invoice(s) and shall be entitled to deduct / setoff / recover such GST amount (CGST & SGST/UTGST or IGST) or Input Tax Credit amount together with penalties and interest, if any, by adjusting against any amounts paid or becomes payable in future to the Supplier under this contract or under any other contract.

Place: [Signature of Authorized Signatory of Bidder]
Date: Name:
Designation:
Seal:

F-18



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



**NO CLAIM CERTIFICATE
(TO BE SUBMITTED BEFORE RELEASE OF CPS/SECURITY DEPOSIT)**

[On the Letter-head of Supplier/Vendor]

We, _____, a company incorporated under the laws of India/ a Consortium between *____ and *____ (*name of Consortium partners to be inserted*)/ a Partnership Firm consisting of *____ and *____ (*name of Partners to be inserted*)/ a Sole Proprietorship (as the case may be), having its registered office at _____ and carrying on business under the name and style M/s. _____ were awarded the contract by GAIL (India) Ltd. in reference to Tender No. _____ dated _____ (“Order/Contract”).

After completion of the above-said items/job under the Order/Contract, we have scrutinized all our claims, contentions, disputes, issues and we hereby confirm that after adjusting all payments received by us against our R.A. Bills and final bill, we have no claims, dues, issues and contentions from GAIL (India) Ltd.

We further absolve GAIL (India) Ltd. from all liabilities present or future arising directly or indirectly out of the Contract.

There is no economic duress or any other compulsion on us for submission of this no claim certificate.

Signature with Seal of Supplier/Vendor

Dated:



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



**PROFORMA OF "INSURANCE SURETY BOND" FOR "EARNEST MONEY DEPOSIT/ BID
SECURITY"**

(To be stamped in accordance with the Stamp Act)

To, M/s GAIL (India) Limited _____	Insurance Surety Bond No.	
	Date of ISB	
	ISB Valid up to (Expiry date)	
	Claim period up to (indicate date of expiry of claim period which includes minimum three months from the expiry date)	
	Stamp Sl. No./e-Stamp Certificate No.	

Dear Sir(s),

In accordance with Tender Document under your reference No _____ M/s. _____ having their Registered / Head Office at _____ (hereinafter called the Tenderer/Bidder), wish to participate in the said tender for _____

As an irrevocable Insurance Surety Bond against Earnest Money Deposit for the amount of _____ is required to be submitted by the Bidder as a condition precedent for participation in the said Tender Document which amount is liable to be forfeited on the happening of any contingencies mentioned in the Tender Document.

We, the _____ [Name & address of the Insurer] at _____ having our Head Office _____ (Local Address) guarantee and undertake to pay immediately on demand without any recourse to the Bidder by GAIL (India) Ltd., the amount _____ without any reservation, protest, demur and recourse. Any such demand made by GAIL (India) Ltd., shall be conclusive and binding on us irrespective of any dispute or difference raised by the Bidder.

This Insurance Surety Bond shall be irrevocable and shall remain valid up to _____ [this date should be two (02) months beyond the validity of the bid]. If any further extension of this Insurance Surety Bond is required, the same shall be extended to such required period on receiving instructions from Bidder M/s. _____ on whose behalf this Insurance Surety Bond is issued.

Notwithstanding anything contained herein:

- The Insurer's liability under this Insurance Surety Bond shall not exceed (currency in figures) (currency in words only)
- This Insurance Surety Bond shall remain in force upto _____ (this expiry date should be two months beyond the validity of bid) and any extension(s) thereof; and
- The Insurer shall be released and discharged from all liability under this Insurance Surety Bond unless a written claim or demand is issued to the Insurer on or before the midnight of _____



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



.....(indicate date of expiry of claim period which includes minimum three months from the expiry of this Insurance Surety Bond) and if extended, the date of expiry of the last extension of this Insurance Surety Bond. If a claim has been received by us within the said date, all the rights of GAIL under this Insurance Surety Bond shall be valid and shall not cease until we have satisfied that claim.

In witness whereof the Insurer, through its authorized officer, has set its hand and stamp on this _____ day of _____ 20__ at _____.

Details of next Higher Authority of the Officials who have issued the Insurance Surety Bond:

Name

Designation

WITNESS:

(SIGNATURE)

(NAME)

(OFFICIAL ADDRESS)

(SIGNATURE)

(NAME)

Designation with Insurer Stamp

E-Mail ID:

Telephone/Mobile No. :

Attorney as per
Power of Attorney No. _____

Date: _____



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



**INSTRUCTIONS FOR FURNISHING "BID SECURITY DEPOSIT/ EARNEST MONEY" BY
"INSURANCE SURETY BOND"**

- a) The Insurance Surety Bond shall be from Insurance Regulatory and Development Authority of India (IRDAI) registered general insurance companies as per guidelines issued by Insurance Regulatory and Development Authority of India (IRDAI).
- b) The Employer shall be the Creditor, the Bidder shall be the Principal debtor and the Insurance company/Insurer shall be the Surety in respect of the Insurance Surety Bond to be issued by the Insurer.
- c) The Insurance Surety Bond should be on Non-Judicial stamp paper/e-stamp paper of appropriate value as per Stamp Act prevailing in the state(s) where the Insurance Surety Bond is submitted or is to be acted upon or the rate prevailing in State where the Insurance Surety Bond is executed, whichever is higher. The Stamp Paper/e-stamp paper shall be purchased in the name of Bidder/Insurer issuing the Insurance Surety Bond.
- d) The expiry date should be arrived at in accordance with "ITB: Clause-xx".
- e) The Insurance Surety Bond by bidders will be given from Insurer as specified in "ITB: Clause-xx".
- f) A letter from the issuing insurer of the requisite Insurance Surety Bond confirming that said Insurance Surety Bond / all future communication relating to the Insurance Surety Bond shall be forwarded to the Purchaser at its address as mentioned at "ITB".
- g) Bidder must indicate the full postal address of the Insurer along with the Insurer's E-mail / Fax / Phone from where the Insurance Surety Bond has been issued at sl.no.2 of Form F-5.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

**MATTER TO BE MENTIONED IN COVERING LETTER TO BE SUBMITTED BY VENDOR
ALONG WITH INSURANCE SURETY BOND**

1	INSURANCE SURETY BOND NO	:				
2	VENDOR NAME / VENDOR CODE	:	NAME			
			VENDOR CODE			
3	INSURANCE SURETY BOND AMOUNT	:				
4	TENDER NO	:				
5	NATURE OF INSURANCE SURETY BOND	:				
	(Please Tick (√) Whichever is Applicable		PERFOR- MANCE IN- SURANCE SURETY BOND	SECURI- TY DE- POSIT	EMD	ADVANCE
6	INSURER DETAILS					
(A)		EMAIL ID	:			
(B)		ADDRESS	:			
(C)		PHONE NO	:			



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



F-20

**PROFORMA OF "INSURANCE SURETY BOND" FOR "CONTRACT PERFORMANCE
SECURITY / SECURITY DEPOSIT"**

(ON NON-JUDICIAL STAMP PAPER OF APPROPRIATE VALUE)

To, M/s GAIL (India) Limited _____	Insurance Surety Bond No.	
	Date of Insurance Surety Bond	
	Insurance Surety Bond Valid up to (Ex- piry date)	
	Claim period up to (indicate date of ex- piry of claim period which includes min- imum three months from the expiry date)	
	Stamp Sl. No./e-Stamp Certificate No.	

Dear Sir(s),

M/s. _____ having registered office at _____ (herein after called the "Contractor/Supplier" which expression shall wherever the context so require include its successors and assignees) have been placed/awarded the job/work of _____ vide PO/LOA /FOA No. _____ dated _____ for GAIL (India) Limited having registered office at 16, Bhikaiji Cama Place, R.K. Puram, New Delhi (herein after called the "GAIL" which expression shall wherever the context so require include its successors and assignees).

The Contract conditions provide that the CONTRACTOR/SUPPLIER shall pay a sum of Rs. _____ (Rupees _____) as full Contract Performance Guarantee in the form therein mentioned. The form of payment of Insurance Surety Bond executed by Insurer, undertaking full responsibility to indemnify GAIL (INDIA) LIMITED, in case of default.

The said M/s. _____ (herein after called the "insurer" which expression shall wherever the context so require include its successors and assignees) has approached us and at their request and in consideration of the premises we having our office at _____ have agreed to give such guarantee as hereinafter mentioned.

1. We _____ hereby undertake to give the irrevocable & unconditional guarantee in form of Insurance Surety Bond to GAIL that



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



if default shall be made by M/s. _____ in performing any of the terms and conditions of the tender/order/contract or in payment of any money payable to GAIL (INDIA) LIMITED we shall on first demand, pay without demur, contest, protest and/ or without any recourse to the contractor to GAIL in such manner as GAIL may direct, the said amount of Rupees _____ only or such portion thereof not exceeding the said sum as you may require from time to time.

2. You will have the full liberty without reference to us and without affecting this Insurance Surety Bond, to postpone for any time or from time to time the exercise of any of the powers and rights conferred on you under the order/contract with the said M/s. _____ and to enforce or to forbear from endorsing any powers or rights or by reason of time being given to the said M/s. _____ and such postponement forbearance would not have the effect of releasing the insurer from its obligation under this debt.
3. Your right to recover the said sum of Rs. _____ (Rupees _____) from us in manner aforesaid is absolute & unequivocal and will not be affected or suspended by reason of the fact that any dispute or disputes have been raised by the said M/s. _____ and/or that any dispute or disputes are pending before any officer, tribunal or court or arbitrator or any other authority/forum and any demand made by you to the Insurer shall be conclusive and binding. The Insurer shall not be released of its obligations under these presents by any exercise by you of its liberty with reference to matter aforesaid or any of their or by reason or any other act of omission or commission on your part or any other indulgence shown by you or by any other matter or changed what so ever which under law would, but for this provision, have the effect of releasing the insurer.
4. The Insurance Surety Bond herein contained shall not be determined or affected by the liquidation or winding up dissolution or changes of constitution or insolvency of the said supplier/contractor but shall in all respects and for all purposes be binding and operative until payment of all money due to you in respect of such liabilities is paid.
5. The Insurer undertakes not to revoke this Insurance Surety Bond during its currency without your previous consent and further agrees that the Insurance Surety Bond shall continue to be enforceable until it is discharged by GAIL in writing. However, if for any reason, the Contractor/Supplier is unable to complete the supply/work within the period stipulated in the order/contract and in case of extension of the date of delivery/completion resulting extension of defect liability period/guarantee period of the supplier/contractor fails to perform the supply/work fully, the insurer hereby agrees to further extend this Insurance Surety Bond at the instance of the Contractor/Supplier till such time as may be determined by GAIL. If any further extension of this Insurance Surety Bond is required, the same shall be extended to such required period on receiving instruction from M/s. _____ (contractor) on whose behalf this Insurance Surety Bond is issued.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



6. Insurer also agrees that GAIL at its option shall be entitled to enforce this Insurance Surety Bond against the Insurer (as principal debtor) in the first instant, without proceeding against the Contractor/Supplier and notwithstanding any security or other guarantee that GAIL may have in relation to the Contractor/Supplier's liabilities.
7. The amount under the Insurance Surety Bond is payable forthwith without any delay by Insurer upon the written demand raised by GAIL. Any dispute arising out of or in relation to the said Insurance Surety Bond shall be subject to the exclusive jurisdiction of courts at New Delhi.
8. Therefore, we hereby affirm that we are guarantors and responsible to you on behalf of the Contractor/Supplier up to a total amount of _____ (amount of guarantees in words and figures) and we undertake to pay you, upon your first written demand declaring the Contractor/Supplier to be in default under the order/contract and without caveat or argument, any sum or sums within the limits of (amounts of guarantee) as aforesaid, without your needing to prove or show grounds or reasons for your demand or the sum specified therein.
9. We have power to issue this Insurance Surety Bond in your favor under our Memorandum and Articles of Association, and the undersigned has full power to sign and execute documents under the Power of Attorney, dated _____ granted to him by the Insurer.
11. Notwithstanding anything contained herein:
a) The Insurer's liability under this Insurance Surety Bond shall not exceed (currency in figures) (currency in words only)
b) This Insurance Surety Bond shall remain in force upto _____ (this date should be expiry date of defect liability period of the Contract) and any extension(s) thereof; and
12. The Insurer shall be released and discharged from all liability under this Insurance Surety Bond unless a written claim or demand is issued to the Insurer on or before the midnight of(indicate date of expiry of claim period which includes minimum three months from the expiry of this Insurance Surety Bond) and if extended, the date of expiry of the last extension of this Insurance Surety Bond. If a claim has been received by us within the said date, all the rights of GAIL under this Insurance Surety Bond shall be valid and shall not cease until we have satisfied that claim.
13. Details of next Higher Authority of the Officials who have issued the Insurance Surety Bond:

Name

Designation

Yours faithfully,

Insurer by its Constituted Attorney

Signature of a person duly

Authorized to sign on behalf of the Insurer



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



INSTRUCTIONS FOR FURNISHING

**"CONTRACT PERFORMANCE SECURITY / SECURITY DEPOSIT" BY "INSURANCE SURETY
BOND"**

- a) The Insurance Surety Bond shall be from Insurance Regulatory and Development Authority of India (IRDAI) registered general insurance companies as per guidelines issued by Insurance Regulatory and Development Authority of India (IRDAI).
- b) The Employer shall be the Creditor, the Bidder shall be the Principal debtor and the Insurance company/Insurer shall be the Surety in respect of the Insurance Surety Bond to be issued by the Insurer.
- c) The Insurance Surety Bond should be on Non-Judicial stamp paper/e-stamp paper of appropriate value as per Stamp Act prevailing in the state(s) where the Insurance Surety Bond is submitted or is to be acted upon or the rate prevailing in State where the Insurance Surety Bond is executed, whichever is higher. The Stamp Paper/e-stamp paper shall be purchased in the name of Bidder/Insurer issuing the Insurance Surety Bond.
- d) The Insurance Surety Bond by successful Bidder(s) will be given on non-judicial stamp paper as per 'stamp duty' applicable. The non-judicial stamp paper should be in name of the issuing Insurer.
- e) The Insurance Surety Bond by Bidders will be given from insurer as specified in cl.no. XX of ITB [Section-III] of Tender Document.
- f) A letter from the issuing insurer of the requisite Insurance Surety Bond confirming that said Insurance Surety Bond and all future communication relating to the Insurance Surety Bond shall be forwarded to Purchaser.
- g) Supplier/Contractor shall submit attached cover letter (Annexure) while submitting Contract Performance Security / Security Deposit.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

**MATTER TO BE MENTIONED IN COVERING LETTER TO BE SUBMITTED BY VENDOR
ALONG WITH INSURANCE SURETY BOND**

1	INSURANCE SURETY BOND NO	:				
2	VENDOR NAME / VENDOR CODE	:	NAME			
			VENDOR CODE			
3	INSURANCE SURETY BOND AMOUNT	:				
4	PURCHASE ORDER/ LOA NO	:				
5	NATURE OF INSURANCE SURETY BOND	:				
	(Please Tick (√) Whichever is Applicable		PERFORMANCE INSURANCE SURETY BOND	SECURI- TY DE- POSIT	EMD	AD- VANCE
6	INSURER DETAILS					
(A)		EMAIL ID	:			
(B)		ADDRESS	:			
(C)		PHONE NO	:			



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



SECTION IV

GENERAL CONDITIONS OF CONTRACT (GCC)

*General Conditions of Contract - Works
is available on GAIL's Tender website
(<http://gailtenders.in/Gailtenders/gccs.asp>).*





TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



SECTION-V

SPECIAL CONDITIONS OF CONTRACT (SCC)

Note: GAIL Special Condition of Contract (SCC) shall prevail over GCC where there is conflict on terms & conditions



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



SPECIAL CONDITIONS OF CONTRACT





TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)





TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

INDEX

- 1.0 GENERAL
- 2.0 SCOPE OF WORK & SCOPE OF SUPPLY
- 3.0 SUPPLY OF WATER, POWER & OTHER UTILITIES
- 4.0 COMPLETION SCHEDULE/ COMPLETION PERIOD
- 5.0 DRAWINGS AND DOCUMENTS
- 6.0 COMPLIANCE WITH LAWS
- 7.0 GOVERNMENT OF INDIA NOT LIABLE
- 8.0 REGISTRATION OF THE CONTRACT WITH STATUTORY AU-
THORITIES (FOR FOREIGN BIDDER)
- 9.0 LIMITATION OF LIABILITY
- 10.0 CRITICAL WORK TO BE CARRIED OUT BY CONSORTIUM LEADER-
DELETED
- 11.0 CONTRACT PERFORMANCE SECURITY/ SECURITY DEPOSIT
- 12.0 TAXES, DUTIES AND LEVIES IN INDIA
- 13.0 TAXES, DUTIES AND LEVIES IN FOREIGN COUNTRIES
- 14.0 SUBSEQUENT LEGISLATION
- 15.0 STATUTORY VARIATION IN TAXES & DUTIES - **DELETED**
- 16.0 INCOME TAX & CORPORATE TAX
- 17.0 CUSTOM DUTY
- 18.0 CUSTOM DUTY ON CONSTRUCTION EQUIPMENTS
- 19.0 ISSUE OF ESSENTIALITY CERTIFICATE
- 20.0 IMPORT LICENCE
- 21.0 WITHHOLDING, ACCOUNTING AND TAX REQUIREMENTS
- 22.0 INTELLECTUAL PROPERTY
- 23.0 FIRM PRICE
- 24.0 WORKS CONTRACT
- 25.0 PROVIDENT FUND ACT
- 26.0 MOBILIZATION ADVANCE
- 27.0 CHANGE ORDERS/ EXTRA WORKS/ DEVIATIONS
- 28.0 CONSTRUCTION RIGHT -OF-USE AND PERMITS
- 29.0 CONSTRUCTION EQUIPMENT AND ORGANIZATION
- 30.0 MECHANISED CONSTRUCTION
- 31.0 GENERAL GUIDELINES DURING AND BEFORE ERECTION
- 32.0 PRICE ADJUSTMENT DUE TO DELAYED MOBILIZATION OR
SHORTFALL IN MOBILISATION OF MINIMUM EQUIPMENT
AND MANPOWER
- 32B.0 SCHEDULE FOR SUBMISSION OF DOCUMENTS
- 33.0 MEASUREMENT OF WORKS
- 34.0 TERMS OF PAYMENT
- 35.0 REPAIR OF PIPE DEFECTS
- 36.0 ISSUE OF EMPLOYER/CONSULTANT SUPPLIED MATERIAL
- 37.0 LOCATION OF DUMPYARD/ WAREHOUSE/ STORAGE YARD

	<p style="text-align: center;">TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION NETWORK (1 YEAR ARC)</p> <p style="text-align: center;">TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101</p>	
---	--	--

- 38.0 STATUTORY APPROVALS
- 39.0 TESTS AND INSPECTION
- 40.0 INSPECTION OF SUPPLY ITEMS
- 41.0 FINAL INSPECTION
- 42.0 COMPENSATION FOR EXTENDED STAY
- 43.0 COMPUTERIZED CONTRACTORS BILLING SYSTEM
- 44.0 TEMPORARY WORKS
- 45.0 DISTINCTION BETWEEN FOUNDATION AND SUPERSTRUCTURE
- 46.0 QUALITY ASSURANCE/ QUALITY CONTROL
- 47.0 HEALTH SAFETY AND ENVIRONMENT (HSE) MANAGEMENT
- 48.0 SITE CLEANING
- 49.0 COMPLETION DOCUMENTS
- 50.0 COORDINATION WITH OTHER AGENCIES
- 51.0 SETTLEMENT OF DISPUTE BETWEEN TWO PSU's - **DELETED**
- 52.0 UNDERGROUND AND OVERHEAD STRUCTURES
- 53.0 TEST CERTIFICATES
- 54.0 ROYALTY
- 55.0 EXCAVATION BY BLASTING
- 56.0 SITE FACILITIES FOR WORKMEN
- 57.0 EXECUTION OF ELECTRICAL WORKS - **DELETED**
- 58.0 HYDROSTATIC TESTING
- 59.0 ARBITRATION
- 60.0 MAKE OF MATERIALS
- 61.0 ADDITIONAL WORKS/ EXTRA WORKS
- 62.0 COMPENSATION FOR DELAY/PRICE REDUCTION SCHEDULE FOR ANY DELAY
- 63.0 PROJECT PLANNING, SCHEDULING AND MONITORING SYSTEM
- 64.0 RESPONSIBILITY OF CONTRACTOR
- 65.0 CHECKING OF LEVELS
- 66.0 STORAGE FACILITIES
- 67.0 ABNORMALLY HIGH RATED ITEMS (AHR ITEMS)
- 68.0 INSURANCE FOR FREE ISSUE MATERIAL
- 69.0 INSURANCES IN INDIA
- 70.0 INSURANCE IN FOREIGN COUNTRIES
- 71.0 BANK GUARANTEES
- 72.0 SUBMISSION OF COLOURED PHOTOGRAPHS
- 73.0 DISPOSAL OF EMPTY OFC CABLE DRUM - **DELETED**
- 74.0 VIDEOTAPE
- 75.0 PIPES FOR WELDING QUALIFICATION
- 76.0 SPARES
- 77.0 BUILDING AND OTHER CONSTRUCTION WORKER'S ACT
- 78.0 INTERMEDIATE CONSTRUCTION MILE STONE - **DELETED**
- 79.0 SINGLE POINT RESPONSIBILITY

	<p style="text-align: center;">TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION NETWORK (1 YEAR ARC)</p> <p style="text-align: center;">TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101</p>	
---	--	--

- 80.0 BONUS FOR EARLY COMPLETION
- 81.0 REQUIREMENT OF EMPLOYMENT VISA FOR FOREIGN NATIONALS
- 82.0 REQUIREMENT OF PAN FOR FOREIGN BIDDER
- 83.0 DIRECT PAYMENTS TO SUB-VENDORS/ SUPPORTING AGENCIES OF MAIN CONTRACTOR
- 84.0 SUB-LETTING OF WORKS
- 85.0 JOINTS MEASUREMENT OF WORK EXECUTED, BILLING, INVOICE AND PAYMENTS.
- 86.0 CONTRACTOR TO ENGAGE CONTRACT MANPOWER BELONGING TO SCHEDULED CASTES AND WEAKER SECTIONS OF THE SOCIETY
- 87.0 WAY BILL / ROAD PERMIT
- 88.0 LOCAL EMPLOYMENT
- 89.0 LOCAL SKILL DEVELOPMENT
- 90.0 QUARTERLY CLOSURE OF THE CONTRACT
- 91.0 COMPLETION CERTIFICATE
- 92.0 PRADHAN MANTRI SURAKSHA BIMA YOJANA (PMSBY) AND PRADHAN MANTRI JEEVAN JYOTI BIMA YOJANA (PMJJBY)
- 93.0 ANNUAL RATE CONTRACT CONDITIONS
- 94.0 PLANNING AND DESIGNING IN PURVIEW OF VULNERABILITY ATLAS OF INDIA



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



1.0 GENERAL

- 1.1 Special Conditions of Contract shall be read in Conjunction with the General conditions of Contract, specification of work, Drawings and any other documents forming part of this Contract wherever the context so requires.
- 1.2 Notwithstanding the sub-division of the documents into these separate sections and volumes, every part of each shall be deemed to be supplementary to and complementary of every other part and shall be read with and into the Contract so far as it may be practicable to do so.
- 1.3 Where any portion of the General Condition of Contract is repugnant to or at variance with any provisions of the Special Conditions of Contract, unless a different intention appears, the provisions of the special Conditions of Contract shall be deemed to over-ride the provisions of the General Conditions of Contract and shall to the extent of such repugnancy, or variations, prevail.
- 1.4 Wherever it is mentioned in the specifications that the Contractor shall perform certain work or provide certain facilities, it is understood that the Contractor shall do so at his own cost and the value of contract shall be deemed to have included cost of such performance and provisions, so mentioned.
- 1.5 The materials, design, and workmanship shall satisfy the relevant Indian Standards, the Job Specifications contained herein and Codes referred to. Where the job specification stipulate requirements in addition to those contained in the standard codes and specifications, these additional requirements shall also be satisfied.
- 1.6 In case of an irreconcilable conflict between Indian or other applicable standards, General Conditions of Contract, Special Conditions of Contract, Specifications, Drawings or Schedule of Rates, the following shall prevail to the extent of such irreconcilable conflict in order of precedence :
- i) Contract Agreement
 - ii) Detailed Letter of Acceptance along with Statement of Agreed Variations.
 - iii) Fax / Letter of Intent / Fax of Acceptance.
 - iv) Schedule of Rates as enclosures to Letter of Acceptance.
 - v) Job / Particular Specifications.
 - vi) Drawings
 - vii) Technical / Material Specifications.
 - viii) Special Conditions of Contract.
 - ix) Instruction to Bidders
 - x) General Conditions of Contract.



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- xi) Indian Standards
- xii) Other applicable Standards

- 1.7 It will be the Contractor's responsibility to bring to the notice of Engineer-in-Charge any irreconcilable conflict in the contract documents before starting the work (s) or making the supply with reference which the conflict exists.
- 1.8 In the absence of any Specifications covering any material, design of work (s) the same shall be performed / supplies / executed in accordance with Standard Engineering Practice as per the instructions / directions of the Engineer-in-Charge, which will be binding on the Contractor.
- 1.9 *In case of any conflict in technical requirements among PJS, TS, SCC, SOR etc. of tender document and international / national codes / standards, more stringent requirement shall govern or as per the decision of EIC.*

2.0 SCOPE OF WORK & SCOPE OF SUPPLY

The scope of work covered in this Contract will be as described in **Annexure- 1 to SCC**, Particular job specifications, Standard Specifications, Schedule of Rates etc. The scope of supply covered in this Contract will be as described in **Annexure-2 to SCC**, Particular Job Specifications, Standard Specifications, Schedule of Rates etc. It is however, explicitly understood that scope described is not limiting, in far as the responsibilities of the contractor are concerned and shall include, inter alia, carrying out any and all works and providing any and all facilities as are required to complete the works in all respect.

3.0 SUPPLY OF WATER, POWER & OTHER UTILITIES

- 3.1 The Clause No. 2.3 to 2.5 given in General Conditions of Contract is modified to following extent:
- 3.2 The Contractor shall be responsible at his own cost for arranging and providing all the required Water, Power, land required for temporary site office , fabrication yard and other utilities, in the quantities and at the times required for performance of work under the contract. The contract price shall be deemed to include all costs towards the same.

The Employer/CMC shall not supply water, power and other utilities.



- 3.3 Contractor shall, if required by him, for the entire duration of the execution of the work make available near the site, land for construction of Contractor's office, Warehouse, Workshops and for any purpose in connection with providing infrastructure required for the execution of the Contract. The Contractor shall at his own cost construct all temporary buildings and provide suitable water supply and sanitary arrangement as required. On completion of the work undertaken by the Contractor, he shall remove all temporary works erected by him and have the site cleared as directed by Engineer-in-Charge. If the Contractor shall fail to comply with these requirements, the Engineer-in-Charge may at the expense of the Contractor remove such surplus and rubbish materials and dispose off the same as he deems fit and get the site cleared as aforesaid, and the Contractor shall forthwith pay the amount of all expenses so incurred and shall have no claims in respect of any such surplus material disposed of as aforesaid.
- 3.4 Cutting of trees shall not be permitted except in the case that tree is falling on the line of ROU/ROW. In such circumstances, details of such tree being cut shall be prepared and forest/ municipal authorities be informed and necessary approval be obtained by contractor. However, after backfilling of trench & restoration, contractor should plant equal number of saplings in that area, cutting of tree for any purposes (fuel etc) by workers are strictly prohibited.

4.0 COMPLETION SCHEDULE / COMPLETION PERIOD

- 4.1 The work shall be executed strictly as per COMPLETION SCHEDULE / COMPLETION PERIOD given in **Annexure-3 to SCC** in the bidding document. The period of completion given includes the time required for mobilization as well as testing, rectifications, if any, retesting and completion in all respects to the entire satisfaction of the Engineer-in-Charge.
- 4.2 A joint programme of execution of work will be prepared by the Engineer-in-Charge/CMC and Contractor. This programme will take into account the time of completion mentioned above.
- 4.3 Monthly/ weekly construction programme will be drawn up by Engineer-in-Charge jointly with the contractor based on availability of work fronts and the joint construction programmes as above clause. The Contractor shall scrupulously adhere to these Targets/ Programme by deploying adequate personnel, construction tools & tackles and shall also supply all materials of his scope of supply in good time to achieve the targets set out in the weekly and monthly programme. In all matters concerning the extent of targets set out in the weekly and achievements, the decision of the Engineer-in-Charge shall be final and binding on the contractor.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- 4.4 If the Contractor fails to achieve the targeted progress schedule of each month as mentioned in the bidding document, the Employer/CMC at its option, may terminate the contract as contractor's default and get the work completed from other sources at contractor's risk & cost.
- 4.5 Contractor shall give every day report on category wise labour and equipment deployed along with the progress of work done on previous day in the proforma prescribed by the Engineer-in-Charge.
- 4.6 The contractor shall submit fortnightly report covering all major activities indicating schedule / actual progress, slippages & its reasons and catch up plan.
- 4.7 The Bidder shall also consider local labour/ Trade unionism in the state while quoting. No waiver shall be attributable to the stoppage due to union activities & due to the influence of trade unionism and adverse weather conditions.
- 4.8 No waiver shall be attributable to the stoppage due to union activities & due to the influence of trade unionism and adverse weather conditions.

5.0 DRAWINGS AND DOCUMENTS

- 5.1 The drawings accompanying the bid document (if any) are of indicative nature and issued for bidding purpose only. Purpose of these drawing is to enable the bidder to make an offer in line with the requirements of the Owner/ Consultant. However no extra claim whatsoever, shall be entertained for variation in the "Approved for Construction" and "Bid document drawings" regarding any changes/units. Construction shall be as per drawings/specifications issued/approved by the Engineer-in-Charge during the course of execution of work. Detailed construction drawings (wherever required) on the basis of which actual execution of work is to proceed will be prepared by the contractor.
- 5.2 The drawings and documents to be submitted by the Contractor to Owner/Consultant after award of the work as per the requirements enlisted in the bidding document shall be for Owner/Site Consultant's review, information and record. The Contractor shall ensure that drawings and documents submitted to Owner/Site Consultant are accompanied by relevant calculations, data as required and essential for review of the document/ drawings. Site consultant shall review the drawings/ documents within two weeks from the date of submission provided the same are accompanied by relevant calculations, data as required and essential for review.
- 5.3 All documents and drawings including those of Contractors sub-vendor's manufacturer's etc. shall be submitted to Owner/Consultant after having



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



been fully vetted in detail, approved and co-opted by the Contractor & shall bear Contractor seal/ certifications to this effect. All documents/drawings & submissions made to Owner/Consultant without compliance to this requirement will not be acceptable and the delay & liability owing to this shall be to the Contractor's account.

- 5.4 The review of documents and drawings by Owner/Consultant shall not absolve Contractor from his responsibility to meet the requirements of specifications, drawings etc. and liabilities for mistakes and deviations. Upon receiving the comments on the drawing/documents reviewed by Owner/Consultant, Contractor shall incorporate the comments as required and ensure their compliance.
- 5.5 Copies of all detailed working drawing relating to the works shall be kept at the contractors' office at the site and shall be made available to the Engineer-in-charge/ Owner/Consultant at any time during execution of the contract. However no extra claim whatsoever shall be entertained for any variation in the "approved/issued for construction drawings" and "tender drawings" regarding any changes/units unless otherwise agreed.
- 5.6 The Contractor shall rectify any inaccuracies, errors and non-compliance to contractual requirements. Any delay occurring on this shall not construe a reason for delay/ extension.

6.0 COMPLIANCE WITH LAWS

- 6.1 The Contractor shall abide by all applicable rules, regulations, statutes, laws governing the performance of works in India, including but not limited to the following:
- i) Contract Labour (Regulation & Abolition) Act 1970 & the centre rules, 1971 framed there under.
 - ii) Payment of Wages Act.
 - iii) Minimum Wages Act.
 - iv) Owner's Liability Act.
 - v) Factory Act.
 - vi) Apprentices Act.
 - vii) Workman's Compensation Act.
 - viii) Industrial Dispute Act.
 - ix) Environment Protection Act.
 - x) Wild life Act.
 - xi) Maritime Act.
 - xii) Any other Statute, Act, Law as may be applicable.
 - xiii) PNGRB Act.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



7.0 GOVERNMENT OF INDIA NOT LIABLE

- 7.1 It is expressly understood and agreed by and between the Contractor and the Owner/Consultant that the Owner/Consultant is entering into this agreement solely on its own behalf and not on behalf of any other person or entity. In particular, it is expressly understood and agreed that the Government of India is not a party to this agreement and has no liabilities, obligations or rights there under. It is expressly understood and agreed that the Owner/Consultant is an independent legal entity with power and authority to enter into contract, solely in its own behalf under the applicable laws of India and general principal of Contract Law. The Contractor expressly agrees, acknowledges and understands that the Owner/Consultant is not an agent, representative or delegate of Govt. of India. It is further understood and agreed that the Govt. of India is not and shall not be liable for any acts, omissions, commissions, breaches or other wrongs arising out of the contract. Accordingly, contractor hereby expressly waives, releases and foregoes any and all actions or claims, including cross claims, impleader claims or counter claims against the Govt. of India arising out of this contract and covenants not to sue to Govt. of India as to any manner, claim, cause of action or thing whatsoever arising of or under this agreement.

8.0 REGISTRATION OF THE CONTRACT WITH STATUTORY AUTHORITIES (FOR FOREIGN BIDDER) -VOID

9.0 LIMITATION OF LIABILITY

- 9.1 The final payment by the Owner/CMC in pursuance of the Contract terms shall not mean release of the Contractor from all of his liabilities under the Contract. The Contractor shall be liable and committed under this contract to fulfill all his liabilities and responsibilities, till the time of release of contract performance guarantee by the Owner/CMC.
- 9.2 Notwithstanding anything contrary contained herein, the aggregate total **liability** of Contractor under the Contract or otherwise shall be limited to 100% of Contract value. However, neither party shall be liable to the other party for any indirect and consequential damages, loss of profit or loss of production.

10.0 *DELETED*



11.0 CONTRACT PERFORMANCE SECURITY / SECURITY DEPOSIT

11.1 Please refer clause no. 38 of ITB (Vol I) and clause no. 24.0 of GCC (General Condition of Contract).

11.2 In addition to clause no.38 of ITB and 24 of GCC following will also apply: -

- a) In the event completion of works is delayed beyond the Scheduled Completion Date for any reasons whatsoever, the Contractor shall have the validity of the guarantee suitably extended to cover the period mentioned above.
- b) The Owner/CMC shall have an unqualified option under this guarantee to invoke the Banker's Guarantee and claim the amount there under in the event of Contractor failing to honour any of the commitments entered into under this Contract and/or in respect of any amount due from the Contractor to the Owner/ CMC. In case Contractor fails to furnish the requisite Bank Guarantee as stipulated above, then the Owner/CMC shall have the option to terminate the Notification of Award of Work and forfeit the Bid Security/Earnest Money amount and no compensation for the works performed shall be payable upon such termination.
- c) Upon completion of the Works as per Completion Schedule stipulated in Contract, the above said guarantee shall be considered to constitute the Contractor's warranty/guarantee for the work done by him or for the Works supplied and performance as per the specifications and any other conditions against this Contract. The warranty/guarantee shall remain in force for 12 months from the date of issuance of certificate of Completion and Acceptance against this Contract as per GCC. Contractor shall also arrange for the Performance Guarantee to remain valid until expiration of the guarantee period for entire works covered under the contract.
- d) In the event of Completion of Project being delayed beyond the Scheduled Completion Date, the Owner/CMC may without prejudice to any other right or remedy available to the Owner/CMC, operate the Bank Guarantee to recover the Compensation for delay as per provision of Contract. The Bank Guarantee amount shall thereupon be increased to the original amount, or the Contractor may alternatively submit a fresh Bank Guarantee for the equivalent amount of compensation for delay recovered.

12.0 TAXES, DUTIES AND LEVIES IN INDIA

The Contractor agrees to and does hereby accept full and exclusive liability for the payment of any and all taxes, duties, including GST etc. now in force and hereafter increased, imposed or modified from time to time in respect of works and materials and all contributions and taxes for unemployment compensation,



insurance and old age pensions or annuities now or hereafter imposed by any Central or State Government authorities which are imposed with respect to or covered by the wages, salaries, or other compensations paid to the persons employed by the Contractor and the Contractor shall be responsible for the compliance with all obligations and restrictions imposed by the Labour Law or any other law affecting Owner-employee relationship and the Contractor further agrees to comply, and to secure the compliance of all subcontractors with all applicable Central, State, Municipal and local law and regulation, and requirement of any central, State or Local Government agency or authority. Contractor further agrees to defend, indemnify and hold Owner/CMC harmless from any liability or penalty which may be imposed by the Central, State or Local authorities by reason of any violation by Contractor or Subcontractor of such laws, regulations or requirements and also from all claims, suits or proceedings that may be brought against the Owner/CMC arising under, growing out of, or by reason of the work provided for by this Contract, by third parties, or by Central or State Government authority or any administrative subdivision thereof. The prices shall also be inclusive of GST as applicable.

- 12.2 Owner/CMC shall make from Contractors' bills such tax deductions as are required as per rules and regulations in force from time to time.
- 12.3 If GST is applicable during site fabrication, the same must be assessed and deemed to be included by the bidder in the quoted prices. The bidder in this regard shall arrange all required formalities.
- 12.4 Bidder shall take care of all applicable taxes & duties while submitting their prices.
- 12.5 Any errors of interpretation of applicability of taxes/ duties by Bidders shall be to their account.

13.0 TAXES, DUTIES AND LEVIES IN FOREIGN COUNTRIES

- 13.1 The Contractor agrees to and does hereby accept full and exclusive liability at its own cost for the payment of any and all taxes, duties and levies etc as are payable to any government, local or statutory authority in any country other than India, as in force on bid due date or as hereafter imposed, increased or modified, and as are payable by Contractor, his agents, sub-contractor and their employees etc. for performance of work under this contract. The Contractor shall be deemed to have been fully informed with respect to all such liabilities and considered the same in his bid, and the contract shall not be varied in any way on this account.

14.0 SUBSEQUENT LEGISLATION



- 14.1 All duties, taxes, fees, charges, expenses, etc. (except where otherwise expressly provided in the Contract) as may be levied/ imposed in consequence of execution of the works or in relation thereto or in connection therewith as per the Acts, Laws, Rules, Regulations in force shall be to Contractor's account. However, any new taxes /duties imposed after the date of submission of last price bid & up to Contractual Completion date shall be to the GAIL's account but such Taxes /duties imposed beyond Contractual Completion date shall be to the Contractor's account. However if such new taxes etc. are in substitute of existing taxes, it will be considered on merit of each case.

15.0 **VOID**

16.0 **INCOME TAX & CORPORATE TAX**

Please refer clause no. 43 of ITB, Vol I.

17.0 **VOID**

18.0 **VOID**

19.0 **VOID**

20.0 **IMPORT LICENCE**

- 20.1 Contractor shall arrange import of all materials required for permanent incorporation in the works as well as construction equipment as per the guidelines laid down by the Government of India. Owner/CMC shall not provide import licence.

21.0 **WITHHOLDING, ACCOUNTING AND TAX REQUIREMENTS**

- 21.1 Contractor agrees for withholding from wages and salaries of its agents, servants or employees all sums, required to be withheld by the laws of the Republic of India or any other agency having jurisdiction over the area where Contractor is conducting operations, and to pay the same promptly and directly when due to the proper authority. Contractor further agrees to comply with all accounting and reporting requirements of any Nation having jurisdiction over the subject matter hereof and to conform to such laws and regulations and to pay the cost of such compliance. If requested, Contractor will furnish the evidence of payment of applicable taxes, in the country(ies) of the Contractor's and his sub-contractor(s) and expatriate employees.

22.0 **INTELLECTUAL PROPERTY**



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- 22.1 Neither Owner/CMC nor Contractor nor their personnel, agents nor any sub-contractor shall divulge to any one (other than persons designated by the party disclosing the information) any information designated in writing as confidential and obtained from the disclosing party during the course of execution of the works so long as and to the extent that the information has not become part of the public domain. This obligation does not apply to information furnished or made known to the recipient of the information without restriction as to its use by third parties or which was in recipient's possession at the time of disclosure by the disclosing party. Upon completion of the works or in the event of termination pursuant to the provisions of the contract, Contractor shall immediately return to Owner/CMC all drawings, plans, specifications and other documents supplied to the Contractor by or on behalf of Owner/CMC or prepared by the Contractor solely for the purpose of the performance of the works, including all copies made thereof by the Contractor.

23.0 FIRM PRICE

- 23.1 The quoted prices shall be firm and shall not be subjected to price escalation till the work is completed in all respects.

24.0 WORKS CONTRACT

- 24.1 The work covered under this contract shall be treated as "Works Contract".

25.0 PROVIDENT FUND ACT

- 25.1 The Contractor shall strictly comply with the provisions of Employees Provident Fund Act and register themselves with RPFC before commencing work. The Contractor shall deposit Employees and Owners contributions to the RPFC every month. The Contractor shall furnish along with each running bill, the challan/ receipt for the payment made to the RPFC for the preceding months.



26.0 MOBILIZATION ADVANCE -NOT APPLICABLE FOR THIS TENDER

27.0 CHANGE ORDERS/ EXTRA WORKS/ DEVIATIONS

27.1 A change order will be initiated in case:

- i) The Owner/CMC directs the Contractor to include any addition to the scope of work not covered under this contract or delete any Section of the scope of the work under the contract.
- ii) Contractor requests to delete any part of the work which will not adversely affect the operational capabilities of the project and if agreed by the Owner/CMC and for which cost and time benefits shall be passed on to the Owner/CMC.

27.2 Any changes required by the Owner/CMC before giving their approval to detailed procedure or any other document relating to material procurement, layout plans etc for complying with the requirements of bidding document shall not be construed to be a change in the scope of work under the contract.

27.3 Any change order as above comprising an alteration which involves a change in the cost of the works (which sort of alteration is hereinafter called a "Variation") shall have impact on the contract value that shall be dealt towards end of contract. All change orders shall be approved by the EIC.

27.4 If the contract provides applicable rates for the valuation of the variation in question the contract price shall be increased or decreased in accordance with those rates. If the parties agree that the contract does not contain applicable rates then the parties shall negotiate a revision of the contract price which shall represent the change in cost of the works caused by the variations. Any change order must be duly approved by the Owner/CMC in writing.

27.5 If there is a difference of opinion between Contractor and Owner/CMC whether a particular work constitutes a change order or not, the matter shall be handled in accordance with the procedures set forth in para 27.7.8 and 27.7.9 here below.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- 27.6 Within 10 (Ten) working days of receiving the comments from the Owner/CMC on the documents submitted by the Contractor for approval, the Contractor's response in writing stating which item(s) is/are potential change (s), if applicable, will be submitted to the Owner/CMC.
- 27.7 **Procedure**
- 27.7.1 During execution of work if the Contractor observes that any new requirements which is not specific or intended in the bidding document has been indicated by Owner/CMC, they shall discuss the matter with Owner/CMC's representatives.
- 27.7.2 In case such requirement arises from the side of the Contractor they would also discuss the matter with Owner/CMCs Representative.
- 27.7.3 In either of the two cases above, the representatives of both the parties shall discuss the project requirement and mutually decide whether the project requirement constitutes a change order.
- 27.7.4 If it is mutually agreed that the project requirement/Inquiry constitutes a "Change Order" then a joint memorandum will be prepared to confirm a "Change Order" and basic ideas of necessary agreed modifications.
- 27.7.5 Contractor will study the work required in accordance with the Joint memorandum and assess subsequent schedule and cost effect if any.
- 27.7.6 The results of this study would be discussed mutually to enable Owner/CMC to give a final decision whether Contractor should proceed with the Change Order or not, in the best interest of the Project.
- 27.7.7 If Owner/CMC's representative accepts the change order in writing then Contractor shall proceed with the work stipulated in the Change order. Time worked by all workmen employed and a statement showing the description and quantity of all materials and plant utilised for extra work shall be submitted to Owner/CMC. The Owner/CMC's representative shall sign and return to the Contractor the statement, as agreed. At the end of each month the Contractor shall deliver to the Owner/CMC's representative a priced statement of the labour, materials and plant used. Whenever any dispute arises as to cost allocation between the Contractor and the Owner/CMC, the voucher shall nevertheless be signed by the Owner/CMC as a record of time worked and materials used. List and Vouchers so signed will be the sub-



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



ject of negotiations between the Owner/CMC and the Contractor regarding their costs allocation.

- 27.7.8 In case, mutual agreement as above that is whether Project Requirement constitutes a Change order or not, is not reached, then Contractor, in the interest of the project, shall take up the implementation of the work, if advised in writing to do so by Owner/CMC's representative pending settlement between the two parties to the effect whether the Project Requirement constitutes a change order or not as per the terms and conditions of Contract Documents.
- 27.7.9 The time and cost effect in such a case shall be mutually verified for the purpose of record. Should it be established that the said work is constituting a Change Order, the same shall be compensated taking into account the records kept and in accordance with the contract.
- 27.7.10 Should the amount of Extra Work/ Change Order, if any, which the Contractor may be required to perform by the Owner/CMC, fairly entitles the Contractor to extensions of time beyond the scheduled completion date for completion of either the whole of the works or for such Extra Work only, the Owner/CMC and the Contractor shall mutually discuss and decide the extension of time, if any to be granted to the Contractor.

28.0 CONSTRUCTION RIGHT-OF-USE AND PERMITS:

28.1

- A. Company will acquire the ROU free of any encroachments/ temporary/permanent structures under P&MP act in general. Acquiring of ROU means publishing of 3(1) and 6(1) Gazette notification/publication under P&MP act 1962. Therefore, handing over of 6(1) gazette shall mean handing over of ROU to the Contractor for opening of RoU. Contractor shall open the ROU with revenue team of competent authority appointed by GAIL and start the construction activities.
- B. During field measurement if any anomaly on legality of the published 6(1) is observed in certain plot(s)/Survey nos. i.e. rightfully not acquired as per the P&MP Act-1962 e.g. inclusion of residential/commercial/industrial plots or standing permanent structure prior to 3(1) declaration etc. then this portion of the ROU shall not be considered acquired ROU and will be deducted from the ROU handed over to Contractor.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- C. All the awards declared by the Competent Authority will be binding to the Land owners except when such dispute(s) is/are
- i. Revised subsequently by the Competent authority himself due to various reasons deem to do so. Hence the period or time lapse between the dispute raised and the revision effected shall not be accountable to the Contractor and then this portion of the ROU shall not be considered acquired ROU and will be deducted from the ROU handed over to Contractor.
 - ii. If any dispute upheld by the District court and stay order is passed, then the period or time lapse between the dispute raised till the stay order is dismissed shall not be accountable to the Contractor and then this portion of the ROU shall not be considered acquired ROU and will be deducted from the ROU handed over to Contractor.
- D. If any intervention from State Administration in any section of the ROU where work had to be stopped due to intervention from State Administration shall not be accountable to the Contractor and then this portion of the ROU shall not be considered acquired ROU and will be deducted from the ROU handed over to Contractor.
- E. Removal of all the hindrances in the ROU shall be sole responsibility of the contractor except due to reasons as in A to D as above, not accountable to Contractor.

28.1.1 Opening of ROU to start construction works and related activities, management & maintaining of ROU during entire period of execution through necessary liaison & coordination with local people / Farmers / authorities for ensuring hindrance-free construction works at site shall be the responsibility of contractor. In case any obstruction by landowner(s)/farmers/villagers or encroachments or structures are encountered during execution, same shall be got removed by the contractor or local detouring of pipeline shall be carried out. All costs towards such activities shall be to Contractor's account. Compensations rightfully due and applicable as per provisions of the P&MP act shall be paid by COMPANY.

28.2 For pipeline construction purposes, ROU of varying width shall be made available depending upon site condition. In cross country areas the ROU of 20 m width shall normally be made available to Contractor to the extent feasible. Pipeline shall be laid on one side of boundary of ROU as advised by Engineer- in-Charge. In Forest areas, hilly terrain and congested areas such as built-up areas etc., ROU of 10 m or less shall be available. The pipeline



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



shall be laid at 2 m from the ROU edge in reserve forest areas. All these eventualities shall be taken into account. It shall be Contractor's responsibility to make arrangement for any additional land required for fabrication, construction, storage and all other work areas.

- 28.3 Contractor shall carry out construction work within the width as made available to him. Where the pipeline route passes through forest/plantation areas contractor shall clear only the minimum width required for laying the pipeline as per Company's approved procedure for pipeline construction. Felling of trees/plants shall be minimized. Damage to any obstruction, temporary/permanent structure, boundary walls etc. within ROU shall be repaired and restored and cost of repairs/restoration shall be to Contractor's account. Contractor shall arrange for additional working space as required for the purpose of pipeline construction at his own cost & time.
- 28.4 The Contractor must ensure that during laying of the pipeline minimum damage occurs to the land. The land has to be restored to original condition. All construction activities shall be in accordance with the local Government regulations and shall be performed by the competent and qualified persons for providing adequate protection to the general public, livestock, wild life, forest, power lines, buildings etc. in the vicinity of the pipeline.
- 28.5 During pipeline construction, measures shall be adopted in order to minimize the impact of pipeline construction activities on the environment. During ROU clearance, the vegetation shall be cut off at ground level leaving the roots intact. Only stumps and roots directly over the trench shall be removed for pipeline Installation.
- 28.6 In case of any detour from the acquired ROU due to constructability problems or otherwise, contractor may be permitted to do so after approval from CA / Company. All statutory payments shall be paid/ reimbursed by Company. However, such activity shall not affect the construction schedule and overall completion period.
- 28.7 Clean-up and restoration of ROU and other conveniences like road, rail, canals, cultivable land, water facilities, irrigation facilities, boundary wall/fence etc. to original condition as per specification and drawings to the entire satisfaction of Company and/or Landowner/Cultivator/ Authorities having jurisdiction over the same, including disposal of surplus excavated soil and other construction materials to a location identified by Contractor approved by local authority without causing any disturbance to environment and to the entire satisfaction of Company.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- 28.8 Contractor shall arrange necessary clearance from the concerned authorities/land owners to the effect that ROU/ ROW has been restored back to original condition. Contractor shall carry out joint survey with representative of Competent Authority (CA) and will obtain clearance in writing from CA that ROU has been restored to original condition. Necessary clearance from statutory authority / NOC for restoring the ROU to original condition shall be in Contractor's scope. However, if the owner does not give the NOC, payment may be released to the contractor if the restoration is done physically and to the satisfaction of Owner / CMC / CA and is certified & accepted by Engineer-in-charge as per the tender specifications. Necessary Proof of restoration i.e. through photographs and video recordings will have to be submitted by the contractor wherever NOC is not available.
- 28.9 Local state Government may impose Taxes/ Duties/ royalty etc towards the excavation and filling of earth for the pipe line and terminals works. It is the responsibility of contractor to make such payments without any cost implications to GAIL.
- 28.10 Contractor is required to maintain a hindrance register. All hindrances encountered in the execution needs to be logged in this register and shall be jointly signed by Contractor and CMC/GAIL.
- 28.11 ROU shall be opened in stretches and may not be continuous. In such an event contractor shall skip the section and jump over to next stretch where ROU is available, without any cost & time implication to the Company.
- 29.0 CONSTRUCTION EQUIPMENT AND ORGANIZATION**
- 29.1 CONSTRUCTION EQUIPMENT**
- 29.1.1 Bidders shall meet the requirement regarding deployment of minimum construction equipment's as specified in the Bidding Document at **Annexure-9 to SCC**. Bidder shall also submit their compliance for deployment of equipment's as above along with the bid.
- 29.2 MANPOWER DEPLOYMENT**
- 29.2.1 Bidder shall meet the requirement regarding deployment of minimum construction manpower as specified in the bidding document at **Annexure-10**



to SCC. Bidder shall also submit their compliance for deployment of manpower along with the bid. Qualification and Experience of key construction personnel shall be as per **Annexure-10A to SCC**.

29.2.2 **Schedule of Labour & Equipment Rates**

Hiring / Recovery Rate for Deployment of Manpower attached as **Annexure- 11 to SCC** shall be used for analyzing rates for extra items and recovery for non- deployment of manpower.

29.2.3 Equipment Hiring / Recovery Rates attached as **Annexure-12 to SCC** shall be used for analyzing rates for extra items and recovery for non-deployment of equipment.

30.0 **MECHANISED CONSTRUCTION**

30.1 Contractor shall without prejudice to his overall responsibility to execute and complete the work as per specifications and time schedule adopt as far as practicable, mechanized construction techniques for major site activities. Contractor agrees that he will deploy the required numbers and types of the plant & machinery applicable for different activities in consultation with the Engineer-in-charge during execution of works.

30.2 Contractor further agrees that Contract price is inclusive of all the associated costs, which he may incur for actual mobilization, required in respect of use of mechanized construction techniques and that the Owner/CMC in this regard shall entertain no claim whatsoever.

31.0 **GENERAL GUIDELINES DURING AND BEFORE ERECTION**

31.1 Contractor shall be responsible for organizing the lifting of the equipment in the proper sequence, that orderly progress of the work is ensured and access routes for erecting the other equipments are kept open.

31.2 Orientation of all foundation, elevations, lengths and disposition of anchor bolts and diameter of holes in the supports saddles shall be checked by contractor, well in advance. Minor rectifications including chipping of foundations as the case may be shall be carried out at no extra cost by the contractor after obtaining prior approval of the Engineer-in-Charge. The Contractor shall also be provided with the necessary structural drawings and piping layouts etc., wherever required for reference. During the



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



structural member need to be dismantled, to facilitate the equipment erection, same shall be done by the contractor after ensuring proper stability of main structure with prior permission of Engineer-in-Charge. All such dismantled members shall be put in position back after the completion of equipment erection to satisfaction of Engineer-in-Charge.

- 31.3 During the performance of the work the Contractor at his own cost, shall keep structures, materials and equipment adequately braced by guys, struts or otherwise approved means which shall be supplied and installed by the Contractor as required till the installation work is satisfactorily completed. Such guys, shoring, bracing, strutting, planking supports etc. shall not interfere with the work of other agencies and shall not damage or cause distortion to other works executed by him or other agencies.
- 31.4 Manufacturer's recommendations and detailed specifications for the installation of the various equipment and machines will be passed on to the contractor to the extent available during the performance of work. The requirements stipulated in these clauses shall be fulfilled by the Contractor.
- 31.5 Various tolerances required as marked on the drawings and as per specifications and instructions of the Engineer-in-Charge, shall be maintained. Verticality shall be maintained. Verticality shall be verified with the Theodolite.

31.6 ERECTION OF EQUIPMENTS

- 31.6.1 All the erection shall be carried out by Cranes of suitable capacity. Erection by derrick shall not be permissible. The contractor shall arrange the crane of suitable capacity required for erection and include cost for same in respective items without any liability on the part of Owner/CMC.
- 31.6.2 Bidder shall submit the indicative erection scheme for compressor/equipment and shall undertake the erection only after obtaining approval of erection scheme by Engineer-in-charge.
- 31.6.3 Grouting of equipments, anchor bolts, pockets and under base plates shall be carried out as per technical specifications.

32.0 PRICE ADJUSTMENT DUE TO DELAYED MOBILIZATION OR SHORTFALL IN MOBILISATION OF MINIMUM EQUIPMENT AND MANPOWER



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- 32.1 VOID
- 32.2 In case during execution, adequate front is not available at site, contractor may request for delayed mobilization of certain equipments and submit for approval.
- 32.3 Contractor shall maintain record of actual mobilization of each equipment and key personnel. Joint record of equipment mobilization will be maintained month-wise. Further a copy of hindrance register for the specified period (RA bill period) duly signed by contractor / GAIL shall be maintained and submitted along with each RA bill.
- 32.4 In case of delay in mobilization or shortfall in mobilization of equipment and key personnel, recovery shall be effected from contractor's running bills as certified by ENGINEER-IN-CHARGE. The recovery shall be for the delayed period for shortfall manpower and equipment beyond but not including the permissible mobilization period / month for each such equipment based on the hiring / recovery rates specified elsewhere in the bidding document.
- 32.5 If found necessary, GAIL / CMC may deploy any equipment / manpower and recover the amount for such deployment at contractor risk and cost or as per rates provided at **Annexure-11 & 12 to SCC respectively, whichever is higher.**
- 32.6 VOID
- 32.7 Equipments and key personnel may be demobilized by the contractor on completion of its work at site after written clearance of Engineer-in-charge. Unilateral withdrawal of any equipment / key personnel by the contractor will attract recovery as per the hiring / recovery rates specified in **Annexure-11 & 12 to SCC**".
- 32.8 "Deduction under this clause is in addition to PRS applicable pursuant to GCC clause 27.0 and SCC Clause. The provision of GCC clause no. 27.0 shall have no bearing on this clause. The Contractor's maximum liability towards deduction for non-deployment of requisite minimum equipment and manpower shall be limited to 2.5% of contract price".
- 32.9 "In case time extension is granted without application of Price Reduction Schedule (PRS), then amount deducted on account of minimum equipment & Manpower will be refunded to the contractor".
- 32.10 NOC from sub-contractor, if any (deployed after getting approval from GAIL / CMC) regarding receipt of payment from contractor upto previous month to be submitted along with RA Bill.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- 32.11 In case of final bill, contractor shall be required to submit NOC from sub-contractor, if any (deployed after getting approval from GAIL / CMC) about receipt of full payment from the contractor.
- 32.12 VOID
- 32.13 Base schedule duly signed by Contractor, CMC & GAIL shall be submitted **within 15 days** of Kick off Meeting (KOM).
- 32.14 Contractor to submit quarterly closure reports jointly signed along with GAIL/CMC.
- 32.15 VOID
- 32B.0 **SCHEDULE FOR SUBMISSION OF DOCUMENTS**
- 32B.1 Contractor shall submit HDD profile drawing along with design calculation within 45 days of date of Fax of Acceptance (FOA)/ Date of intimation.
- 32B.2 Work shall start within 15 days of approval of HDD profile drawing.
- 33.0 **MEASUREMENT OF WORKS**
- 33.1 In addition to the provisions of relevant clause of GCC and associated provisions thereof, the provisions of **Annexure-4 to SCC** shall also apply.
- 34.0 **TERMS OF PAYMENT**
- 34.1 Basis and terms of payment for making “On Account Payment” shall be as set out in **Annexure-5 to SCC**.
- 35.0 **REPAIR OF PIPE DEFECTS**
- 35.1 Immediately prior to aligning pipe for welding, the bevelled ends of each joint of pipe and the area immediately adjacent thereto (at least 25mm from the edge on the inside and outside of the pipe) shall be thoroughly cleaned of paint, rust, mill scale, dirty or other foreign matter by use of power drive wire buffing wheels, disc sanders, or by other methods approved by Owner/CMC. This shall be done at no extra cost to Owner/CMC.
- 35.2 All damaged ends of pipe that are bent, cut or otherwise mutilated to such an extent that in the opinion of the Owner/CMC, faulty alignment or unacceptable welding would result, shall be



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



repaired or cut-off and rebevelled to the correct angle with a bevelling machine of a type approved by Owner/CMC. No compensation shall be allowed by reason of such recutting or bevelling, except when required because of the original bevel being damaged before the pipe is "taken over" by Contractor.

- 35.3 Dents in bevels with a depth of less than 1 mm shall be removed by Contractor during cleaning and grinding, ahead of the welding in the field. Contractor shall rebevel dented bevel ends with a depth between 1 and 3 mm. Dents over 3mm depth shall be repaired by cutting and rebeveling.

36.0 ISSUE OF OWNER/CMC SUPPLIED MATERIAL

- 36.1 The conditions for issue of material and reconciliation refer enclosed **Annexure-8 to SCC**.
- 36.2 The reconciliation of material shall be applicable only for the material issued by Owner/CMC as free issue to the contractor.

37.0 LOCATION OF DUMPYARD / WAREHOUSE / STORAGE YARD

- 37.1 The Dumpyard / Warehouse / Storage Yard is situated at the locations as mentioned in the scope of work.
- 37.2 The Contractor shall collect the line pipes from the above dump yard(s) and arrange handling of pipes including crane etc. for unloading, transportation of pipes to required location or pipeline ROU shall be the responsibility of contractor.
- 37.3 Similarly other items issued as Free Issue Material (FIM) shall be collected by the Contractor from Owner/CMC's designated storage yard(s) as directed by Engineer-in-Charge. Contractor shall arrange for handling of FIM including crane etc for loading/unloading, transportation of FIM to required site location free of cost.
- 37.4 Contractor shall lift the entire quantity envisaged for the section (inclusive of 10% extra pipe quantity) to cater to the wastage, re-routing etc., encountered during the construction; store it properly in the pipe yard maintained by the contractor.

38.0 STATUTORY APPROVALS

- 38.1 Owner shall obtain general in-principle permissions from most of the authorities having jurisdiction over the area as necessary for construction of the pipeline. However, specific site related work / coordination with concerned authority required for executing the



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



job will have to be done by the Contractor. Contractor may have to follow up/expedite with the concerned authorities to execute the job in time. All the statutory payment required for such purpose shall be reimbursed by Owner at actuals on production of documentary evidence.

- 38.2 The Contractor shall arrange the inspection of the works by the authorities and necessary co-ordination and liaison work in this respect shall be the responsibility of the contractor. However statutory fees paid, if any, for all inspections and approvals by such authorities shall be reimbursed at actual by the Owner/CMC to the contractor on production of documentary evidence.
- 38.3 Any change/ addition required to be made to meet the requirements of the statutory authorities shall be carried out by the contractor free of charge. The inspection and acceptance of the work by statutory authorities shall however, not absolve the contractor from any of his responsibilities under this contract.
- 38.4 Statutory approvals of all type of permanent buildings are to be in the scope of contractor. Detection / intimation of foreign utility and pipelines shall be in the scope of contractor. Necessary safety of such utilities shall be ensured by the contractor during construction.

39.0 TESTS AND INSPECTION

- 39.1 The Contractor shall carry out the various tests as enumerated in the technical specifications of this bid document and the technical documents that will be furnished to him during the performance of the work.
- 39.2 All the tests either on the field or at outside laboratories concerning the execution of the work and supply of materials by the Contractor shall be carried out by Contractor at his own cost.
- 39.3 The work is subject to inspection at all times by the Engineer-in-Charge. The contractor shall carry out all instructions given during inspection and shall ensure that the work is being carried out according to the technical specifications of this bid document, the technical documents and the relevant codes of practice will be furnished to him during the performance of the work.
- 39.4 The Contractor shall provide for purposes of inspection access ladders, lighting and necessary instruments at his own cost.
- 39.5 Any work not conforming to execution drawings, specifications



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



or codes and approved methodology / scheme shall be rejected forthwith and the Contractor shall carryout the rectifications at his own cost.

- 39.6 All results of inspection and tests will be recorded in the inspection reports, Performa of which will be approved by the Engineer-in-Charge. These reports shall form part of the completion documents.
- 39.7 For materials supplied by Owner, Contractor shall carryout the tests, if required by the Engineer-in-Charge, and the Owner/CMC shall reimburse the cost of such tests at actual to the Contractor on production of documentary evidence.
- 39.8 Statutory fees paid to IBR authorities and for repeat tests and inspection due to failures, repairs etc. such reasons attributable to the Contractor shall be borne by the Contractor.
- 39.9 Inspection and acceptance of work shall not relieve the Contractor from any of his responsibilities under this Contract.

40.0 INSPECTION OF SUPPLY ITEMS

- 40.1 All inspection and tests on bought out items shall be made as per the specifications forming part of this contract. Various stages of inspection and testing shall be identified after receipt of Quality Assurance Programme from the Contractor/ Manufacturer.
- 40.2 Inspection calls shall be given for associations of Owner/CMC's/PMC representative as per mutually agreed programme in prescribed proforma with 15 days margin, giving details of equipment and attaching relevant test certificates and internal inspection report of the Contractor. All drawings, General Arrangement and other contract drawings, specifications, catalogues etc. pertaining to equipment offered for inspection shall be got approved from Owner/CMC/PMC and copies shall be made available to Owner/CMC/PMC before hand for undertaking inspection.(Note: PMC will do the necessary inspection at manufacturer work only if any only in India)
- 40.3 The contractor shall ensure full and free access to the inspection Engineer of Owner/CMC at the Contractor's or their subcontractor's premises at any time during contract period to facilitate him to carry out inspection and testing assignments.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



40.4 The contractor/ sub-contractor shall provide all instruments, tools, necessary testing and other inspection facilities to inspection engineer of Owner/CMC free of cost for carrying out inspection.

40.5 Where facilities for testing do not exist in the Contractor's/ sub-contractor's laboratories, samples and test pieces shall be drawn by the Contractor/ Sub- Contractor in presence of Inspection Engineer of a Owner/CMC and duly sealed by the later and sent for testing in Government approved Test House or any other testing laboratories approved by the Inspection Engineer at the Contractor's cost.

41.0 FINAL INSPECTION

41.1 After completion of all tests as per specification the whole work will be subject to a final inspection to ensure that job has been completed as per requirement. If any defects noticed in the work attributable to Contractor, the Contractor at his own cost shall attend these, as and when the Owner/CMC brings them to his notice. The Owner/CMC shall have the right to have these defects rectified at the risk and cost of the contractor if he fails to attend to these defects immediately

42.0 COMPENSATION FOR EXTENDED STAY

Refer Clause no. 33 of ITB & BDS.

43.0 COMPUTERIZED CONTRACTORS BILLING SYSTEM

43.1 Without prejudice to stipulation in General Conditions of Contract, Contractor should follow following billing system.

43.2 The bills will be prepared by the contractors on their own PCs as per the standard formats and codification scheme proposed by GAIL/CMC. The contractors will be provided with data entry software to capture the relevant billing data for subsequent processing. Contractors will submit these data to GAIL/CMC in an electronic media along with the hard copy of the bill, necessary enclosures and documents. The contractor will also ensure the correctness and consistency of data so entered with the hard copy of the bill submitted for payment.

43.3 Owner/CMC will utilize these data for processing and verification of the Contractor's bill and payment."

44.0 TEMPORARY WORKS



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- 44.1 All Temporary and ancillary works including enabling works connected with the work shall be responsibility of the Contractor and the price quoted by them shall be deemed to have included the cost of such works which shall be removed by the contractor at his cost, immediately after completion of his work.

45.0 DISTINCTION BETWEEN FOUNDATION AND SUPERSTRUCTURE

- 45.1 To distinguish between work in foundations and superstructures, the following criteria shall apply:

- 45.1.1 For all Equipment pedestals, pipe racks, other foundation and R.C.C. Structures, work done upto 300 mm level above finished grade level will be taken as work in foundations and work above this level will be treated as work in superstructures and payments would be made accordingly.

- 45.1.2 For Buildings only, all works upto level corresponding to finished floor level shall be treated as 'Work in foundation' and all works above the finished floor level shall be treated as "Work in superstructure".

- 45.1.3 Irrespective of what has been stated above, all pavements, R.C.C. Retaining wall, all pipe sleepers and any similar item would be taken as work done in foundations irrespective of locations, nomenclature and levels given anywhere.

- 45.1.4 Where not specifically pointed out all works in Cellars/ sumps, Tank Pads, Cable trenches, or such similar item would be taken as work in foundation.

46.0 QUALITY ASSURANCE/ QUALITY CONTROL

- 46.1 Bidder shall include in his offer the Quality Assurance Programme containing the overall quality management and procedures, which is required to be adhered to during the execution of contract. After the award of the contract detailed quality assurance programme shall be prepared by the contractor for the execution of contract for various works, which will be mutually discussed and agreed to.

- 46.2 The Contractor shall establish document and maintain an effective quality assurance system outlined in recognized codes.

- 46.3 Quality Assurance System plans/procedures of the Contractor



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



shall be furnished in the form of a QA manual. This document should cover details of the personnel responsible for the Quality Assurance, plans or procedures to be followed for quality control in respect of Engineering, Procurement, Supply, Installation, Testing and Commissioning.

The quality assurance system should indicate organizational approach for quality control and quality assurance of the construction activities, at all stages of work at site as well as at manufacture's works and dispatch of materials.

46.4 The Owner/CMC or their representative shall reserve the right to inspect/witness, review any or all stages of work at shop/site as deemed necessary for quality assurance.

46.5 The contractor has to ensure the deployment of Quality Assurance and Quality Control Engineer(s) depending upon the quantum of work. This QA/QC group shall be fully responsible to carry out the work as per standards and all code requirements. In case Engineer-in-Charge feels that Contractor's QA/QC Engineer(s) are incompetent or insufficient, contractor has to deploy other experienced Engineer(s) as per site requirement and to the full satisfaction of Engineer-In-Charge.

46.6 In case contractor fails to follow the instructions of Engineer-in-charge with respect to above clauses, next payment due to him shall not be released unless until he complies with the instructions to the full satisfaction of Engineer-in- charge.

46.7 The Contractor shall adhere to the quality assurance system as per PMC Specification enclosed in the Bidding Document as **Annexure-6**.

47.0 HEALTH SAFETY AND ENVIRONMENT (HSE) MANAGEMENT

47.1 The Contractor, during entire duration of the Contract, shall adhere to HSE requirement as per spec. enclosed in the bidding document as **Annexure-7**.

48.0 SITE CLEANING

48.1 The Contractor shall clean and keep clean the work site from time to time to the satisfaction of the Engineer-in-Charge for easy access to work site and to ensure safe passage, movement and working.

48.2 If the work involves dismantling of any existing structure in



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



whole or part, care shall be taken to limit the dismantling up to the exact point and/or lines as directed by the Engineer-in-Charge and any damage caused to the existing structure beyond the said line or point shall be repaired and restored to the original condition at the Contractor's cost and risks to the satisfaction of the Engineer-in-Charge, whose decision shall be final and binding upon the Contractor.

- 48.3 The Contractor shall be the custodian of the dismantled materials till the Engineer-in-Charge takes charge thereof.
- 48.4 The Contractor shall dispose off the unserviceable materials, debris etc. to any area as decided by the Engineer-in-Charge.
- 48.5 The Contractor shall sort out, clear and stack the serviceable materials obtained from the dismantling/renewal at places as directed by the Engineer-in-Charge.
- 48.6 No extra payment shall be paid on this account.

49.0 COMPLETION DOCUMENTS

A) Notwithstanding the provisions contained in standard specification, upon completion of work, the Contractor shall complete all of the related drawings and documents to the "AS BUILT" stage (including all vendor / sub-vendor drawings for bought out items), all Free-Issue-Material (FIM) documents and provide the Owner/CMC, the following:

- (i) One complete bound set of all original documents as mentioned but not limited to documents listed elsewhere in the bid document.
- (ii) **Three complete bound sets of documents as mentioned at (i) above, in original size and in 3 (three) CD-ROM/DVD.**
- (iii) Three complete bound sets of Contractor's specifications including design calculations.
- (iv) Three copies of Daily Progress Reports
- (v) Three sets of all raw data collected / generated for and during execution of the entire job as specified in documents requirement.
- (vi) **Three sets of Closure report.**

B) Completion Documents

The following documents shall be submitted in hard binder by the CONTRACTOR in **3 (Three)** sets, as a part of completion documents:



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- i) Welding Procedure Qualification Report.
- ii) Welder Qualification Report.
- iii) Radiographic Procedure Qualification.
- iv) Radiographic Report along with radiographs (Radiographs only with the original).
- v) Batch Test Certificate from manufacturers for electrodes.
- vi) Hydrostatic and other test results & reports.
- vii) HDD Activities.
- viii) Pre-commissioning/ Commissioning checklist.
- ix) All other requirements as specified in the respective specifications.
- x) As built drawings.
- xi) Any other drawing/document/report specified elsewhere in the bidding document

Note: The Contractor shall be eligible to apply for issue of completion certificate after submission of completion documents as mentioned above.

50.0 COORDINATION WITH OTHER AGENCIES

50.1 Work shall be carried out in such a manner that the work of other agencies operating at the site is not hampered due to any action of the Contractor. Proper coordination with other agencies will be Contractor's responsibility. In case of any dispute, the decision of Engineer-in-Charge shall be final and binding on the Contractor.

51.0 VOID

52.0 UNDERGROUND AND OVERHEAD STRUCTURES

52.1 The information to possible extent regarding existing structures/overhead lines, existing pipelines and utilities are already indicated on alignment sheets. Over and above contractor may encounter other structure/pipelines/ OFC etc. which may not be appearing on alignment sheet, the contractor is required to collect such information on his own before commencing the work. Contractor must intimate the Local Officer concerned of the utility about the pipeline construction activities and take necessary steps to ensure safety and protection to men, materials and utility provided. The Contractor shall execute the work in such a manner that the said structures, utilities, pipelines etc. are not disturbed or damaged, and shall indemnify and keep indemnified the Owner/CMC from and against any destruction thereof or damages thereto.

53.0 TEST CERTIFICATES



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

53.1 Bidder shall be required to submit recent test certificates for the material being used in works from the recognized laboratories. These certificates should indicate all properties of the materials as required in relevant IS Standards or International Standards.

53.2 Contractor shall also submit the test certificate with every batch of material supplied which will be approved by Engineer-in-Charge. No secured advance will be given for the materials not having test certificate. In case any test is to be carried out, the same shall be got done in the approved laboratory at the cost of contractor.

54.0 ROYALTY

54.1 Contractor's quoted rate should include the royalty on different applicable items as per the prevailing Government rates. In case, Owner/CMC is able to obtain the exemption of Royalty from the State Government, the contractor shall pass on the same to Owner/CMC for all the items involving Royalty.

55.0 EXCAVATION BY BLASTING

55.1 The Contractor shall obtain licence from the District authorities for undertaking blasting work as well as for obtaining and storing the explosive as per Explosive Rules 1940, corrected up to date. He shall purchase the Explosives, fuses, detonators etc. only from a licensed dealer. He shall be responsible for the safe custody and proper accounting of the explosive materials. The Engineer-in-Charge and his authorized representative shall have the access to check the contractor's store of explosives and his accounts. In case where the explosive are required to be transported and stored at site, relevant clauses of the Explosive rules 1940 as amended subsequently shall apply. The Contractor shall be responsible for any accident to workman, public or property, due to blasting operations.

56.0 SITE FACILITIES FOR WORKMEN

56.1 Following facilities are to be ensured at all work places where workmen are deployed/engaged by Contractor.

- i) Arrangement of first aid
- ii) Arrangement for clean drinking water.
- iii) Toilets
- iv) Canteen where tea & snacks are available
- v) A creche where 10 or more women workmen are having children below the age of 6 years.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



57.0 *DELETED*

58.0 HYDROSTATIC TESTING

58.1 The bidder as per the Technical specification along with their offer taking into account the completion schedule shall furnish the detailed procedure proposed for the hydrostatic testing of pipeline. The necessary piping, pumps etc. shall be provided by the contractor. The final disposal of water after testing shall be contractor's responsibility and should be in such a way that neither the traffic movement even pedestrians nor the standing crop in nearby fields gets affected. Suitable drains shall be provided for this purpose as directed by the Engineer-in-Charge within the contracted prices.

58.2 The Contractor shall propose and obtain approval of Engineer-in-Charge for exact number of test sections, based on drawings, availability of water for hydro testing and keeping in view other exigencies, if any before starting hydro testing work. The Contractor will carryout the hydrostatic test for approved number of test section including preparation for test and tie-ins, without any time and cost implication on this account to Owner/CMC . Any increase or decrease in number of test sections will not have any cost implication to Owner / CMC / Contractor.

59.0 **VOID**

60.0 MAKE OF MATERIALS

60.1 The materials required to be supplied by the contractor under this contract shall be procured only from Owner/CMC approved vendors. Where the makes of materials are not indicated in the Bidding document contractor shall furnish the details of makes and shall obtain prior approval of Engineer- in-Charge of vendors/sub-vendors before placing order.

61.0 ADDITIONAL WORKS/ EXTRA WORKS

61.1 Owner/ CMC reserves their right to execute any additional works/ extra works, during the execution of work, either by themselves or by appointing any other agency, even though such works are incidental to and necessary for the completion of works awarded to the Contractor. In the event of such decisions taken by Owner/ CMC Contractor is required to extend necessary cooperation, and act as per the instructions of Engineer-in-Charge.



62.0 **COMPENSATION FOR DELAY / PRICE REDUCTION**
SCHEDULE FOR ANY DELAY

62.1 Clause No: 27.0 of GCC, pertaining to Compensation for Delay (Price Reduction Schedule) stands modified to the following extent:

62.1.1 Void

62.1.2 The Price Reduction Schedule under 62.1.1 above shall be applied on part order/individual order/service order/sub-purchase order/release order/intimation letter, as under:

“In case of delay in works related to clause 62.1.1, the Price Reduction shall be applied at the rate of ½% of the total contract value (part order/individual order/service order/sub-purchase order/release order/intimation letter) per week of delay or part thereof. The total liability of the Contractor to Owner/ CMC under sub clause no. 62.1.1 on Compensation for Delay/Price Reduction Schedule shall not exceed 5% (Five Percent) of individual contract value of Release order. The compensation on account of any liability (ies) other than above shall be as per provisions of Bidding Documents.”

The value referred in PRS clause is excluding taxes and duties reimbursable by GAIL.

The price reduction schedule shall be applicable against individual release order with specific completion period and not on the total ARC value.

62.1.3 Void

62.1.4 Void

63.0 **PROJECT PLANNING, SCHEDULING AND MONITORING SYSTEM**

The following schedules/documents/reports shall be prepared and submitted by the Bidder/Contractor for review/approval at various stages of the contract.

63.1 **After the Award of Contract**



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



a) Time Schedule

The Completion Time Schedule for the work (including mobilization period) as per **Annexure-3 to SCC** of Tender in all respect, from the date of FOA/Go- Ahead.

The Bidder is required to submit a Project Time Schedule in Primavera or as agreed by EIC. The Schedule shall cover all aspects like sub-ordering, manufacturing and delivery, indicated in the Bid Document. The Owner interface activities shall be clearly identified with their latest required dates. Owner reserves the right to disqualify the Bidder if the above Schedule submitted by the Bidder is not in line with the over all Project requirement.

b) Scheduling & Monitoring System

The Bidders should describe their system of Project Scheduling and monitoring, the extent of computerization, level of detailing, tracing methodology etc. with the name of computer package and sample outputs.

c) Overall Project Schedule

The Contractor shall submit within 1 week of Fax of Acceptance, a sufficiently detailed over all Project Schedule in the activity network form, clearly indicating the major milestones, interrelationship/ interdependence between various activities together with analysis of critical path and floats.

The network will be reviewed and approved by Engineer- in-Charge and the comments if any shall be incorporated in the network before issuing the same for implementation. The network thus finalized shall form part of the contract document and the same shall not be revised without the prior permission from Engineer-in- Charge during the entire period of contract.

d) Progress Measurement Methodology

The contractor is required to submit within 1 week of award of WORK, the methodology of progress measurement of sub-ordering, manufacturing/ delivery, sub- contracting construction and commissioning works and the basis of computation of over-all services/physical progress informed. Owner reserves the right to modify the methodology in part or in full.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



e) Functional Schedules

The contractor should prepare detailed functional schedules in line with network for functional monitoring and control and submit scheduled progress covers for each function viz. ordering, delivery and construction.

63.2 **Project Review Meetings**

The Contractor shall present the programme and status at various review meetings as required.

a) Weekly Review Meeting

Level of : Contractor's/
CMC's RCM/ Participation Site Incharge
& Job Engineers.

Agenda : a) Weekly programme v/s
actual achieved in the past
week & programme for
next week.
b) Remedial Actions
and hold up analy-
sis.
c) Client query/ approval.

Venue : Site Office

b) Monthly Review Meeting

Level of : Senior Officers of
GAIL/ CMC and Participation Contrac-
tors.

Agenda : a) Progress Status/ Statistics
b) Completion Outlook
c) Major hold ups/slippages
d) Assistance required
e) Critical issues



f) Client query/ approval

Venue : GAIL/ CMC Office/ Site
at the dis-
cretion of Owner/ CMC

63.3 Progress Reporting Performa

A) Monthly Progress Report

This report shall be submitted on a monthly basis within 10 (ten) calendar days from cut-off date, as agreed upon covering overall scenarios of the work. The report shall include, but not limited to the following :

- a) Brief Introduction of the work.
- b) Activities executed/ achievements during the month.
- c) Schedule versus actual percentage progress and progress curves for Detail Engg. Sub-ordering, Manufacturing/ Delivery, Sub-contracting, Construction, Commissioning and Overall and quantum wise status & purchase orders against schedule.
- d) Area of concern/ problem/ hold-ups, impacts and action plans.
- e) Resources deployment status.
- f) Annexures giving status summary for drawings, MRs, deliveries, sub- contracting and construction.
- g) Procurement status for items to be supplied by Contractor.

B) Weekly Reports

The report will be prepared and submitted by the Contractor on weekly basis and will cover following items :

- a) Activities programmed and completed during the week.
- b) Resource deployed men and machines.
- c) Quantities achieved against target in construction
- d) Record of Mandays lost.
- e) Construction percentage progress schedule and actual.

C) Daily Repots

- a) Activity programme for the day
- b) Progress of the previous day and commutative progress.
- c) Manpower & machinery deployed.

D) Any other additional reports/ information as may be required by E.I.C.

63.4 Progress Reports



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- 63.4.1 CONTRACTOR shall make every effort to keep the OWNER adequately informed as to the progress of the WORK throughout the CONTRACT period.

CONTRACTOR shall keep the OWNER informed well in advance of the construction schedule so as to permit the OWNER to arrange for requisite inspection to be carried out in such a manner as to minimize interference with progress of WORK. It is imperative that close coordination be maintained with the OWNER during all phases of WORK.

- 63.4.2 By the 10th (tenth) of each month, CONTRACTOR shall furnish the OWNER a detailed report covering the progress as of the last day of the previous month. These reports will indicate actual and scheduled percentage of completion of construction as well as general comments of interest or the progress of various phases of the WORK. The frequency of progress reporting by the CONTRACTOR shall be weekly.

- 63.4.3 Once a week, CONTRACTOR shall submit a summary of the WORK accomplished during the preceding week in form of percentage completion of the various phases of the WORK, to the OWNER.

- 63.4.4 Progress reports shall be supplied by CONTRACTOR with documents such as chart, networks, photographs, test certificate etc. Such progress reports shall be in the form and size as may be required by the OWNER and shall be submitted in at least 3 (three) copies.

- 63.4.5 Contractor shall prepare daily progress report (DPR) in the desired format and submit it to Engineer-in-charge alongwith schedule of next day to Engineer-in- charge.

63.5 **Progress Review Team (PRT) Meeting**

Project Progress shall be reviewed by the PRT Team of GAIL on regular basis. Contractor shall be liable to submit compliance report(s) within 15 days of PRT review meeting(s).

Contractor is also required to submit quarterly closure report within 15 days (of completion of each quarter).

In event of failure of submission of compliance report and quarterly closure reports by the contractor, EIC reserves the right to take appropriate action.



64.0

RESPONSIBILITY OF CONTRACTOR

64.1

It shall be the responsibility of the Contractor to obtain the approval for any revision and/or modifications decided by the Contractor from the Owner/ CMC / Engineer-in-charge before implementation. Also such revisions and/or modifications if accepted/ approved by the Owner/ CMC Engineer-in-charge shall be carried out at no extra cost to the Owner/ CMC. Any changes required during and/or after approval for detailed construction drawings due to functional requirements or for efficient running of system keeping the basic parameters unchanged and which has not been indicated by the Contractor in the data/drawings furnished along with the offer will be carried out by the Contractor at no extra cost to the Owner/ CMC.

64.2

All expenses towards mobilization at site and demobilization including bringing in equipment, clearing the site etc. shall be deemed to be included in the prices quoted and no separate payments on account of such expenses shall be entertained.

64.3

It shall be entirely the Contractor's responsibility to provide, operate and maintain all necessary construction equipments, scaffoldings and safety gadgets, cranes and other lifting tackles, tools and appliances to perform the work in a workman like and efficient manner and complete all the jobs as per time schedules.

64.4

Preparing approaches and working areas for the movement and operation of the cranes, levelling the areas for assembly and erection shall also be the responsibility of the Contractor. The Contractor shall acquaint himself with access availability, facilities such as railway siding, local labour etc. to provide suitable allowances in his quotation. The Contractor may have to build temporary access roads to aid his own work, which shall also be taken care while quoting for the work.

64.5

The procurement and supply in sequence and at the appropriate time of all materials and consumables shall be entirely the Contractor's responsibility and his rates for execution of work will be inclusive of supply of all these items.

65.0

CHECKING OF LEVELS

65.1

The Contractor shall be responsible for checking levels, orientation plan of all foundations, foundation bolts, etc., well in advance of taking up the actual erection work and bring to the notice of Engineer-in-Charge discrepancies, if any. In case of minor variations in levels etc. the Contractor shall carry out the necessary rectification of the foundations within his quoted



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



price.

- 65.2 The Contractor shall also be responsible for checking with templates, wherever necessary, the disposition of foundation bolts with the corresponding bases of structure and shall effect rectifications, as directed, within his quoted rate.

66.0 STORAGE FACILITIES

- 66.1 The Contractor shall maintain wherever required an air-conditioned room for the storage of the instruments as well as for calibration and testing of the instruments at his own cost. The contractor shall provide these facilities with in the quoted price.

67.0 ABNORMALLY HIGH RATED ITEMS (AHR ITEMS)

Please refer clause no. 41 of ITB, Vol I

68.0 INSURANCE FOR FREE ISSUE MATERIAL

- 68.1 Contractor shall at his own expense arrange, secure and maintain insurance cover for Owner/ CMC's supplied free issue materials as defined in Bidding Document. Contractor's quoted price shall be inclusive of all costs on account of insurance liabilities covered under the Contract. Contractor to note that the beneficiary of insurance cover shall be GAIL (India) Limited (GAIL). The insurance cover of the free issue material shall be for the period from the date of handing over the material to Contractor from Owner/ CMC 's designated place of issue/ dumpsite to date of handing over the completed work to Owner/ CMC. The approximate cost of free issue material is **INR- 2.45 Crores**.

69.0 INSURANCES IN INDIA

- 69.1 In addition to the insurance covers specified in the General Conditions of Contract to be obtained and maintained by the Contractor, Contractor shall at his own expense arrange, secure and maintain insurance with reputable insurance companies to the satisfaction of the Owner/ CMC as may be necessary and to its full value for all such amounts to protect the works in progress from time to time and the interest of Owner/ CMC against all risks as detailed herein. The form and the limit of such insurance as defined herein together with the under writer works thereof in each case should be as acceptable to the Owner/ CMC. However, irrespective of work acceptance, the responsibility to maintain adequate insurance coverage at all times during the period of Contract shall be that of Contractor alone. Contractor's failure in



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



this regard shall not relieve him of any of his responsibilities and obligations under Contractor.

- 69.2 Any loss or damage to the equipment during ocean transportation, port/custom clearance, inland and port handling, inland transportation, storage, erection and commissioning till such time the Work is taken over by Owner/ CMC, shall be to the account of Contractor. Contractor shall be responsible for preferring of all claims and make good for the damage or loss by way of repairs and/or replacement of the parts of the Work damaged or lost. Contractor shall provide the Owner/ CMC with a copy of all insurance policies and documents taken out by him in pursuance of the Contract. Such copies of documents shall be submitted to the Owner/ CMC immediately upon the Contractor having taken such insurance coverage. Contractor shall also inform the Owner/ CMC at least 60 (Sixty) days in advance regarding the expiry cancellation and/or changes in any of such documents and ensure revalidation/renewal etc., as may be necessary well in time.
- 69.3 Statutory clearances, if any, in respect of foreign supply required for the purpose of replacement of equipment lost in transit and/or during erection, shall be made available by the Owner/ CMC .Contractor shall, however, be responsible for obtaining requisite licenses, port clearances and other formalities relating to such import. The risks that are to be covered under the insurance shall include, but not be limited to the loss or damage in handling, transit, theft, pilferage, riot, civil commotion, weather conditions, accidents of all kinds, fire, war risk (during ocean transportation only) etc. The scope of such insurance shall cover the entire value of supplies of equipments, plants and materials to be imported from time to time.
- 69.4 All costs on account of insurance liabilities covered under this Contract will be to Contractor's account and will be included in Contract Price. However, the Owner/ CMC may from time to time, during the currency of the Contract, ask the Contractor in writing to limit the insurance coverage risk and in such a case, the parties to the Contract will agree for a mutual settlement, for reduction in Value Of Contract to the extent of reduced premium amounts.
- 69.5 Contractor as far as possible shall cover insurance with Indian Insurance Companies, including marine Insurance during ocean transportation.
- 70.0 VOID**
- 71.0 VOID**



72.0 SUBMISSION OF COLOURED PHOTOGRAPHS

72.1 The Contractor shall shoot, prepare and submission coloured photographs (B5 size) in 2 sets along with softcopies to CMC site office along with monthly progress report covering all the activities (minimum 10 nos. of photographs covering various phases of each activities) of pipeline constructions highlighting the progress or other areas of work. Similarly photographs for problem areas (as required) should be submitted well in advance with a proposed methodology to execute the works and meet the construction schedule. The cost of same shall be deemed to be inclusive in the rates and no separate payment shall be made.

73.0 ***DELETED***

74.0 VIDEOTAPE

74.1 Contractor shall develop and submit (in CD / Pen Drive) a videotape of three hours duration covering the construction activities showing the nature and magnitude of the work. The tape shall be shot and edited to Indian broadcast standards. Videotape recorded in field shall be shot by professional camerapersons and shall meet the technical standards of the Hi-8 format or better. Tape shall cover, but not limited to the following construction activities:

- i) Mobilisation of equipment/ machinery
- ii) ROW cleaning/grading
- iii) Stringing
- iv) Welding: Manual
- v) Radiography
- vi) Joint coating
- vii) Pipe Installation
- viii) HDD works
- ix) Hydro testing
- x) Restoration of ROU
- xi) Blowing of optical fibre cable as per scope
- xii) Any other activity which is not covered above

74.2 Videotape shall also have coverage on new/special techniques used in the Contract and major problems encountered, if any, and the measures taken to resolve them. The tape shall be supplemented with suitable narration and subtitles explaining the job, techniques and methodology, etc. The video shall be prepared with two narration tracks, one in Hindi one in English. Professional narrators shall voice both. The script shall include explanations of job activities, techniques used methodologies etc. Elements of the video programme sequencing and editing techniques shall be discussed with Owner/ CMC and mutually agreed to before videotaping begins.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Draft script shall be submitted to Owner/ CMC for approval before editing commences.

- 74.3 Following completion of editing and review and approval of programme by Owner/ CMC, Contractor shall deliver edited master tape to Owner/Consultant plus six VHS-Format copies of the programme

75.0 PIPES FOR WELDING QUALIFICATION

- 75.1 Contractor for the purpose of qualification of welding procedure and for the same pipes issued by Owner/ CMC may be used. However, accounting of such pipes shall be done within the un-accountable wastage and scraps limit as per **Annexure-8 to SCC** enclosed with the bidding document.

- 75.2 The bare pipes for the purpose as above shall be issued within two week from the date of FOI/FOA. The contractor shall bear all cost towards lifting, carting from issue point to work site/Contractor's store, custody, handling, insurance and levies etc. and return of surplus/scrap materials to Owner designated storage point. No separate payment shall be made for such expenditure.

76.0 SPARES

- 76.1 Contractor shall procure and supply all spare parts required during commissioning of the various items / materials supplied by him as enumerated in the Bidding Document. The quoted lump-sum prices shall be deemed to have been inclusive of all such provision of commissioning spares, required till commissioning of such items. Contractor shall make available all the commissioning spares required at site at least 4 (four) weeks before start of commissioning. However, listed spares not used during commissioning shall be handed over to Owner at their designated place. Contractor shall also supply commissioning spares not listed but required during commissioning within the contracted price.

- 76.2 In addition to above, special tools & tackles required, if any, for operation & maintenance shall also be supplied by the Contractor and the quoted prices shall be deemed to have been inclusive of all such provisions.

77.0 BUILDING AND OTHER CONSTRUCTION WORKER'S ACT



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



77.1 In order to govern welfare and working conditions of labourers engaged in construction activities, the Building and other Construction Workers' (Regulation of Employment and Conditions of Service "RE &CS") Act, 1996 came into force. RE&CS Act'1996 is applicable in respect of building and other construction work. Wherever applicable, The CONTRACTOR shall strictly comply with the following provisions pertaining to RE &CS Act'1996.

- a. The CONTRACTOR must be registered with the concerned authorities under the Building and Other Construction Workers' (RE&CS) Act, 1996 or in case of non-registration; the CONTRACTOR should obtain registration within one month of the award of contract.
- b. The CONTRACTOR shall be responsible to comply with all provisions of the Building and Other Construction Workers' (RE&CS) Act, 1996, the Building and Other Construction Workers' Welfare Cess Act, 1996, the Building and other Construction Workers' (RE&CS) Rules, 1998 and the Building and Other Construction Workers Welfare Cess Rules, 1998.
- c. Cess as per the prevailing rate, shall be deducted at source from bills of the CONTRACTOR by the engineer-in-Charge of the contract and remitted to the "Secretary, Building and Other Construction Workers Welfare Board" of the concerned State. The CONTRACTOR shall be responsible to submit final assessment return of the cess amount to the assessing officer after adjusting the cess deducted at source.

78.0 VOID

79.0 SINGLE POINT RESPONSIBILITY

79.1 The entire work as per scope of work covered under this contract shall be awarded on single point responsibility basis.

80.0 BONUS FOR EARLY COMPLETION

80.1 The Clause 27.3 of GCC for Bonus for early completion shall not be applicable in this Contract.

81.0 VOID



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



82.0 VOID

83.0 DIRECT PAYMENTS TO SUB-VENDORS/ SUPPORTING AGENCIES OF MAIN CONTRACTOR

"Normally, the payment is to be made to vendor/ contractor only as per provision of contract. During execution, in case of financial constraints, GAIL may make direct payment to their sub-vendor/ supporting agencies as an exception from the amounts due to the vendors/ contractors from any of their bills under process upon certification by EIC subject to receipt of such request from the vendor/ contractor. Further, the request for direct payments to the sub-vendor/ sub-contractor shall be considered in performance evaluation of such vendor/ contractor. "

84.0 SUB-LETTING OF WORKS

"Pursuant to Clause No. 37 of GCC-Works:

The contractor shall not, save with previous consent in writing of the Engineer-in-charge, sub-let, transfer or assign the contract or any part thereof or interest therein or benefit or advantage thereof in any manner whatsoever. Provided, nevertheless, that any such consent shall not relieve the contractor from any obligation, duty or responsibility under the contract. However, subletting of WHOLE WORKS is prohibited. Vendor/ Contractor shall submit undertaking to this effect along with each invoice/ bill."

85.0 JOINTS MEASUREMENT OF WORK EXECUTED, BILLING, INVOICE AND PAYMENTS.

85.1 Measurement shall be recorded as per the methods of measurement spelt out in Specification/Contract Documents. The CMC/GAIL site engineer/DGM/CM will check the measurement as recorded in the Measurement Books/Bills

86.0 CONTRACTOR TO ENGAGE CONTRACT MANPOWER BELONGING TO SCHEDULED CASTES AND WEAKER SECTIONS OF THE SOCIETY

Please refer clause no. 48 of ITB.

87.0 WAY BILL / ROAD PERMIT: Shall be issued by GAIL only for transportation of free issue material from one state to another.

88.0 LOCAL EMPLOYMENT

88.1 In order to encourage local employment, contractor shall endeavour to deploy personnel pass-out from local institutes including execution of non-critical activities through local agencies. However, preference should be given to engage more unskilled manpower resources locally to boost local employment.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



89.0 LOCAL SKILL DEVELOPMENT

Contractor's scope shall also include to provide/ conduct a training program to develop/ enhance skill of local people in association with local technical (Diploma/ ITI) Institute through their skilled manpower (i.e. Forman, Welder Grinder, Fitter, NDT Experts etc.) as a part of Govt. of India's ambitious Skill Development Program.

90.0 QUARTERLY CLOSURE OF THE CONTRACT

Please refer clause no. 44 of ITB.

91.0 COMPLETION CERTIFICATE-REFER ITB & GCC

92.0 PRADHAN MANTRI SURAKSHA BIMA YOJANA (PMSBY) AND PRADHAN MANTRI JEEVAN JYOTI BIMA YOJANA (PMJJBY)

Contractor shall ensure that all its personnel deployed under this contract have obtained additional insurance coverage under the Pradhan Mantri Suraksha Bima Yojana (PMSBY) and Pradhan Mantri Jeevan Jyoti Bima Yojana (PMJJBY) through the participating banks and submit the proof of such insurance coverage to the satisfaction of GAIL. The cost of the insurance premium amount for both the above schemes shall be borne by the contractor giving evidence/proof to GAIL in this respect and Contractor shall suitably consider the same in their bid.

Both the schemes are to be regulated continuously on yearly basis and the same should be renewed on each successive relevant date in subsequent years.

93.0 ANNUAL RATE CONTRACT CONDITIONS:

- i) The Annual Rate Contract shall be valid for 12 (Twelve Months) from date of issuance of "Fax of Acceptance".
- ii) OWNER can award to contractor as per Schedule of Rates (SOR) in bid document as & when required during the validity of Rate Contract.
- iii) Contract Performance Bank Guarantee (CPBG) shall be applicable as per ITB cl. no. 38 & Bid Data Sheet (BDS).
- iv) Separate release order (s) will be placed for required work during the validity of Rate Contract. Price Reduction Schedule for delay in completion, Defect Liability Period and contract value for Limitation of Liability will be applicable for each order (i.e. Release order) separately.

Completion period will be counted from date of release of order (letter of intimation).



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- v) Owner envisages that there can be more than one front / section for performance of work (like Welding, Lowering of Pipes, other works, etc) at a time, accordingly contractor shall be required to work for the all front / sections simultaneously and each front / section shall be dealt exclusively separate so that project(s) schedule can be adhered to and completed on or before the date of completion.
- vi) Quantity in SOR is estimated and payment will be made on actual work done basis based on release order (s) issued.

94.0 PLANNING AND DESIGNING IN PURVIEW OF VULNERABILITY ATLAS OF INDIA

The following provision shall be considered as a part of General Conditions of Contract-Work:

Vulnerability Atlas of India (VAI) is a comprehensive document which provides existing hazard scenario for the entire country and presents the digitized State/UT- wise hazard, maps with respect to earthquakes, winds and floods for district-wise identification of vulnerable areas. It also includes additional digitized maps for thunderstorms, cyclones and landslides. The main purpose of this Atlas is its use for disaster preparedness and mitigation at policy planning and project formulation stage.

This atlas is one of its kind single point source for the various stakeholders including policy makers, administrators, municipal commissioners, urban managers, engineers, architects, planners, public etc. to ascertain proneness of any city/location/site to multi-hazard which includes earthquakes, winds, floods thunderstorms, cyclones and landslides. While project formulation, approvals and implementation of various urban housing, buildings and infrastructures schemes, this Atlas provides necessary information for risk analysis and hazard assessment.

The Vulnerability Atlas of India has been prepared by Building Materials and Technology Promotion Council under Ministry of Housing and Urban Affairs, Government of India and available at their website www.bmtpc.org. It is mandatory for the bidders to refer Vulnerability Atlas of India for multi- hazard risk assessment and include the relevant hazard proneness specific to project location while planning and designing the project in terms of.

- i) Seismic zone (II to V) for earthquakes,
- ii) Wind velocity (Basic Wind Velocity: 55, 50, 47, 44, 39 & 33 m/s)
- iii) Area liable to floods and Probable max, surge height
- iv) Thunderstorms history
- v) Number of cyclonic storms/severe cyclonic storms and max sustained wind specific to coastal region
- vi) Landslides incidences with Annual rainfall normal
- vii) District wise Probable Max. Precipitation.”



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



ANNEXURES TO SCC



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



ANNEXURES TO SCC

C O N T E N T S

Annexure-1	: Scope of Work
Annexure-2	: Scope of Supply
Annexure-3	: Completion Schedule
Annexure-4	: Measurement of Work
Annexure-5	: Terms of Payment
Annexure-6	: Specification for Quality Assurance System requirements from Bidders
Annexure-7	: Specification for Health, Safety and Environment(HSE) Management
Annexure-8	: Conditions for issue & reconciliation of material
Annexure-9	: List of Minimum Equipment to be deployed by the Bidder
Annexure-9A	: List of Minimum Equipments required to be owned by bidder
Annexure 9B	: Details of proposed Equipments, Tools & Tackles
Annexure-10	: Minimum no. of skilled manpower to be deployed
Annexure-10A	: Experience Criteria for Key Personnel to be Deployed
Annexure-11	: Hiring / Recovery Rate for Deployment of Manpower
Annexure-12	: Equipment Hiring / Recovery Rate





**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



SCOPE OF WORK

(ANNEXURE-1 TO SPECIAL CONDITIONS OF CONTRACT)

	<p style="text-align: center;">TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION NETWORK (1 YEAR ARC)</p> <p style="text-align: center;">TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101</p>	
---	--	--

ANNEXURE-1 TO SCC

1.0 SCOPE OF WORK

Scope of work shall be as detailed in Particular Job Specification, Technical Specifications, Schedule of Rates & various other parts of this Bidding Document.





**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



SCOPE OF SUPPLY

(ANNEXURE-2 TO SPECIAL CONDITIONS OF CONTRACT)

	<p style="text-align: center;">TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION NETWORK (1 YEAR ARC)</p> <p style="text-align: center;">TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101</p>	
---	--	--

ANNEXURE-2 TO SCC

1.0 SCOPE OF SUPPLY

1.1 Owner's Scope of Supply (Free Issue Item)

Owner's scope of supply shall be as specified in Particular Job Specification, Technical specifications, Schedule of Rates & various other parts of the Bidding Document.

In order to speed up the project Free Issue Materials on replacement basis shall be issued to the Contractor from the designated store(s) of GAIL (I) Ltd. Contractor shall be responsible for lifting the free issue materials from Owner's storage point(s) and transporting the same to work site(s) at his own cost.

Conditions for Issue and Reconciliation of Materials shall be as per Document enclosed as **Annexure-8** to Special Conditions of Contract.

1.2 Contractor's Scope of Supply

All materials except what is under Owner's scope of supply as mentioned in Clause No. 1.1 above, and required for successful completion of works in all respects shall be supplied by the Contractor and the cost of such supply shall be deemed to have been included in the quoted price without any additional liability on the part of Owner.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



COMPLETION SCHEDULE

(ANNEXURE-3 TO SPECIAL CONDITIONS OF CONTRACT)



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



ANNEXURE-3 TO SCC

Completion Schedule / Completion Period

Annual Rate Contract shall be valid for 12 (Twelve Months) from date of issuance of “Fax of Acceptance”,. Including the Mobilization period shall be 15 days from date of issuance of part FOA.

SL.No	Description of Work	Time Schedule
1	Laying of pipeline including all associated works up to 2.0 Km	3 months
2	Laying of pipeline including all associated works more than 2.0 Km and up to 5.0 Km	4 months
3	Laying of pipeline including all associated works more than 5.0 Km and up to 10.0 Km	6 months
4	HDD for length up to 300 meter including all associated works for various dia crossing	4 months
5	HDD for More than 300 meter and less than or equal to 600 meter for various dia crossing	5 months
6	HDD for More than 600 meters for various dia crossing	6 months
7	Above ground piping works at each location including supply of material & valves.	4 months

NOTE: The above mentioned time schedule (under Sl. no. 1 to 7 above) is for the entire scope of work including supply of flange & fittings, valves, IJ etc.

Notes

1. The time of completion as mentioned above is for total scope of work.
2. Effective Date shall mean the date on which Contractor's obligations will commence and that will be date of issuance of Fax of Acceptance.
3. The time indicated above is for completing all the works in all respect including idle time preservation of pipeline, if required as per specification, codes, drawings and instruction of Engineer-in-Charge.

(STAMP & SIGNATURE OF BIDDER)



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



MEASUREMENT OF WORK

(ANNEXURE-4 TO SPECIAL CONDITIONS OF CONTRACT)



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



ANNEXURE-4 TO SCC

MEASUREMENT OF WORK

1.0 GENERAL

- 1.1 The mode of measurement shall be as mentioned in relevant standard specification incorporated in the Bidding Document. Any other mode of measurements not covered in above specifications shall be followed in accordance with relevant BIS codes/ Schedule of Rates/ Specifications etc. and/ or as decided by Engineer-in-charge.
- 1.2 Payment will be made on the basis of joint measurements taken by Contractor and certified by Engineer-in-charge. Measurement shall be based on “Approved for Construction” drawings, to be the extent that the work conforms to the drawings and details are adequate.
- 1.3 Wherever work is executed based on instructions of Engineer-in-charge or details are not adequate in the drawings, physical measurements shall be taken by Contractor in the presence of Engineer-in-charge.
- 1.4 Measurements of weights shall be in metric tonnes corrected to the nearest Kilogram. Linear measurements shall be in meters corrected to the nearest centimeters.
- 1.5 The weights mentioned in the drawing or shipping list shall be the basis for payment. If mountings for panels etc. are packed separately, their erection weights shall include all mountings.
- 1.6 Welds, bolts, nuts, washers etc. shall not be measured. Rates for structural steel work shall be deemed to include the same.
- 1.7 No other payment either for temporary works connected with this Contractor for any other item such as weld, shims, packing plates etc. shall be made. Such items shall be deemed to have been included for in the rates quoted.
- 1.8 Measurement will be made for various items under schedule of rates on the following basis as indicated in the unit column.

- i) Weight: MT or Kg
- ii) Length : M (Meter)
- iii) Number : No.
- iv) Volume : CuM
- v) Area : SqM

- 1.9 All measurements shall be in metric system. All the works in progress will be jointly measured by the representative of the Engineer-in-charge and the contractor's authorised agent progressively. Such measurements will be either recorded/typed by the contractor in the numbered measurement sheets to be supplied by Engineer-in-Charge / Owner or computerized by Contractor themselves. The measurements shall be signed in token of acceptance by the contractor or his authorized representative.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



The contractor shall submit the bill in the approved performa in quintuplicate to the Engineer-in-Charge of the work.

2.0 PIPING

- 2.1 Length of pipes shall be measured along the curvilinear centre of the pipelines laid/ installed and shall include all types of fittings, bends etc. but excluding all types of valves. Length of valves shall be excluded from piping measurement and shall be considered on number basis.
- 2.2 All Socket weld fittings & hot/cold bends, reducers etc. for size 1½" and below shall be fabricated and erected as per requirements by the contractor at no additional cost and his rates for piping of size 1½" and below shall be inclusive of this work.
- 2.3 Vents and drains shall be measured from O.D. of pipe lines and shall be paid for at the corresponding unit rates for similar sizes of pipe. Other piping attachment such as couplings, earthing lugs etc. shall be supplied & erected by the contractor within his quoted rates for piping.
- 2.4 Fabrication of spool pieces for temporary use to aid Contractor's work such as fabrication, erection, flushing and testing of piping etc. shall be done by Contractor as part of piping work and no separate payment shall be made for this.
- 2.5 In case of branch piping, the measurement shall be made from outer surface of the main line except in case of equal size branches.

2.6 Erection of Valves

Erection of all types of valves such as gate/ globe / check / plug / needle/ ball / control/ safety valves etc. will be paid on number basis at the rates given separately in the Schedule of Rates. Any dismantling and re-erection of the valves required for the purpose of testing, calibration etc. will be carried out by the contractor within his quoted rates.

2.7 Fabrication of Supports

- Fabrication of all types of pipe supports, provided as per drawings & instructions of the Engineer-in-Charge, will be paid on weight basis. Bolts, nuts and washers including U-bolt will be supplied by contractor. Weight of bolts, nuts and clamps etc. shall not be added to the weight of pipe support for payment purpose.
- Erection of all types of supports, spring supports and turn buckles, including grouting of supports, if required, shall be carried out by the Contractor as part of piping work and no separate payment will be made for it.
- While fabricating the supporting elements, the contractor will ensure that the dimensions shown in the drawings match with site conditions. No payment shall be made for rectification arising out of discrep-



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



ancies in dimensions of the fabricated items of supporting elements due to site conditions.

- Additional supports as necessary with the site condition shall be fabricated and erected in accordance with the standard engineering practices and instructions of Engineer-in-charge.

3.0 RADIOGRAPHY/DYE-PENETRANT EXAMINATIONS/MAGNETIC PARTICLE TEST (MPT)

Payment for radiography shall be made on the basis of circumferential joints for different pipe dia. Repeat radiography due to defective films or on repaired joint due to Contractor's fault or for additional radiography necessitated due to poor performance of Contractor's welder will be done at Contractor's cost.

4.0 STRUCTURAL STEEL WORK

4.1 Payment for steel work shall be made on basis of admissible weight of the structure accepted, the weight being determined as described below.

4.2 The weight for payment will be assessed from the approved fabrication drawings and the respective bill of materials prepared by the contractor and approved by the Engineer-in-Charge. The weight of structural material/ Plate shall be calculated wherever necessary on the basis of IS Hand Book. If sections are different from IS sections, then Manufacturer Hand Book shall be referred to.

4.3 Sections built out of plates/structural shall be paid on the actual weight incorporated except for gussets which will be paid on the weight of the smallest rectangle enclosing the shape.

4.4 Gratings shall be paid on the basis of calculated weights as determined from the dimensions given on the design drawings/ bill of materials. Full deduction shall be made for all opening above 300 mm size and skews.

4.5 Welds, bolts, nuts, washers etc. shall not be measured. Rate of structural steel work shall be deemed to include the same.

4.6 No other payment either for temporary works or for any other item such as welds, shims, packing plates etc., shall be made. Such items shall be deemed to have been included in the rate quoted for steel work.

5 ELECTRICAL WORKS

5.1 Cables

The measurement for cable laying shall be made on the basis of length actually laid from lug to lug including that of loops provided and paid accordingly.

5.2 The weights mentioned in the drawing or shipping list shall be the basis for payment. If mountings are sent separately (for panels etc.) to facilitate transportation then erection weight shall be



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



inclusive of all mountings. For structural steel measurements/payment shall be made as per finished items.

6.0 INSTRUMENTATION WORKS

6.1 Measurement of primary piping/ tubing between piping or equipment on one side and the instrument on the other side will be from the first break flange or tubing fitting upto the first block valve of fabricated instrument manifold or upto first tee of instrument manifold for integral type manifolds. All piping / fittings at the first block valve or the piping / equipments side upto break flange or tubing fittings shall be excluded. Any valve manifold tubing forming part of manifold or drain connection for instruments upto 1.5 metres individually or each drain connection shall be excluded.

6.2 Air lines and any other utility lines will be measured from end to end including valves and pipe fittings.

6.3 Copper tube measurement will be taken between the two fittings of the copper tube.

6.4 Direct mounted instrument and instruments mounted on support shall be accounted in terms of the quantity in numbers.

6.5 Multicore cables/multi-tubes will be measured between the junction box and its termination inside the control room."

6.6 Two/Three core cables shall be measured between two end terminals.

6.7 No separate payment will be made for receiving, handling and transportation of owner issued materials from owner's / consultant storage points to contractor's store/workshop and the same are deemed to be included in the unit rates for the respective item of work."

6.8 Erection Weights

The weights mentioned in the drawings or shipping list shall be the basis of payment. If mountings are sent separately (for panel etc.) to facilitate transportation then erection weight shall be inclusive of all such mountings. For structural steel, measurements / payment shall be made as per finished items."

7.0 PAINTING ON EQUIPMENTS/PIPING/STRUCTURAL STEEL ETC.

a) EQUIPMENTS

- I) For columns, vessels, reactors, Exchangers, furnaces, ejectors etc., measurement shall be on square meter basis taken over the painted surface.
- II) For pumps, motors and compressors measurement shall be made on number basis.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



b) PAINTING ON PIPING INCLUDING SPECIALS AND FITTINGS

- I) Payment will be made on linear measurement in 'Metres' corrected to the nearest centimeter.
- II) Piping shall be measured along the centre line through all types of fittings and flanges.
- III) Rates for painting of pipes shall be inclusive of painting of all types of pipe supports, flanges, guides, shoes, saddles, clamps, etc. and also all types of fittings except valves (2" and above) which shall be paid separately on number basis.
- IV) There will be no separate measurements of the colour bands/ identification signs (line numbering), flow direction etc. on un insulated piping, the rates of painting of linear length of piping shall be inclusive of cost of such items.

c) PAINTING ON STEEL STRUCTURE

- I) Payment for steel structures shall be made on the basis of admissible weight of structure painted.
- II) Welds, bolts, nuts, washers etc. shall not be measured and rates for painting of structure shall be inclusive of painting such items.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



TERMS OF PAYMENT

(ANNEXURE-5 TO SPECIAL CONDITIONS OF CONTRACT)



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



ANNEXURE-5 TO SCC

1.0 TERMS OF PAYMENT

Pending completion of the whole works, provisional progressive payments for the part of work executed by the contractor shall be made by Owner on the basis of said work completed and certified by the Owner's representative as per the agreed milestone payment schedule and the percentage break-ups given below.

Contractor shall submit his invoices to the Owner's representative monthly in the manner as instructed by Owner. Each invoice will be supported by documentation acceptable to Owner and certified by the Owner's representative. Payments made by owner to the contractor for any part of the work shall not deem that the Owner has accepted the work. All payments against running bills are advance against the work and shall not be taken as final acceptance of work / measurement carried out till the final bill. Owner will release payment through e-payments only as detailed in the bidding document.

NO MOBILIZATION ADVANCE IS PERMISSIBLE.

1.LAYING, HDD & ASSOCIATED WORKS FOR VARIOUS CROSSING AT JAMSHEDPUR GA

1) INSTALLATION & POST-INSTALLATION TESTING OF CARRIER PIPELINE LAID BY HDD METHOD

1.	All types of pre-construction surveys required for design and calculations, detailed engineering, drawings, execution planning, and submission of reports.	2%
2.	Approval of design and calculations, detailed engineering, drawings, and execution plan.	1%
3.	Mobilization and placement of the drilling rig (HDD machine) at site, along with all accessories and consumables.	2%
4.	After completion of Pulling of the complete pipeline string	45%
5	On completion of coating integrity checks for the installed 3LPE pipeline, Post-hydrotesting/ mainline hydrotest, dewatering, and swabbing, carry out final clean-up and restoration of the area, including disposal of drilling fluid and waste etc.	35%
6.	On submission of all required documents, including as-built drawings, pipe book, NOC from the concerned authority, radiography reports, hydrotest reports, and all other documents as specified in the tender requirements.	5%
7.	Completion of all activities and their acceptance, submission of final documents and final bill, and acceptance of the same by the Owner, thereafter leading to the successful closure of the work order.	10%



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Note: Failure of activities i.e. pulling, gauging, post hydro-testing etc. shall be responsibility of Contractor and no payment on account of any activity shall be payable to Contractor. Moreover, earlier successive payments made through RA Bills shall also be recovered. Loss of free issue material occurred due to failure shall be treated in-line with the provision of reconciliation of free issue material.

**II) CARRIER PIPELINE STRING PREPARATION & THEIR PRE-TESTING
FOR RIVER CROSSING BY HDD METHOD**

1.	Up to & including Pre-testing (After stringing, welding, NDT, Joint coating)	30%
2.	After completion of Pulling of the pipeline string	60%
3.	Final acceptance of the system by Owner	10%

III) MAINLINE LAYING WITH ASSOCIATED WORKS

S. No.	Milestone	Payment
1.1.1	Completion of site development, stacking, clearing and grading of ROU , fabrication, alignment, stringing, field welding, NDT (radiography).	30% progressively
1.1.2	Completion of bend installation (if any), joint coating, trenching, lowering & padding and back filling, tie-ins, tie-in NDT, tie-in joint coating.	20% progressively
1.1.3	Completion of Hydro testing, dewatering & swabbing	35% progressively
1.1.4	On submission of all required documents, including as-built drawings, pipe book, NOC from the concerned authority, radiography reports, hydrotest reports, and all other documents as specified in the tender requirements.	5% progressively
1.1.5	Completion of all activities and their acceptance, submission of final documents and final bill, and acceptance of the same by the Owner, thereafter leading to the successful closure of the work order.	10% progressively

The above payment shall be made subject to the following:

- The stage payment of 30% as per sub-clause 1.1.1 above will be released on completion of continuous stretch of min. 1 Km. However, depending on site conditions, EIC may authorize



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



to release payment for execution of non- continuous stretch.

- ii) For discontinuity on account of major crossings specified in SOR, crossing length shall not be taken into account for above payment purposes. The payment towards such crossings shall be made on the basis of item rate in SOR.

IV) Crossing & Other items not covered above or elsewhere in the Tender

Sl. No.	Milestone	Payment
a)	Completion of individual items of work	90% progressively
b)	Completion of all activities and their acceptance Submission of final documents, final bill and acceptance of these by owner thereafter for successful closure of work order.	10% progressively

V) HDPE DUCT (Laying with Associated Works)

1. Completion of Laying of Duct in same Pipeline Trench : 30% progressively
2. Supply & Erection of blowing pit every km, duct jointing for testing & termination of duct in the pit with end cap : 25% progressively
3. Testing of HDPE Duct & Accessories after laying preparation of report as per Specification : 35%
4. Final completion, handing over of complete pipeline system and acceptance of the system by Owner : 10%

VI) CATHODIC PROTECTION WORKS

The basis for payment against various items shall be as follows :

Temporary Cathodic Protection System

- a) 5% on placement of order on sub-vendor.
- b) 5% on design approval of TCP Package
- c) 60% on receipt of material at site and acceptance thereof.
- d) 20% on installation, testing, pre-commissioning and commissioning.
- e) 10% on completion of all activities and their acceptance. Submission of final documents, final bill and acceptance of these by owner thereafter for successful closure of work order

VIII) PIPING WORKS



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- a) 35% on fabrication of piping.
- b) 40% on erection, alignment, welding complete to achieve mechanical completion.
- c) 15% on flushing, testing, draining, drying, painting etc.
- d) 10% on completion of all activities and their acceptance, submission of final documents, final bill and acceptance of these by owner thereafter for successful closure of work order.

IX) CIVIL WORKS & ARCHITECTURAL WORKS

- a) 90% on completion of work on pro-rata basis as certified in running bills.
- b) 10% on completion of all activities and their acceptance, submission of final documents, final bill and acceptance of these by owner thereafter for successful closure of work order.

X) STRUCTURAL WORKS

- a) 5% on approval of fabrication drawings.
- b) 40% on supply and acceptance of material at site.
- c) 20% on fabrication.
- d) 25% on erection, alignment, welding, painting, etc.
- e) 10% on completion of all activities and their acceptance, submission of final documents, final bill and acceptance of these by owner thereafter for successful closure of work order.

XI) FOR SUPPLY ITEMS

- a) 70% on receipt of material at site and acceptance of IMIR.
- b) 20% on completion installation and testing.
- c) 10% after completion of all works in all respects and acceptance by Engineer-in-charge.

XII) FOR ERECTION ITEMS

- a) 55% on transportation and installation in position.
- b) 20% after initial alignment, leveling and grouting.
- c) 15% after final alignment and making ready for commissioning.
- d) 10% on completion of all activities and their acceptance. Submission of final documents, final bill and acceptance of these by owner thereafter for successful closure of work order



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



XIII) ITEM INVOLVING SUPPLY & ERECTION OF MATERIALS

- a) 35% on receipt of materials at site and acceptance of IMIR.
- b) 45% after erection and alignment.
- c) 10% on testing.
- d) 10% after completion of all works in all respects and acceptance by Engineer-in charge.

XIV) OTHER ITEMS NOT COVERED ABOVE OR ELSEWHERE IN THE TENDER

- a) 90% On deployment & completion of work in all respect and Satisfaction of EIC.
- b) 10% After submission of documents and closure of contract

XV) FOR LUMP SUM ITEMS

For all lumpsum items included in schedule of rates, contractor shall furnish price breakup for quoted lumpsum prices for the approval of Engineer-in-charge. Payment for such item shall be made accordingly. In this regard decision of Engineer-in-charge shall be final and binding to the bidder.

Note:

- (i) **Any further breakup of each activity for the payment purpose can be done depending upon the site situation/requirement and Recommendation by Engineer – In-Charge and approval of Construction-In-Charge.**
- (ii) **Failure of activities ie; Pulling, Gauging, Post Hydro testing etc. shall be responsibility of Contractor and no payment on account of any such activity shall be payable to contractor, moreover earlier successive payment made through RA bills shall also be recovered. Loss of free issue material occurred due to failure shall be treated inline with the provision of reconciliation of free issue material.**
- (iii) Notes for SOR Items for valve Pit : For the payment of changed size of valve pit other than SOR item due to site requirements, the following to be adopted.

In case of any change in size of valve pit as per site condition or instruction of EIC, the following shall be adopted for proportionate payment at the quoted rates for reduced or increased dimensions than sizes specified in item, the quantity shall be arrived proportionately based on the actual perimeter constructed and specified perimeter of items (Rate to be consider from the nearest size of the available SOR item).

RCC cover of valve chamber should be engraved/Painted with “GAIL” inline with Instruction of Engineer In Charge.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



All bills are to be submitted mentioned as under:

1. All Bills should be submitted in a Closed Envelope.
2. Following details should be written on the cover of the Closed Envelope without fail:
 - Vendor Name & Vendor Code
 - Invoice Number with Date of Invoice
 - Invoice Amount
 - Name of the Engineer In Charge
 - Nature of Bill

E-Payment

- i) GAIL (India) Limited has initiated payments to Contractors electronically, and to facilitate the payments electronically through 'e-banking'.
- ii) GAIL is implementing Vendor Invoice Management (VIM) system titled as #SARATHI# for automation, digitization & centralization of Account Payable process w.e.f. 01.04.2023.
- iii) After implementation, Supplier/ Contractor/Service Provide/ Consultant is required to upload digital invoice on 'Sparsh' portal. The system optimizes and simplifies the process of receiving, managing, monitoring and forwarding invoices for payment process. The link of 'Sparsh' portal is as under:
- iv) <https://sparsh.gail.co.in/flipper/#/login>
- v) The 'Help Manual' hyperlink to access the detailed User Manual, Demo Videos, FAQ#s and other relevant information is available on 'Sparsh' portal.
- vi) Only digital invoice is to be uploaded on 'Sparsh' portal and all other supporting documents along with copy of invoice are to be submitted to concerned as defined in Purchase Order (PO)/ Letter of Acceptance (LOA).

2.0 PAYMENT METHODOLOGY

I)	The Contractor shall raise invoices on monthly basis. Bidder shall enclose all documents as per checklist issued by GAIL (I) Ltd./ CMC.
II)	All the relevant clauses of "General Conditions of Contract", "Instructions to Bidders" and "Special Conditions of Contract" shall be applicable.
III)	Payment shall start only after signing of Contract Agreement and receipt of SECURITY DEPOSIT/CONTRACT PERFORMANCE GUARANTEE as per Bid Document. Payment shall be made to the bank account bearing the name of the Contractor to whom "Letter of Acceptance"/"Work Order" has been released by GAIL.
IV)	The payment of the contractor will be released within 15 days from the date of receipt of complete invoice as per terms and condition of the contract.
V)	Owner will release payment through e-payments only as detailed in bidding document.
VI)	All payments against running bills are advance against the work and shall not be taken as Final acceptance of work / measurement carried out till the final bill.
VII)	Further break-up of Lump sum Prices, if deemed necessary for any progressive payment of individual item may be mutually arrived at between Engineer-in-Charge and the Contractor.
VIII)	Successful bidder(s) to submit material reconciliation certificate along with each bill.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



IX)	Bills shall be raised by contractor in line with check list attached in Tender document.
X)	<p>The Contractor shall be responsible to submit the invoices to EIC or designated person in GAIL and the same shall be processed through GAIL's "ANJANI PORTAL". GAIL has implemented "Anjani" e-Measurement Book & e-Billing Portal for ease in submission of measurement book/bill and reduction in paper transaction. Accordingly, GAIL will process the Bill with Measurement Book through "Anjani" e-Measurement Book & e-Billing Portal (link: https://gailebank.gail.co.in/MBAutomation/firmlogin.aspx). Accordingly, Contractor/ Service Provider/ Consultant is requested to forward the RA Bill on "Anjani" e-Measurement Book & e-Billing Portal through concerned EIC/CIC/SIC, whichever is applicable. Further, User Manual is also available on aforesaid portal.</p>
XI)	All RA Bills shall be submitted to EIC of CMC / GAIL.
XII)	As per CBDT Notification No. 95/2015 dated 30.12.2015, mentioning of PAN no. is mandatory for procurement of goods / services/works/consultancy services exceeding Rs. 2 Lacs per transaction.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



SPECIFICATION FOR QUALITY ASSURANCE SYSTEM REQUIREMENTS

(ANNEXURE-6 TO SPECIAL CONDITIONS OF CONTRACT)

(For details- Refer our Technical Specification No. BR/QA/001 of the same is enclosed in Vol.-II
of tender document.)



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



STANDARD SPECIFICATION FOR HEALTH, SAFETY AND ENVIRONMENTAL (HSE) MANAGEMENT AT CONSTRUCTION SITES

(ANNEXURE-7 TO SPECIAL CONDITIONS OF CONTRACT)



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



CONDITIONS FOR ISSUE AND RECONCILIATION OF MATERIAL

(ANNEXURE – 8 TO SPECIAL CONDITIONS OF CONTRACT)



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



ANNEXURE-8 TO SCC

1.0 CONDITIONS FOR ISSUE OF MATERIALS

Whenever any material is issued by Owner, following conditions for issue of material in addition to other conditions specified in the contract shall be applicable.

- 1.1 Necessary indents will have to be raised by the Contractor as per procedure laid down by the Engineer-in-charge from time to time, when he requires the above material for incorporation in permanent works.
- 1.2 Materials will be issued only for permanent works and not for temporary works, enabling works etc. unless specifically approved by the Engineer-in-charge and the same shall not be taken into account for the purpose of materials reconciliation.
- 1.3 The contractor shall bear all other cost including lifting, carting from issue points to work site/ contractor's store, custody and handling etc. and return of surplus/ serviceable scrap materials to Owner's storage points to be designated by the Engineer-in-charge etc. No separate payment for such expenditure will be made.
- 1.4 No material shall be allowed to be taken outside the plant without a gate pass.
- 1.5 The contractor shall be responsible for proper storage, preservation and watch & ward of the materials.

1.6 RETURN OF UNUSED MATERIAL

- 1.6.1 All unused/scrap materials shall be the property of the Owner and shall be returned in good and acceptable condition size wise, category wise by the Contractor at his own cost to Owner's Store(s).
- 1.6.2 No credit will be given to the Contractor for return of scrap. The Contractor should quote the rates accordingly.
- 1.6.3 In case the Contractor fails to return unused/scrap materials, then recovery for such quantity of materials, not returned by the Contractor shall be affected at following penal rates from the Contractor's bills or from any other dues of the Contractor to the Owner. Contractor shall make his own arrangements for weighing the off cuts to be returned to Owner's stores.

1.6.4 Penal Rates for non return of materials

Sl. No.	Material	Penal Rates
1.	(a) Penal rate for non return of accountable scrap. (b) Penal rate for return of serviceable materials in excess permitted % allowances. (c) Penal rate for issuance of unplanned OFC jointing kits.	Issue Rate + 25% or Landed Rate + 25% (in case issue rate are not indicated in the contract)
2.	Penal rates for non return of Unused	Twice the Issue Rates



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

	material/excess scrap	or Twice the Landed Rates (in case Issue Rates are not indicated in the Con- tract)
--	-----------------------	--

- NOTE : 1) Landed Rate shall be arrived from the latest Purchase Order of respective material received at site by Owner/Consultant.
- 2) In case different penal rates have been indicated in the Contract (based on Project requirement), the same will supersede the above rates

2.0 PIPING MATERIALS

- 2.1 All pipes shall be issued in available lengths/shapes and no claims for extra payments on account of issue of non-standard length & shape will be entertained. Pipes shall be issued on linear measurement basis. All valves, flanges, fittings etc. shall be issued on number(s) basis. Contractor shall store the materials in such a way so as to avoid mixing of different types of material and shall maintain complete identification and traceability at all times.
- 2.2 The scrap allowance for pipes issued by the Owner shall be 3% (2½% accountable +½% non accountable) of the actual consumption as incorporated in the works.
- 2.3 All pipes in length of 2 meters and above shall be considered as serviceable material provided the material is in good and acceptable condition and has clear identification and traceability (Manufacturer's name, heat number/batch number and test certificates). Pipes in lengths less than 2M shall be treated as scrap.
- 2.4 For the non account of pipes drawn by the Contractor over and above the actual consumption as determined by the Engineer-in-Charge, plus 3% (2½% accountable + ½% non accountable) thereof to cover the scrap allowance, recovery at penal rate shall be effected from the Contractor's bill(s) or from any other dues of the Contractor to the Owner.
- 2.5 All unused/scrap pipes, valves, flanges, forged fitting like elbows, reducers tees shall be returned by the Contractor category wise duly cleaned, greased and spec. marked at his own cost to Owner's stores. In case the Contractor fails to do so then recovery for such quantity of pipes not returned by the Contractor at the penal rates shall be effected from the Contractor's bill(s) or from any other dues of the Contractor to the Owner.

3.0 EQUIPMENTS

Various equipment/materials intended for the installation will be received by Owner in unpacked, skid mounted, crated, packed or loose condition and will be stored in the warehouses and open yards. In general, materials will be issued to the Contractor in 'as received' condition. It will be the Contractor's responsibility to draw, load and transport all materials from Owner's designated places of issue to the point of installation and return all packing materials like steel frames, wooden boxes/scrap etc. to Owner's stores.

All materials supplied by the Owner shall be duly protected by the Contractor at his own cost with appropriate preservative like primer, lacquer painting, grease etc. as required.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



4.0 CABLES

4.1 Appropriation of cables shall be done as follows:

4.1.1 All the surplus and serviceable cables out of the cables quantity(ies) issued by the Owner to the Contractor shall be returned by the Contractor to the Owner's store in good condition and as directed by the Engineer-in-Charge.

4.1.2 The Contractor shall be allowed a cutting/wastage allowance of 1.5% for power cables and 3% for the control cables. This cutting/wastage allowance shall be computed on the length of cables actually laid, measured and accepted.

4.1.3 All cables being returned to store should carry Aluminium sheet tags indicating the size & type of cable. Cables of less than 15 meters length will be termed as scrap. Cables of lengths 15M and above shall be termed as serviceable material & shall be returned size wise and category wise to the Owner's store in wooden drums. Cables of serviceable length being returned to stores in drum(s) shall be accepted only after Megger value continuity test and physical measurement is carried out by the Contractor to the satisfaction of Engineer-in-Charge. Empty cable drums and major packing material (as decided by Engineer-in-charge) shall be Owner's property and shall be returned to Owner's Store/designated place without any additional cost.

4.1.4 While carrying out material appropriation with the Contractor, the above points will be taken into account. All serviceable materials returned by the Contractor (size wise & category wise) shall be deducted from the quantity(ies) issued to the Contractor for the respective sizes. Scrap generated for power cable and control cable shall also be returned to Owner's store on Lot basis.

4.1.5 Material appropriation shall be done & allowable scrap quantity calculated. The wastage generated by the Contractor in excess of the allowable percentage shall be charged at the penal rates.

5.0 LINE PIPES

5.1 All coated line pipes as per Line Pipe specifications shall be issued on linear measurement basis. The line pipes shall be issued in available lengths and shapes and no claim for extra payment on account of issue of non-standard length and shape will be entertained. Contractor shall store and maintain the line pipes in proper manner to avoid mixing of different classes of pipes. Contractor shall maintain complete identification and traceability at all times. All cut pieces when returned to Owner's storage points after beveling, shall be considered as serviceable material provided:

5.1.1 Corrosion Protection Coating is intact.

5.1.2 Pipe pieces have pipe specifications, manufacturer's logo/name and heat number duly authenticated with hard stamp of the authorized inspector as per approved procedure. All cut pieces of pipes measuring less than 2 M will be treated as wastage/scrap.

5.2 For the purpose of accounting of coated line pipes, following allowances shall be permitted:

a) Unaccountable wastage:



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- | | | |
|------|--|-------|
| I) | Upto 100 km | 0.1% |
| II) | 101 to 500 km | 0.07% |
| III) | Beyond 500 km | 0.05% |
| b) | Scrap (All cut pieces of pipes measuring less than 2 Meter) | 0.25% |
| c) | Serviceable materials (All cut pieces of pipe measuring 2 Meter and above) | 0.5% |

Scrap shall be accounted at actuals as per site assessment subject to maximum limits as stated above.

The percentage allowance shall be accounted on the basis of pipe book chainage for main pipeline

- 5.2.1 Material appropriation shall be done & allowable scrap quantity calculated. The wastage generated by the Contractor in excess of the allowable percentage shall be charged at the penal rates as per clause no. 1.6.4 above as given in the contract.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



**MINIMUM NUMBER OF EQUIPMENTS TO BE DEPLOYED / MINIMUM NO.
OF MAJOR EQUIPMENTS REQUIRED TO BE OWNED**
(ANNEXURE-9 TO SPECIAL CONDITIONS OF CONTRACT)



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



ANNEXURE-9 TO SCC

LIST OF MINIMUM EQUIPMENT TO BE DEPLOYED BY THE BIDDER

Sl. No.	Equipment Description	Qty. (in Nos.)
1.	Excavator/Back-Hoe (□ Hitachi 60 or equivalent)	1
2.	Hydra (8 – 10 MT)	2
3.	JCB	1
4.	DG Welding Machines /Welding Rectifier	4
5.	DG Set 62.5 KVA to 200 KVA + Stabilizer	1
6.	HDD Rig with All Equipments & Accessories (Min. Cap. 30 T)	1
7.	Rollers	As required
8.	Mud Pump (Spare)	1
9.	Water Lifting / Filling Pumps (Adequate capacity)	1/1
10.	Pressurization Pump – Motorized	1
11.	Air Compressor – (Min Capacity -300CFM , Higher Capacity as required)	1
12.	Complete hydro testing kit (pressure & temperature recorder, Dead WT Tester, thermocouple, water filling pump, Dozing Pump etc.)	1 No. or As required
13.	Dewatering Pump	1
14.	Holiday Detector Unit	1
15.	Pipe Trailers	As required
16.	Blast Cleaning Machine	1
17.	Dozing Pump	As required
18.	X-Ray Unit (Complete)	1
19.	External/Internal Clamp 8",6" & 4"NB	As required

Notes:

- Bidder is required to mobilize the above minimum critical equipments in good working condition and suitable for piping & associated work. Bidder is required to augment the above list with additional numbers / categories of equipments as per actual requirement and instruction of Engineer-In-Charge without any additional financial implication to client.
- Contractor to ensure **WELDING & NDT** procedure and welders are qualified within **10 DAYS** time from date of FOA/ Date of intimation.
- Bidder shall replace any defective / damaged equipments promptly to complete the work without any time & cost implication to the client / owner.
- After completion of certain activities, in case equipments are not required the same can be demobilised with prior approval of Engineer-In-Charge.
- Capacity of HDD Rig indicated above is tentative only. Actual capacity of HDD Rig to be deployed shall be as per design calculation. Contractor shall not be compensated for any increase in Rig capacity, if required, for successful execution of HDD crossing.
- Work against first Letter of Intimation for each GA, the mobilization period shall be 14 days from date of intimation. The mobilization period for subsequent individual work orders for each location shall be 7 (seven) days.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



MINIMUM NO. OF SKILLED MANPOWER TO BE DEPLOYED

(ANNEXURE-10 TO SPECIAL CONDITIONS OF CONTRACT)



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



ANNEXURE-10 TO SCC

MINIMUM NO. OF SKILLED MANPOWER TO BE DEPLOYED

S.No	Description	Requirement per contractor
1	Resident Construction Manager	1
2	Planning engineer	1
3	Safety officer	1
4	Discipline Engineer's (Mechanical/ QA-QC)	1/1
5	Foreman / Supervisor	2
6	Civil survey crew	1
7	Welder	4
8	Fitter	As required
9	Grinder	As required
10	Machine operator	As required
11	Blast cleaning crew	As required
12	Electrician / Machine mechanic	As required
13	Drivers	As required
14	X-ray crew	1
15	Field joint coating crew	1
16	HDD crew (Driller and supporting staff)	As required
17	Hydro-testing crew	1

The above proposed list of skilled manpower is the minimum to be deployed by Contractor.

NOTES:-

- (1) HDD equipment and Crew as required shall be deployed based on the SOW finalized and as per instructions of EIC.
- (2) The details of minimum manpower required to be mobilized by the execution contractor to complete the work within schedule is given above and it is not exhaustive. Contractor is required to augment the above list with additional numbers/categories of workmen as required and directed by Engineer-In charge to complete the work within the completion time schedule and quoted price.
- (3) The Manpower as identified above, should have required qualification and adequate relevant experience.
- (4) *CV of proposed Resident Construction Manager, QA/QC Engineer, Planning Engineer & Safety Officer to be submitted along with the bid.* The experience should be related to execution of Cross Country/CGD Hydrocarbon Transportation Pipeline laying.
- (5) This manpower are to be mobilized **within 14 days** of Date of FOA/Date of intimation



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



ANNEXURE-10A TO SCC

EXPERIENCE CRITERIA FOR KEY PERSONNEL TO BE DEPLOYED DURING CONSTRUCTION

- The Bidder must provide a detailed **organizational chart** indicating the organization or personnel and equipment for each phase of the Works. **CVs of key persons** shall be submitted by the Contractor along with bid and replacement of any of these key persons after LOA issuance shall be approved by Owner / Owner's representative. Key persons shall be deployed during the entire duration of the work till completion of all works. Non deployment of key persons will be subject to recovery as defined elsewhere in the bid.

Following key persons to be deployed during construction:

Sl. No.	Position	Qualification & Knowledge	Experience	No. of Key Personnel (minimum)
1.	Construction Manager / Construction In-Charge	Degree / Diploma in Civil / Mechanical Engineering	At least 8 years experience for Degree holder and 12 years experience for Diploma holder in Construction of Cross country Pipeline/ HDD works in Hydrocarbon Pipelines Project (Oil & Gas). Out of the 8 / 12 years experience, at least 5 / 8 years experience must be in similar position in works related to construction of cross country pipeline/ HDD works in hydrocarbon pipeline projects.	1 No.
2.	Safety Officer	Degree / Diploma in Engineering / Project Management	At least 4 years of experience for Degree holder and 8 years experience for Diploma holder in Safety Management in construction of cross country pipeline/ HDD works in Hydrocarbon Pipeline Project.	1 No
3.	QA / QC Engineer	Degree / Diploma in Mechanical Engineering	At least 6 years of experience for Degree holder and 10 years experience for Diploma holder in quality / NDT management in construction of cross country pipeline/ HDD works in Hydrocarbon Pipeline Project.	1 No.
4.	Welding / NDT Engineer	Degree / Diploma in	At least 5 years of experience for Degree holder and 7 years	1 No.



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION NETWORK (1 YEAR ARC)

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Sl. No.	Position	Qualification & Knowledge	Experience	No. of Key Personnel (minimum)
		Mechanical Engineering	experience for Diploma holder in Welding / NDT management in construction of cross country pipeline/ HDD works in Hydrocarbon Pipeline Project.	
5.	Planning Engineer	Degree / Diploma in Engineering / Project Management	At least 4 years of experience for Degree holder and 8 years experience for Diploma holder in executing projects in construction of cross country pipeline/ HDD works in Hydrocarbon Pipeline Project.	1 No.

- The above experience criteria for key personnel shall be binding to the contractor. Bidder shall provide, at his own expenses, all the necessary equipment, instruments, accessories etc. to the above key personnel to execute the job in professional & safe manner.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



HIRING / RECOVERY RATE FOR DEPLOYMENT OF MANPOWER

(ANNEXURE-11 TO SPECIAL CONDITIONS OF CONTRACT)



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

ANNEXURE –11 to SCC

HIRING / RECOVERY RATE FOR DEPLOYMENT OF MANPOWER

1. The Labour rates are “all inclusive”. These rates include but are not limited to all payroll costs and allowances, payroll taxes, fringe benefits, protective and/or special clothing, construction supplies required for work of a nature included in this contract, overhead, profit, insurance, transportation and travel time.
2. The rates are inclusive of providing hand tools and consumables such as electrodes, filler wire, gases, grinding wheels where the concerned category of labour is expected to use in execution of the job but exclusive of all major equipment and machineries.
3. The normal time labour rates shall apply for all hours worked upto eight (8) hours in a day and overtime rates shall apply for all hours worked in excess of eight (8) hours in one working day, Sunday and Public Holidays. The payment for part of the day shall be made on prorata basis.

SR NO.	CLASSIFICATION PERSONNEL	RATE PER DAY OF NORMAL HOURS	RATE PER HOUR FOR OVER TIME, SUNDAY & HOL- IDAY
		IN RS.	IN RS.
1	FOREMAN	3217	402
2	SURVEYOR	2275	284
3	SUPERVISOR	3575	446
4	ENGINEER	4550	568
5	SAFETY OFFICER	3575	446
6	GAS CUTTER	1502	187
7	GRINDER	1502	187
8	BRICK MASON	1040	130
9	STONE MASON	1040	130
10	STRUCTURAL WELDER	2145	268
11	QUALIFIED ARC WELDER- AUTOMATIC	2925	365
12	QUALIFIED ARC WELDER-MANUAL	2275	284
13	WATCHMAN/HELPER	845	105
14	CIVIL LABOUR (UNSKILLED LABOUR)	845	105
15	PIPELINE FITTER	1300	162
16	STRUCTURAL FITTER	1105	138
17	COATER	1105	138
18	MECHANIC	1105	138



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

19	SITE EQUIPMENT/MACHINE OPERATOR	1105	138
20	HEAVY MACHINE OPERATOR	1300	162
21	HEAVY DUTY DRIVER	1300	162
22	ELECTRICIAN	1300	162
23	FABRICATOR	1300	162
24	CARPENTER	1040	130
25	PLUMBER	1040	130
26	PAINTER	1040	130
27	CABLE JOINTER	1040	130
28	FUSION OPERATION/JOINTER	1105	138
29	INSTRUMENTATION TECHNI-	1105	138
30	INSULATOR	910	114
31	RIGGER	975	122
32	BHISTI (WATER MAN)	845	106
33	DOCUMENT CONTROLLER	1300	163
34	ACCOUNT OFFICER	1950	244
35	STORE KEEPER/INCHARGE	1300	163

(SIGNATURE OF BIDDER)

NOTES:-

1. Rates are final and Tenderer is to sign only without deviation.
2. In case of foreign bidder, conversion rate applicable on one day prior to price bid opening date published by the State Bank of India will be considered.
3. The recovery rates shall be the rates provided above plus 20% (twenty percent).



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

**EQUIPMENT HIRING/RECOVERY RATES
(ANNEXURE-12 TO SPECIAL CONDITIONS OF CONTRACT)**



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

ANNEXURE-12 TO SCC

EQUIPMENT HOURLY RENTAL RATES FOR EXTRA WORKS

Sl. No.	Equipment	HIRING / RECOVERY RATES (IN INR) (Per Day): 8 Hrs INCLUDING CON-SUMABLES & FUEL
1	Excavator / Back Hoe-Ex 280 / 300 & Above or Equivalent	10,000
2	Excavator / Back Hoe-Ex 200 & Above or Equivalent	8,000
3	Pipe Layer/Side Boom – 70 T & Above Capacity	15,000
4	Pipe Layer/Side Boom – 60 T & Above Capacity	12,000
5	Pipe Layer/Side Boom – 40 T & Above Capacity	10,000
6	Pipe Bending Machine	12,000
7	Dozer with Ripper – D7/D6 or Equivalent	12,000
8	DG Welding Machines	3,350
9	Semi Auto Welding Machines	2,500
10	Dozer with Ripper – D8 or Equivalent	13,600
11	Hydra (upto 10 MT)	5,000
12	Hydra (above 10 MT - upto 25 MT)	7,850
13	Hvdra (above 25 MT to 40T)	8,950
14	Hvdra (above 41 MT to 80T)	16,800
15	Horizontal Auger Boring Machine with Rock breaking tool	7,500
16	Pipe Clamp (Pneumatic/Hydraulic) – Internal	2,000
17	Tyre Mounted Cranes (above 10 and upto 30 MT)	7,850
18	Tyre Mounted Cranes (above 30 and upto 75 MT)	9,500
19	Tyre Mounted Cranes (above 75 MT)	16,800
20	X-Ray M/C – Internal Crawler	3,500
21	X-Ray M/C – External	3,000
22	Gamma Source	3,000
23	Water Lifting Pump (400 m3/hr. & above)	5,000
24	Filling Pumps (400 TO 1000 M3/HR)	8,000
25	Pressurization Pump – Motorized	6,000
26	Induction/Resistance Heating Equipment or LPG Multi Torch.	4,000
27	Air Compressor – (300CFM)	8,900
28	Air Compressor – (450/600/800 CFM)	14,100
29	Air Compressor – (1000-1500) CFM	25,000
30	D.G. Sets : 62.5 KVA to 200 KVA (inclusive of generators)	3,300
31	Blast Cleaning Machine	3,500
32	Pipe Trailers (FB / Semi Low Bed)	10,000
33.	Mono drill crawler mounted	4,500



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

34	Hand drill(pneumatic)for rock blasting	8,400
35	Rock breaker attachment	9,136
36	Dozing Pump	1,000
37	Bevel Cutting Machine –Manua	5,000
38	UT Machine with operator	3,500
39	Dewatering Pump	2,500
40	Holiday Detector Unit	1,250
41	Dead WT Tester	2,200
42	Dumper / Tippers	4,200
43	Pipe locator	1,000
44	Pipe Clamp – External	1,000
45	Pipe Trailer for Coated Line Pipe	10,000
46	Rock Breaking Machine with Excavator	8,536
47	Grinding machine	300
48	Gas cutting set with cylinders	750
49	Trucks (upto 9 T) with driver	5,000
50	Car/Jeep with driver (5 Seater)	5,000
51	Car/Jeep with driver (7 Seater)	8,000
52	Tractor with trolley	2,000
53	Tripod with 5 Tons Chain Pulley Block	3,350
54	Pneumatic Drill (Tractor mounted for blasting) with Compressor	8,400
55	JCB Excavator	8,000
56	JCB Excavator with rock breaking tool	12,000
57	Moling machine (Manual)	3,000
58	Moling machine (Machine)	5,000
59	Fusion jointing Machine	5,000
60	Concrete mixer 0.25 to 0.40 Cum with hopper or as required.	1,000
HDD equipments		
61.	HDD Rig with all Equipments & Accessories (Cap upto 50 T) (Soft Strata)	20,000
62.	HDD Rig with all Equipments & Accessories (Cap upto 50 T) (Rock Strata)	25,000
63.	HDD Rig with all Equipments & Accessories (Cap above 50 T and upto 100 T) (Soft Strata)	30,000
64.	HDD Rig with all Equipments & Accessories (Cap above 50 T and upto 100 T) (Rock Strata)	40,000
65.	HDD Rig with all Equipments & Accessories (Cap above 100 T and upto 200 T) (Soft Strata)	80,000



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

66.	HDD Rig with all Equipments & Accessories (Cap above 100 T and upto 200 T (Rock Strata)	100,000
67.	HDD Rig with all Equipments & Accessories (Cap above 200 T and upto 350T) (Soft Strata)	115,000
68.	HDD Rig with all Equipments & Accessories (Cap above 200 T and upto 350T (Rock Strata)	140,000
69.	HDD Rig with all Equipment's & Accessories (Cap above 350 T) (Soft Strata)	150,000
70.	HDD Rig with all Equipment's & Accessories (Cap above 350 T) (Rock Strata)	180,000

NOTES: -

1. Rates are inclusive of operators / drivers / Fuel /POL and consumables.
2. Rates are inclusive of contractor's overheads & profit.
3. In case of foreign bidder, conversion rate applicable on one day prior to price bid opening date published by the State Bank of India will be considered.
4. The recovery rates shall be the rates provided above plus 20% (twenty percent).
5. Hiring rates of above equipments are for one shift (i.e. 8 Hrs). Hiring rates for two shifts i.e. 16 hrs are 1.25 times of above rates & hiring rates for three shifts i.e. 24 hrs are 1.5 times of above Rates.
6. **Notes for HDD equipment: -**
 - a. Rates are inclusive of operators / drivers / Fuel /POL and consumables.
 - b. Rates are inclusive of contractor's overheads & profit.
 - c. In case of foreign bidder, conversion rate applicable on one day prior to price bid. opening date published by the State Bank of India will be considered.
 - d. The recovery rates shall be the rates provided above plus 20% (twenty percent).

(SIGNATURE OF BIDDER)



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Annexure-A (REV)

The Contractor has to fully comply with all applicable Labour Laws and Regulations passed, modified and notified from time to time by the Central, State and Local Government agencies/authorities. Specific attention of the Contractor is drawn to the following obligations amongst others:

1. The Minimum Wages Act, 1948, Payment of Wages Act, 1936 and Payment of Bonus Act 1965 or The Code on Wages, 2019 (after it comes into force)

1.1. Minimum Wages:

- a. During the tenure of the contract, the Contractor must ensure the payment of minimum wages, as notified by the Central Government or State Government whichever is higher, as per the provisions of the Minimum Wages Act, 1948 I Code on Wages, 2019 (after it comes into force).
- b. **Wage period and monthly wages:** Wage period shall be monthly and wages for a month shall be calculated by multiplying daily rate of Minimum Wages by 26. The monthly wages include the wages of the weekly days of rest as applicable to the office/establishment of GAIL.

Deduction in case of any days of absence other than weekly days of rest shall be calculated using the following formula:

$$\text{Deduction for absence} = \text{days of absence} \times \text{applicable wage rate}$$

1.2. Payment of Wages:

- a. The Contractor shall disburse monthly wages **through e-banking/ digital mode through cashless transaction only**, and avoid illegitimate deductions and maintain records /returns as prescribed. The Contractor shall be solely responsible for the payment of wages and other dues to the resources, if any, deployed by him latest by 7th day of the subsequent month as per the provisions of the Payment of Wages Act, 1936 / as applicable under Code on Wages, 2019 (after it comes into force) in the presence of Engineer In-charge (EiC) or authorized representative of GAIL. After disbursement of wages, the representative of the Contractor and EiC/ authorised representative of GAIL have to certify the payment of wages to the resources and sign the Wage Register - Form B (under The Ease of Compliance to Maintain Registers under various Labour Laws Rules, 2017) / FORM-I of Code on Wages, 2019 (after it comes into force) with specific seal detailing name/designation/Company.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

1.3. Payment of Bonus:

Contractor shall ensure payment of bonus as per the provisions of the Payment of Bonus Act, 1965 / Code on Wages, 2019 (after it comes into force). Present minimum rate of payment of Bonus as per the Payment of Bonus Act, 1965 is 8.33% of minimum wages per month or 8.33% of Rs.7,000/- per month whichever is higher. The rate shall be subject to amendments made from time to time to the legislation.

Payment of Bonus / ex-gratia shall be made preferably before Deepawali festival falling after the end of relevant financial year(s) and the balance payment at the time of closure of contract.

For service contracts, the payment towards the bonus/ex-gratia (**made on yearly basis**) shall be released / reimbursed to the contractor, after submission of proof of payment. No reimbursement shall however be applicable in works contract.

2. Leaves/ Leave with wages/ Holiday:

The Contractor shall comply with all the applicable leave Rules including leave with wages in terms of applicable labour legislations i.e. Factories Act, 1948 / Shops & Establishment Act/ Industrial Establishment (national & festival holidays, casual & sick leave) Act, 1965.

The Contractor shall extend the leave with wages and maintain the Register of Leave pertaining to the resource deployed. The payment towards un-availed leave, as per the Factories Act, 1948 / Shops & Establishment Act, shall be settled with the resource at the time of closure of the contract or separation of resource from the contract by the contractor.

- i. As per the **Factories Act, 1948 (if applicable)**:-Annual Leave with Wages@ 01 day for every 20 days of work performed by him in the previous calendar year becomes due.
- ii. As per the **Shops & Establishment Act (if applicable)** : Privilege Leave not less than 15 days and Sickness/Casual Leave not less than 12 days (this provision may vary from state to state).
- iii. As per the **Industrial Establishment (National & Festival Holidays, Casual & Sick Leave) Act, 1965 / Negotiable Instrument Act 1881 / Shops & Establishment Act (as applicable)**: (a) three national holidays of one whole day each on the 26th January, 15th August and 2nd October (b) five other holidays on any of the festivals specified in the - Schedule appended to this Act. (c) Every worker shall in each calendar year, be allowed by the Owner 07 casual leave and 14 sick leave in such manner and on such conditions as may be prescribed (This provision may vary from state to state).

3. The Employees' Provident Fund & Miscellaneous Provisions Act 1952



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

- a) The Contractor shall have independent PF code no. with the RPFC as required under the Employees' PF & Misc. Provisions Act, 1952.
 - b) The Contractor has to ensure compliance (as per prevailing rates) and extend benefits under the Employees' Provident Fund Scheme 1952, the Employees' Pension Scheme 1995 & the Employees' Deposit Linked Insurance Scheme, 1976 to the resources deployed by him.
 - c) The Contractor is required to submit copies of *separate e-Challans / ECR alongwith proof of payment/receipt* in respect of resources engaged through this contract only, on monthly basis. **Common challans would not be acceptable in GAIL.** The Contractor should submit copies of previous months EPF e-Challans / ECR alongwith current month's bill. The TRRN. No. of the ECR would be verified online from EPFO portal by the Engineer-in-charge to confirm the status of payment and names of the resources deployed.
 - d) **PF is mandatory irrespective of the number of resources deployed** by the Contractor under this contract. PF membership and deposit of PF contribution is also mandatory even if the wage payment to the resource is exceeding the prescribed monthly wage ceiling (i.e. Rs. 15,000/-) under the Employees' PF & Misc. Provisions Act, 1952 and in such case the liability of the Contractor towards PF contribution shall be limited to the prescribed monthly wage ceiling notified from time to time (i.e.Rs.15,000/-currently).
 - e) In case, the Contractor deploys any "**International Worker**", the Contractor should also make compliance under para 83 of EPF Scheme, 1952 i.r.o the "International Workers" and must register on **the International Worker Portal of EPFO.**
4. **The Employees' State Insurance Act, 1948 (If applicable and as per prevailing rates)**
- a) The Contractor shall have his own ESI code No. allotted by Employees' State Insurance Corporation (ESIC) as required under the Employees' State Insurance Act, 1948.'
 - b) The Contractor has to arrange **Smart Cards (i.e. ESI Identity Card) /e-Pehchan Card** for the resource(s) engaged by him from the Corporation.
5. **The Employees' Compensation Act 1923 (wherever applicable)**

In case, the work place is out of the notified coverage area under ESIC i.e. ESIC is not implemented in the area or in case of excluded employees under ESIC, the Contractor is required to take Employee Compensation / Workmen Compensation Policy from IRDAI approved Insurance Company taking into consideration the **maximum compensation liability** as per provisions of Employees' Compensation Act, 1923. It must be ensured that the contractor/contracting firm should extend coverage to the contract workers through Employee Compensation Policy, to meet the **Compensation Liability** under **Employee's Compensation**



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



tion Act, 1923 along with Medi-claim Floater Policy with a coverage of Rs. 3 Lakhs per resource covering his/her spouse and two children.

6. Group Personal Accident Insurance Policy

The Contractor is required to take a Group Personal Accident Insurance Policy with coverage of **Rs. 5 Lakhs** (covering death, permanent disability+ partial disability) per resource for the entire period of contract covering all resources deployed under the contract.

7. The Payment of Gratuity Act, 1972

In case of Death or permanent disablement of a resource during execution of work under the contract, the Contractor has to pay the Gratuity as per the provision under the Payment of Gratuity Act, 1972 to the nominee(s) of the resource as per the details maintained in the duly signed Nomination Form maintained by the Contractor. The proof of disbursement may be submitted to the EiC for claiming reimbursement of amount paid towards death Gratuity from GAIL.

8. The Contract Labour (R&A) Act, 1970

- a) The Contractor is required to obtain Labour license under the provisions of the Contract Labour (R&A) Act, 1970 from the office of Licensing Officer, Central Labour Authority, Ministry of Labour and Employment, Govt. of India having jurisdiction of the Region.
- b) The Contractor shall discharge obligations as provided under the Contract Labour (R&A) Act, 1970 rules and regulations framed under the same and enforced from time to time.
- c) The Contractor shall ensure regular and effective supervision and control over the resources deployed for which a supervisor / representative of the Contractor should be available at all the times for giving suitable direction for undertaking the Contractual Obligations.
- d) The Contractor is solely responsible for payment of wages to each resource deployed by him and such wages shall be paid before the expiry of such period as may be prescribed.
- e) It shall be the duty of the Contractor to ensure the disbursement of wages to resource(s) through e-banking/digital mode. In case the resource does not have a bank account, the disbursement of wages may be made in cash in the presence of the Engineer-in-charge/ authorized representative of GAIL initially and Contractor shall simultaneously arrange for opening the bank account of each contract labour deployed by him.
- f) In case, the Contractor fails to make payment of wages and deposit of PF contribution within the prescribed period or makes short payment of wages/ short deposit of PF contribution, **it shall be treated as FAILURE and action as per the provisions of General Conditions of Contract shall be taken. Further, GAIL as Principal Employer, will make payment of**



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

wages in full or the unpaid balance due, as the case may be, to the resource(s) deployed by the Contractor and deposit the PF contribution with PF authorities. Such amounts will be recovered from the Contractor either by deduction from any amount payable to the Contractor under any contract or as a debt payable by the Contractor.

9. The contractor is required to comply with all applicable labour laws and regulations including, but not limited to the following:
- a. The Factories Act, 1948/ The Shops & Establishment Act, 1948 (which ever applicable)
 - b. The Maternity Benefit Act, 1961
 - c. The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act 1979 & Building and Other Construction Workers Welfare Cess Act, 1996
 - d. The Inter State Migrant Workmen (RECS) Act 1979 (if applicable)
 - e. Contract Labour (R&A) Act-1970
 - f. Employees' Provident Fund & Misc. Provisions Act- 1952
 - g. Employees' State Insurance Act-1948
 - h. Employees' Compensation Act, 1923
 - i. Payment of Gratuity Act, 1972
 - j. Minimum of Wages Act,1948
 - k. The Payment of Wages Act,1936
 - l. The Payment of Bonus Act,1965



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Responsibilities of the Contractor

1. The Contractor shall be solely responsible and indemnify GAIL against all charges, dues, claim etc. arising out of the disputes relating to the dues and employment of resources, if any, deployed by him.
2. The Contractor shall indemnify GAIL against all losses or damages, if any, caused to it on account of acts of the resource(s) deployed by him.
3. The Contractor shall indemnify GAIL from all claims, demands, actions, cost and charges etc. brought by any court, competent authority / statutory authorities against GAIL.
4. The Contractor shall also indemnify GAIL for any action brought against him for violation, non- compliance of any act, rules & regulation of center / state / local statutory authorities.
5. All resources deployed by the Contractor are deemed to be on the rolls of the Contractor.
6. **Age:** No resource below the age of 18 years shall be deployed by the contractor for the execution of the contract. However, maximum age of resources deployed under the contract would be 60 years. (In case of Security and Fire & Safety Services, no resource below the age of 18 years shall be deployed by the contractor for the execution of the contract. However, in view of nature of business operation and nature of duty, for efficacy & efficiency purpose, resources will be deployed up to the age of 58 years. However, the age limit can be relaxed for a further period of two (02) years up to the age of 60 years if the contract worker is competent, efficient and medically fit i.e. physically fit with good health, good eye sight without any disease. The contractor has to produce Medical Fitness Certificate, to this effect, against such contract workers if deployed beyond 58 years.)
7. **Appointment/Nomination of supervisor:**
As a part of the contract, the Contractor is required to appoint/nominate a supervisor (s) who will supervise, control and give directions to the resource(s) for discharging the contractual obligations. Accordingly, the Contractor has to give in writing the name and contact details of the supervisor (s) to the EIC. A copy of the same is also to be sent to HR In-charge and Security In-charge for records.
8. A copy of the Letter of Acceptance (LOA) should be submitted to the Security Department by the Contractor / his representative or supervisor for facilitating the movement of resource(s) including machine & materials involved in the contract.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

9. The resources to be deputed/ deployed by the Contractor shall observe all security, fire and safety rules of GAIL while at the site/work. All existing and amended safety / fire rules of GAIL are to be followed at the work site by the Contractor and his deployed resource(s).
10. Personal Protective Equipment/ Safety Kit and Liveries: Contractor shall ensure adequate supply of personal protective equipment / Safety Kit and Liveries as mentioned in the Scope of Work to all such resources deployed.
11. In case of accident, injury or death caused to the resource(s) while executing the Work under the contract, the Contractor shall be solely responsible for payment of adequate compensation, insurance money etc. to the next kith & kin of injured / diseased. Contractor shall indemnify GAIL from such liabilities.
12. The Contractor shall not deploy any resource suffering from any contagious or infectious disease. The Contractor shall get the deployed resource(s) examined from a civil Govt. Doctor / GAIL's Doctor.
13. No resource(s) or representatives of Contractor (including Contractor) be allowed to consume alcoholic drinks or any narcotics within the premises of GAIL (including Plant, Office and Residential etc.). If found under the influence of above, the Contractor shall immediately replace that resource(s) with intimation to the EIC.
14. While engaging / deploying the resources, the Contractor is required to make efforts to provide opportunity of employment to resources belonging to **Schedule Caste, Schedule Tribe and Other Backward Class** in order to have a fair representation of these sections of the society.
15. While engaging the resources, the Contractor is required to make efforts to provide an **opportunity to** candidates with experience of **apprentice training in GAIL** under the provisions of the Apprentices Act, 1961.
16. The Contractor is required to maintain all Registers and other records in an **office** within the premises of GAIL or at a place **within a radius of three kilometers**.
17. Contractor shall provide proper **Employment cards (FORM XII)** for the resource to be deployed by him, duly signed by the Contractor or authorized person on behalf of Contractor.
18. **Gate/ Entry Pass or Authorization:**

Entry to the premises of GAIL is restricted and is subject to appropriate entry authorization in the prescribed format of a Gate Pass or any other entry authorization w.r.t police verification as per instruction of Security department from time to time. Similarly, entry for materi-



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



al/ equipment's/ tools/ tackles etc. is restricted & subject to entry authorization by security department.

19. The Contractor shall issue Identity cards in his firm's name to the resource deployed.
20. Discipline of the resource(s) during discharge of duties must be regulated by the Contractor himself or by his representative.
21. **Police verification**
 - a) The Contractor (including his sub-Contractors/Petty Contractors etc, if allowed) will undertake police verification in respect of the resource(s) engaged by him in GAIL's premises. Such verification will have to be carried out from concerned police station of their permanent place of residence/present place of residence.
 - b) Further, the Contractor is advised not to deploy any resource having past criminal record in the establishment/premises of GAIL under this contract awarded to him.
 - c) In the event of violation of above clauses at (a) and (b), the Contractor will be solely responsible for the same.
 - d) If any such resource(s) having criminal record is deployed by the Contractor in the premises of GAIL and has come to the notice of GAIL at any point of time, the Contractor shall immediately replace that resource(s), failing which that particular resource(s) of the Contractor will not be allowed to enter into the premises of GAIL.
22. While confirming to any of these conditions, the Contractor must ensure that all applicable Laws of State regarding labour, their welfare, conduct etc. are complied.
23. The contractor shall ensure the KYC of contract workers in EPFO portal at all time during the period of contract and submit a proof of the same to the Engineer-in-charge.
24. The contractor shall ensure that the nomination of contract workers deployed by him under the said contract is duly updated in the EPFO Portal.

Compliance of Government of India Directives

1. **Pradhan Mantri Suraksha Bima Yojna (PMSBY) and Pradhan Mantri Jeevan Jyoti Bima Yojna (PMJJBY)**

Contractor shall, ensure that all its resources deployed under this contract have obtained additional insurance coverage under the Pradhan Mantri Suraksha Bima Yojana (PMSBY) and Pradhan Mantri Jeevan Jyoti Bima Yojana (PMJJBY) through the participating banks and submit the proof of such insurance coverage to the satisfaction of GAIL. The Contractor shall submit evidence / proof to GAIL in this respect. Both the schemes are to be regulated



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



continuously on yearly basis and the same should be renewed on each successive relevant date in subsequent years during the period of the contract.

2. Labour Identification Number (i.e. LIN) Registration (Mandatory)

The Unified Shram Suvidha Portal, developed by Government of India, facilitates reporting of Inspections & submission of Returns and has also been envisaged as a single point of contact between employer, resources and enforcement agencies bringing in transparency in their day-to-day interactions. For integration of data among various enforcement Agencies, the Contractor, as an inspectable unit, is required to register and obtain Labour Identification Number (i.e. LIN) from Shram Suvidha Portal and submit the same in GAIL.

3. Pradhan Mantri Rojgar Protsahan Yojna (PMRPY) / Aatmanirbhar Bharat Rozgar Yojana (ABRY)/ Pradhan Mantri Garib Kalyan Yojana- if applicable

In order to support the Govt. of India's Initiative on Employment Generation, the Contractor must register for Pradhan Mantri Rojgar Protsahan Yojna (PMRPY) Scheme / Aatmanirbhar Bharat Rozgar Yojana (ABRY) /Pradhan Mantri Garib Kalyan Yojana (as applicable). In service contracts, the Contractor shall inform GAIL/Engineer in Charge about the benefit availed, if any, against the scheme for adjustment against the invoice(s) / bill(s).

Records and Registers

1. Maintenance of records and registers

The Contractor is required to maintain statutory records and registers for applicable labour laws as prescribed under the following rules:

- a) Ease of Compliance to Maintain Registers under the various Labour Laws, 2017
- b) Rationalization of Forms and Reports under Certain Labour Laws Rules, 2017
- c) Labour Codes (after they are made effective by Government of India)

2. The Contractor has to maintain the following (but not limited to) Registers/ Forms/ Reports / Returns at all times:

- a) Employee Register in FORM A (to be replaced by FORM-IV of Code on Wages-2019 after it comes into force)



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- b) Wage Register in FORM B (to be replaced by Register of Wages, Overtime, Fine, Deduction for damage and Loss in FORM-I of Code on Wages-2019 after it comes in- to force)
 - c) Register of Loan / Recoveries in FORM C
 - d) Attendance Register in FORM D
 - e) Register of rest/leave/leave wages in FORM E
 - f) Copies of Wage Slips in FORM XIX (to be replaced by FORM- V of Code on Wages-2019, after it comes into force)
 - g) Copies of Employment Card in FORM XII
3. **Documents to be submitted by the Contractor to EIC at various stages during the currency of the contract**
- a) **Immediately after issuance/receiving o(Letter o(Acceptance (LOA)**
 - i. Details as required for issuance of **FORM - VII (Notice of Commencement of Work)**
 - ii. Application for issuance of **FORM -III (Form of Certificate by Principal Employer)** for obtaining Labour License from Licensing Authority for engaging 20 or more resources.
 - iii. Copy of **FORM - VI (License)** before commencement of work if 20 or more resources are engaged.
 - iv. Copy of **Provident Fund Registration Certificate** issued by concerned Regional Provident Fund Commissioner.
 - v. Copy of **ESI Registration Certificate** issued by concerned ESIC.
 - vi. Copies **Insurance Policy(ies)** as mentioned at **Annexure-iv**
 - vii. Copy of **Labour Identification Number (i.e. LIN)** Registration done in **Shram Suvidha Portal** of Govt. of India.
 - viii. Copy of registration under the Building and Other Construction Workers (RE&CS) Act, 1996 in case he employs ten or more building workers in any building or other construction work.
 - b) **At the time of submission of monthly bills**
 - i. Copy of **Employee Register in FORM - A** under The Ease of Compliance to Maintain Registers under various Labour Laws Rules, 2017 (to be replaced by FORM- IV (of Code on Wages-2019, after it comes into force).
 - ii. Copy of **Wage Register in FORM-B** under The Ease of Compliance to Maintain Registers under various Labour Laws Rules, 2017 (to be replaced by Register of Wages, Over-



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

time, Fine, Deduction for damage and Loss in FORM-I of Code on Wages-2019, after it comes into force) duly certified by **authorized representative** of the Contractor and **authorized person** in GAIL certifying as "*Certified that the amount shown in the column No. ---- has been paid to the workman concerned in my presence on----- (date) at ----- (place)*" along with copy of bank statement duly certified by bank and copy of online transaction statement against each resource with details of name, account number, amount paid & date of payment as proof of **Cashless Transaction / Payment of wages through e-banking/digital mode.**

- iii. As a part of compliance and proof of depositing Provident Fund, EDLI and ESI contributions the Contractor shall submit copies of the ***Separate e-Challans / ECR***, bank receipts/bank statement **in respect of resources deployed in GAIL in the previous month in this contract.** The documents should also contain details of resources, PF account No., ESI No., contributions of resources and employer etc.
 - iv. Dully filled in statement as per ***Annexure- i.***
 - v. Copy of Wage Slips in FORM XIX
 - vi. *Proof of deposit of Cess under The Building and Other Construction Workers' Welfare Cess Act, 1996, (if applicable)*
- c) **At the time of closure of contract**
- i. **Indemnity Bond** of Rs. 100/- duly notarized from Notary indemnifying GAIL from all liabilities w.r.t. the resource engaged by the Contractor regarding payment of wages, Provident Fund/ESI contributions, Insurance and other statutory payments. Format for Indemnity Bond is enclosed at ***Annexure- ii.***
 - ii. Copy of the **Wage Register in FORM- B** (to be replaced by FORM-I of Code on Wages-2019 after it comes into force) for the last month.
 - iii. Copies of Service Certificates issue to resource in **FORM VIII**
 - iv. Copy of the ECR related to EPF and ESIC Compliance in respect of Resource.
 - v. Details as required for issuance of **FORM- VII (Notice of Completion of Work)**
 - vi. Copies of FORM-C & FORM -D under the Payment of Bonus Act 1965 as proof of payment towards Bonus.
 - vii. Copy of proof towards release of Leave Encashment
 - viii. Copies of No Dues Certificate from contract workers stating they have received all statutory payments and social benefits.
 - ix. *Proof towards PF KYC compliance of contract workers*
 - x. *Proof of deposit of total Cess under The Building and Other Construction Workers' Welfare Cess Act, 1996, (if applicable) with final assessment from respective Cess Collector(s).*

4. Verifications of bills and documents submitted by the Contractor



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

Before certifying/verifying the running/ final bill/invoice of the Contractor, the designated EIC of the respective contract of GAIL, shall verify from the ECRs of PF/ESI, through respective web portals, the detail/status of the payment made by the Contractor. In case the information furnished by the Contractor is found to be incorrect, GAIL shall take appropriate action against the Contractor under relevant conditions as available in the tender document.

Annexure-I

Statement in support of RA Bill for the Month of _____, 20__

- (1) Name of the Firm/Agency/Contractor _____
- (2) Nature of Contract: Job/ Service _____
- (3) Period of Contract: From _____ to _____
 - (a) Extension Period of Contract, if any from _____ to _____
 - (b) Place where contract workmen are working _____
- (4) Postal address of the Contractor: _____
- (5) Phone No. of the Contractor: _____
- (6) Fax No. and Email of the Contractor: _____
- (7) Name and Address of PF office from where EPF Code No. has been allotted: _____
- (8) EPF CodeNo. allotted by PF office: _____
- (9) Name and Address of ESIC office from where ESI Code No. has been allotted: _____
- (10) ESI Code No. allotted by ESIC office: _____
- (11) Labour License No. _____ dated _____
- (12) Validity period of Labour License from _____ to _____
- (13) Detail of Resource engaged by the Contractor:

Category	No. of Resources		Prevailing Minimum Wages
	Male	Female	
Unskilled			
Semi-skilled			
Skilled			
Highly skilled			
Total			

- (14) Copy of Wage Register in FORM-B (to be replaced by FORM-I as per Code on Wages-2019, after it comes into force)
- (15) Details of deposit of contribution towards EPF:
 - a) EPF Challan No. _____ Amount _____ Date _____
- (16) Details of Deposition of contribution towards ESI
 - a) EPF Challan No. _____ Amount _____ Date _____



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

- (17) Whether any arrangement / agreement has been entered with any resource for extending benefits under Inter-state Migrant Workmen (RE&CS) Act, 1979: _____ (Yes /No)
If Yes, No. of such Inter-state Migrant Workers: _____

SIGNATURE OF CONTRACTOR/AUTHORIZED REPRESENTATIVE

Place:

Date:

Annexure - iv

Summary of Insurance Policies

Contractor is required to cover all resources deployed by him with the following insurances / schemes:

Sl. No.	SCHEME	APPLICABILITY	PREMIUM/ CONTRIBUTION	SUM ASSURED/ BENEFITS	REMARKS
1	The Employees' State Insurance Act, 1948	Applicable to all resources of the Contractor (within ESI wage limit) working in notified area.	3.25% of wages by employer 0.75% of wages by employees	Benefits under the Employees' State Insurance Act, 1948.	
2	The Employees' Compensation Act, 1923 (in lieu of ESI - mentioned at Sl. 1)	Applicable to excluded employees under ESI and those who are working in non-notified area to extend similar benefits as available under ESI Act, 1948	Premium to be calculated considering wage limit under EC Act, 1923 (i.e. Rs. 15,000/- p.m. currently)	Maximum Compensation Liability under Employee's Compensation Act, 1923 along with a Medi-claim Floater Policy with a coverage of Rs. 3 Lakhs per resource covering his/her spouse and two children	Provides compensation and medical facility to resources.
3	Group personal Accident Insurance	Applicable to all resources of the Contractor	Based on the coverage	Insured value: Rs. 5 Lakh to cover expenses associated with any accident.	Death, permanent disablement, temporary total disability or any other medical expenses related to accident.
4	Pradhan Matri Suraksha Bima Yojana (PMSBY)	Eligibility - age group 18 to 70 years	Rs. 12/- per annum	Accidental death and permanent disability: (i) Permanent total disability - Rs. 2 lakhs. (ii) Permanent partial disability - Rs. 1 Lakh.	



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



SECTION-VI

SCOPE OF WORK/DRAWINGS & LIST OF APPROVED MAKES

(Refer Vol. II & Vol. III for other details)



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

JOB SPECIFICATION



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



**PARTICULAR JOB SPECIFICATION FOR MAINLINE,
MECHANICAL & ASSOCIATED WORKS**



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



CONTENTS

<u>Sl.No.</u>	<u>Description</u>
1.0	Project Description
2.0	Work Tendered
3.0	Scope of Work
4.0	Scope of Supply
5.0	Documents, Specification, Standards and Drawings
6.0	Resources Facilities
7.0	Project Scheduling & Monitoring
8.0	Construction
9.0	Documentation
10.0	Survey and level /setting out Work
11.0	Order of works/permission/right of entry/care of existing services
12.0	Make of material/Bought out items
13.0	Inspection of supply items
14.0	Escalation
15.0	Documents to be submitted/produced along with RA Bills
16.0	Following new clauses are also to be considered wherever required which are specific to city conditions laying.
17.0	Following points shall be taken care by the contractor before during execution works.
18.0	Special note pertaining to Schedule of Rates (SOR).



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

1.0 Project Details & Description

M/s GAIL (India) Limited, is in the process of development of CNG & City Gas Distribution Infrastructure at different Geographical Areas namely Varanasi (UP); Patna (Bihar); Ranchi & Jamshedpur (Jharkhand) and Bhubaneswar & Cuttack (Odisha) along their upcoming Jagdishpur- Haldia- Bokaro-Dhamra Pipeline (JHBDPL) Route.

GAIL (India) Ltd. further proposes to lay pipeline by open cut method as well as Horizontal Directional Drilling Method (HDD) for 4''6'' & 8'', NB dia (API 5L Gr X- 52, 6.4 mm WT x 10 KM (approx.) including all associated work encountered in pipeline route of Mango and Agrico area of Jamshedpur District / Jamshedpur Geographical Area (GA). Bidders are requested to have a site visit to familiarize themselves with surroundings, route, strata before putting their bids.

Present tender deals with laying of pipeline by Open Cut/HDD at various locations and crossings of water bodies, railway/road/Culvert crossing etc by Horizontal directional drilling method (HDD) along with and all associated work for connectivity to CNG stations and other customers/DR etc. at Jamshedpur GA.

Brief Scope of Work

Scope under present tender consist of laying of 4'' ,6'' & 8''NB dia pipeline by open cut & HDD method at various locations and crossings of river/ Nala/ water bodies, railway/road/Culvert crossing etc of dia 4'', NB along with all associated works under Jamshedpur for GAIL (India) Limited. Tentative Details of proposed laying by open cut/HDD and crossings are as follows:

Laying/Installation testing & Commissioning including all associated work for 4'', 6'' & 8'' NB dia, API5L Gr-X-52, 6.4 mm WT natural gas pipeline at various locations of Jamshedpur District /GA.

The broad scope of this tender comprised of but not limited to the following:

Main Pipeline Laying by Open Cut /HDD

- Laying/ installation of pipeline by open cut method including testing & commissioning including all associated works at various locations. Supply of various materials as per scope of work.
- Pipeline Laying Liasioning & Co-ordination and obtaining permission / NOC from the statutory / concerned authorities. Assistance in ROU opening & closing and their maintenance/ management.
- Supply, installation of various flanges, fittings, Insulating Joints, valves etc as per scope of work.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- TCP work for as per scope of work.
- Civil & telecom works as per scope of work.
- All other associated work required for construction of pipeline by open cut method as per scope of work & specification.

For Crossings by HDD Method

- Pre-construction survey & detailed survey including determination & establishment of alignment & depth, collecting of historical data from concerned authority and their data interpretation to establish HFL, bed strata, scour depth etc.
- Geo-technical investigation and hydrological, hydrographical survey data / report for various river/Nala/Water body crossings (as required and scope of work) and geo-technical & crossing survey for railway/road/culvert crossings shall be carried out by Contractor as per scope of work and as per direction of EIC. Moreover any technical investigation and surveys if deemed necessary shall be carried out by the Contractor and the contractor shall submit design calculation and all construction (profile) drawings, survey data for GAIL / Consultant approval. Work shall start only after approval of the above.
- Contractor shall submit design calculation and all construction (profile) drawings, survey data for GAIL/CMC for review and approval. Work shall start only after approval of the above document.
- Mobilization of HDD rig and other accessories of adequate capacity along with required number of skilled personnel.
- 3LPE coated line pipe for river crossing by HDD method will be free issue. All associated works including supply of all consumables, deployment of equipment's, tools & tackles, labour and supervision etc. for completion of work as per the construction specifications provided herein, applicable drawing or as directed by the Engineer-in-charge will be in Contractor's scope.
- Supply and application of field joint corrosion coating and repair material for 3 LPE Coated line pipe including supply of all materials and consumables as per SOR and Technical Specification enclosed with tender for pipe string made for crossing to cross by HDD method.
- Preparation of Design basis, detailed execution philosophy, risk mitigation philosophy and contingency plan.
- Design, engineering and construction of dead man structure, launch way, any other civil/ structural works etc., if required. After successful completion of the HDD, dismantling and restoration of the area to original as per the requirements of land owner/ concerned authority shall also be the responsibility of the contractor.
- All tie-in joints with mainline at specified depth.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

- Design, engineering and installation of line pipe across the crossings by HDD method including deployment of required labour, manpower, equipment, machinery, tools, tackles and resources. Completion of work in totality including any repairs/ reworks/ incidental works/ extra works etc. arising due to bad workmanship/ ignorance shall be the responsibility of the contractor and shall be deemed to be included in the quoted prices. The deployed rig(s) shall be capable of pulling the designed HDD string length and to develop sufficient torque for the drilling operation. Contractor shall not be entitled for extra payment due to location/ area constraint and changes in the rig capacity etc.
- The contractor shall carry out the HDD Crossing of Carrier Pipeline in a single shot.
- All construction activities required for and/ or incidental to installation of the crossing, including supply, handling, hauling, loading, un-loading and storing thereof, making all arrangements for temporary acquisition of land for fabrication yard, setting up of intermediate storage yard and developing temporary approach road to site.
- Fabrication of pipe string for crossing including stringing, welding, NDT, special field joint corrosion coating, pigging, hydrostatic pre-testing of completed pipe strings, checking of coating integrity by megger test or any other approved method, temporary approach road to work site, pilot / drilling & pulling of string, installation, post-installation hydrostatic testing of crossing, restoration, final clean up, NOC from concerned authorities and submission of as-built drawings, documents, manuals, reports and records etc.
- The contractor shall be deemed to have inspected and examined the work area and its surroundings and to have satisfied himself so far as practicable as to the form and nature thereof, including sub-surface conditions, hydrological and climatic conditions, the extent and nature of the work and materials necessary for the completion of the work and the means of access to the work area.
- High-definition videography and photography of all the activities.
- Submission of detailed Project closure Report.
- The bidder shall be required to submit detailed execution methodology to be deployed along with the technical bids.

Detailed scope of work is indicated in bid document.

1.1 Description of the facilities covered in the above are described in following clauses.

1.1.1 Main Pipeline

- Line Size : 4", 6 & 8"
- Line Length : 10 km (approx.)
- Class : 300#
- Design Pressure : 49 kg/cm²(g)



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

- Material of Pipe & Grade : API5LGr. X-52 (As per the SOR)
- Wall Thickness : 6.4 mm
- Coating Material : 3 Layer PE
- Design Code : ANSI/ASME B31.8(Latest Edition)
- Corrosion Allowance : 0.5mm
- Major Water Crossings : As per SOR
- Major Road Crossings : As per SOR
- Rail Crossings : As per SOR
- Gas Temperature (Design) :
- Buried : 45°C
- Over ground : 65°C
- Cathodic Protection Works : As per PJS & SOR
- Telecommunication Works : As per PJS & SOR
- Associated underground piping works along with installation of Barred Tees etc.

i) Aboveground Piping Works inside proposed various MRS at Industrial Consumer's Stations / DRS etc.

- Gear & hand operated valves of different sizes and types of all ratings.
- Provision shall be kept for future tap-off, wherever required.
- Local mounted instrument such as PG, TG at CGS.
- Installation of aboveground Insulating Joints, wherever required.
- Associated civil, structural and instrumentation works.

ii) SV Stations at various locations

– Buried installation of full bore ball valves, Buried installation of ball / plug valves of different sizes with underground gas venting facilities shall be provided at every alternate SV Station as per drawing.

- Buried installation of future tap-off provision.
- Buried installation of Insulating Joints at all tap-off points, wherever required in-addition to SV stations.
- Buried installation of all types and sizes of valves on mainline & branch line.
- Associated piping, civil, structural & instrumentation works.
- Installation of Tees / Barred Tees.

1.2 Construction Fronts



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Bidder shall mobilise the machinery and deploy manpower in Two (02) construction front for the proposed works contract.

2.1 Work Tendered

- The work tendered in this bid package consists of supply/procurement of materials for underground pipelines (Line Pipes, LR bends etc), fabrication, installation, testing and commissioning of the mainline, tap- off stations, various MRS at Industrial Consumer's Stations / DRS and SV stations including all associated mechanical, civil, structural, Temporary Cathodic Protection (TCP), Civil, Structural, Electrical, Instrumentation works telecom (if required), above ground piping (assorted pipes, assorted valves , fittings & flanges etc) , survey, clearing of ROU, grading, stringing, bending, welding, trenching, Joint Coating, lowering, crossings (incl crossings by HDD, cased etc), tie- ins, NDT and destructive testing, backfilling, site restoration, hydro- testing, dewatering, swabbing, drying, pre-commissioning & commissioning 16 km (approx) pipeline.
- All works of the section & terminals included in the scope will be done simultaneously from the date of issue of FOA. Bidder will organize equipment and manpower accordingly to meet this requirement as per instruction of Engineer-in-charge.

3.1 Scope of Work

The scope of work shall generally be, but not limited to the following: -

3.2 PROCUREMENT

- 3.2.1. Contractor shall procure and supply all the materials other than OWNER supplied materials, required for permanent installation of main pipeline and terminals in sequence and at appropriate time. All equipment, materials, components etc. shall be suitable for the intended service. Approved vendor list has been indicated in the bid package for various items. For items which are not covered in the vendor list, CONTRACTOR shall obtain Owner's prior approval for the vendor. Equipment requiring specialized maintenance or operation shall be avoided as far as possible. Equipment offered shall be field proven.
- 3.2.2. CONTRACTOR shall procure all materials, components, equipment, consumable etc. required for successful completion of the pipeline system. CONTRACTOR shall also procure and supply spares required for pre- commissioning and commissioning / start up as recommended for all items supplied by him as per specifications provided in the bid package. Where no specification is available in the contract,



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



the same shall be prepared by the CONTRACTOR based on the piping material specification and shall be subject to Owner's approval.

3.2.3. Material take-off with complete description of size, rating material and thickness.

3.2.4. Only single offer shall be provided by the bidder fully complying to specifications/ drawings/ requirements for Owner's review and approval. CONTRACTOR shall provide for inspection of the items at vendor's works by the OWNER/ Owner's REPRESENTATIVE or by a reputed inspection agency and shall submit inspection reports for Owner's clearance.

3.2.5. Stores management including receipt, warehousing, preserving the material in good condition, issue of material to construction site, reconciling/ handing over surplus material to OWNER for OWNER supplied items.

3.2.6. Carryout proper documentation of inspection and quality assurance programmes for all equipment and bulk materials duly approved by OWNER. CONTRACTOR shall maintain an accurate and traceable listing of procurement records for the location, quality and character of all permanent materials in the Project.

3.2.7. CONTRACTOR shall immediately report to the OWNER of all changes which will affect material quality, and recommend any necessary corrective actions to be taken.

3.2.8. Submit periodic manufacturing progress reports highlighting hold ups and slippages, if any, to OWNER and take remedial measures.

3.2.9. Interact with authorities such as Sales Tax, Octroi, Excise, Customs etc. as necessary and arrange for transportation of the materials under his scope of supply to site.

3.2.10. All purchase requisitions including purchase orders shall be approved by Owner / Owner's Representative.

3.2.11. Compliance with vendors and supplier's instructions and recommendations for transportation, handling, installation & commissioning.

3.2 Construction

3.2.1 General

3.2.1.1 All construction works shall be carried out as per "Approved for Construction" drawings, procedures, specification and applicable codes and standards. Any changes at site shall also need prior approval from



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



the OWNER and revision of drawings. Construction drawings will be submitted by the Contractor in a phased manner for Owner's approval in accordance with the procurement and construction plan prepared and furnished by contractor & agreed by Owner.

Owner will take minimum 7 working days from the date of submission of the documents / drawings submitted by the contractor for Owner's comments / approval.

3.2.1.2 Statutory Approvals

The Owner shall provide to the Contractor the basic / in principal approval for laying the pipeline. However, the Contractor at his own initiative shall obtain all permissions, permits and licenses necessary for the performance of the work. If any such permission, permit or license required for the performance of the work by the contractor can only be granted at the request or recommendation of the Owner, the Owner shall at the request of the Contractor, provide recommendatory letters to the contractor to obtain or procure the same. The contractor shall not, however be entitled to any additional compensation over and above contracted rates of services for any hardship or increased cost caused by any idleness, suspension or disruption of work or any other account whatsoever as a result of the inability of the contractor to obtain the permission(s), permit(s), license(s) aforesaid to match with the progress of the work nor shall the same constitute a ground for extension of time.

- a) The approval from any authority required as per statutory rules and regulations of Central/ State Government agencies etc. shall be the contractor's responsibility unless otherwise specified in the tender document. The application on behalf of the Owner for submission to relevant authorities along with copies of required certificates complete in all respects shall be prepared and submitted by the Contractor well ahead of time so that the actual construction/ commissioning of the work is not delayed for want of the approval/ inspection by concerned authorities. The Contractor shall arrange the inspection of the works by the authorities and necessary coordination and liaison work in this respect shall be the responsibility of the Contractor. However statutory fees paid, if any, for all inspections and approvals by such authorities shall be reimbursed at actual by the Owner to the Contractor on production of documentary evidence.
- b) The defective work resulting from poor workmanship and/ or material supplied by contractor, as pointed out by any statutory authority shall be rectified by the contractor at no extra cost to the Owner. Any change/ addition required to be made to meet the requirements of the statutory authorities; the same shall be carried out by the contractor free of charge. The inspection and acceptance of the work by statutory authorities shall, however, not absolve the contractor from any of his responsibilities under this contract.

3.2.1.3 The Contractor shall comply with all the conditions and requirements issued by Authorities having jurisdiction in the area where the work is to be performed.

It shall be the Contractor's sole responsibility to make arrangements for land for setting up of its string fabrication yards, all storage areas for line pipe and other materials, wherever required, and all other work areas.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



The Contractor shall make all arrangements for access to his work site at his own cost and responsibility. If no public road exists Contractor shall arrange on his own for access to his work area at no extra cost to the COMPANY.

The CONTRACTOR shall be responsible for claims if any arising out of damage/ obstruction to public utilities like lines of DOT etc. where the claims will cover the restoration costs as well as loss of revenue due to down time.

- 3.2.1.4 Providing schedules, progress reporting, organization chart at construction site, quality assurance plan and developing quality control procedures, as per requirements indicated elsewhere in the bid package.
- 3.2.1.5 Coordination and supervising the work of sub-contractors.
- 3.2.1.6. Transportation of appropriate materials and taking delivery of Company supply materials, store, worksite, intermediate storage points, maintaining and operating an adequate material control procedure at worksite.
- 3.2.1.7. Fabrication of all structural components as per approved drawings.
- 3.2.1.8 . All civil/ structural works, electrical and instrumentation, laying and commissioning works shall be performed in accordance with relevant specifications and requirements enclosed elsewhere in the bid package.
- 3.2.1.9. CONTRACTOR shall provide complete details of manpower, equipment etc. to be deployed. Mobilizing and providing all equipment's, manpower (skilled and unskilled), consumable and other resources etc. for each spread as required for the execution of the complete job defined herein and thereafter demobilizing the same upon completion of work.
- 3.2.1.10. Provide, maintain and operate all temporary facilities required for the construction related works and remove after completion of work. Providing barricading at trench in city area as per instruction of engineer in charge for safety.
- 3.2.1.11. Hook up / tie-in of pipeline and piping system with other facilities etc.
- 3.2.1.12 All works related to cleaning, testing, dewatering, swabbing, drying, pre- commissioning and commissioning of the work tendered.
- 3.2.1.13. Idle time preservation of pipeline, if required.
- 3.2.1.14. All incidental and associated works and any other works not specifically listed therein but are required to be carried out to complete entire work related to pipelines and terminals.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



3.2.2 Main Pipeline

3.2.2.1 Topographic Survey

The contractor shall be deemed to have familiarized themselves with route prior to quoting and take care of all the eventualities. No extra cost shall be admissible in any form at a later date. The survey drawings & details to the extent available are being furnished to the successful Bidder. Any additional survey/ route survey and their details required either for local detours during execution or for which the survey work for sections of pipeline have not been carried out by owner, shall be carried out by contractor in similar manner without any extra cost to the owner. However, laying and construction of entire pipeline including detoured portion and pipeline section/ sections of pipeline for which survey work has not been carried out by Owner, shall be within the scope of contractor without any cost implication. Contractor shall be deemed to have considered such survey works while formulating his bid.

Preliminary schematic layout of city gas steel pipeline grid & CNG facilities, Typical arrangement of SV stations drawings and other standard drawings are included in the Bid Package. These drawings are indicative & tender purpose only and are furnished to enable Bidder to estimate the quantum of work and to quote a firm price for the work. Final construction drawings of all type shall be prepared and submitted for approval to Owner by successful bidder / contractor at or before project execution stage. Approved for Construction drawings may vary to some extent from the drawings included in the Bid Package. Contractor shall carry out all works in accordance with the construction drawings duly approved by Owner without any extra time & cost implication to the Owner.

3.2.2.2.1 Familiarization of Pipeline Route

Bidders are advised arrange to carry out survey and preparation of Alignment sheets, make site visits to familiarize themselves with all the salient features of terrain and available infrastructure along the pipeline route. Contractor shall be deemed to have considered all constraints and eventualities on account of site conditions along pipeline route while formulating his bid. Contractor shall not be eligible for any compensation in terms of cost and/ or time, on account of site conditions along pipeline route varying to any extent from whatever described in the Bid Package and the drawings furnished along with the Package.

3.2.2.3 Soil Investigation and Soil Resistivity survey

It shall be Contractor's responsibility conduct soil investigation & resistivity survey along the entire pipeline route as per requirement and direction of EIC. CONTRACTOR shall not be entitled for any compensation in terms of time or cost. It shall be Contractor's responsibility to familiarize himself with sub-soil conditions along the pipeline route and workout the lengths of pipeline to be laid in different subsoil conditions including the quantum of rock excavation that would be necessary. Unit rates quoted shall also be inclusive of all rock excavation. No extra compensation shall be payable to CONTRACTOR for any rock excavation whatsoever.

3.2.2.4 The city condition field / other fields may have lots of PVC, PE & utility pipelines or other pipelines



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



& cables being used for city utility / other utilities purposes. CONTRACTOR shall ensure that these lines shall not be damaged/ cut affecting the water / power / communication / other supply to concerned Users / Owners/ Authorities. Wherever required temporary necessary precautions had to be maintained for uninterrupted supply.

3.2.2.5 Right-of-use (ROU)

For pipelines construction purposes, in city condition, pipeline restricted ROU/ Corridor will be made available to Contractor by the Owner, the pipeline shall be laid in restricted ROU / Corridor along side of the existing road, inside available corridor, below road / rail / utility culvert, etc. in city areas.

Where the pipeline passes through city areas / industrial areas / forest areas etc., the ROU will be restricted to required width may reduced upto 1 metre as made available by concerned department. Contractor shall carry out construction work in the width as made available to him with no time and cost implication to the Owner. It shall be Contractor's sole responsibility to make arrangement for any additional land required for fabrication, construction, storage and all other work areas, if required.

The contractor shall notify the owner the probable date of commencement of work at ROU site at least two (2) weeks in advance to enable the owner to arrange handing over of the ROU/ site on the date requested. Should contractor fail in such notification, the owner shall not be liable for any claim by contractor, of whatsoever nature, for delay in the available of a ROU/ site.

3.2.2.6 “Receiving and Taking-over” as defined in the specifications of OWNER supplied externally corrosion-coated and bare line pipes at Owner’s designated stacking yards/ dump site. Management of dumpsite after receiving and taking over of pipes transportation including loading/ unloading, handling, stacking, hauling and stringing of pipes from Owner’s stacking yards to Contractor’s worksite(s)/ workshop(s)/ pipeline Right-of-use (ROU), including arranging all necessary intermediate storage area(s) required thereof till the pipes are installed in permanent installation.

3.2.2.7 Carrying out inspection of OWNER supplied line pipes and pipe corrosion coating at the time of receiving and taking-over. Carrying out all repairs, to pipe and pipe coating, including supply of all materials. All handling, lifting, stacking of coated/ bare pipes required during inspection.

3.2.2.8 Carrying out repairs (including supply of all materials) of line pipe and pipe coating which will include repair of all defects/ damages occurring during transportation and / or handling after receiving and taking over.

3.2.2.9 Loading, unloading, handling, stacking, storing and transportation to workshop/ work site of all materials that may be used for the construction of pipeline system either supplied by OWNER at their designated stack yard/dump site/store and/or by Contractor as the case may be.

3.2.2.10 ROU acquisition / principal permission of laying the pipeline including permission for all crossing i.e. rail, road, river, foreign hydrocarbon & utility pipelines, utility cables, HT lines, etc. will be responsi-



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



bility of the Owner. However obtaining all necessary approvals, work permits and liasioning / coordination works for ROU acquisition / permission for laying of pipeline and its all crossing from concerned local authorities and respective OWNER's having jurisdiction, as applicable for performing the work including shifting/ relocation and restoration of telephone/ electrical poles and underground pipes and other utilities etc. as required by local authorities and as directed by OWNER shall be responsibility of contractor.

- 3.2.2.11** Stacking, clearing, grading, fencing of Right-of-Use (ROU) as required, trenching to all depths in all types of soil including soft & hard rock, controlled rock blasting (if permitted, however, permission / approval / NOC / work permit will be obtained by the contractor) by special techniques, chiseling or otherwise cutting etc. to a width to also accommodate the HDPE duct as per relevant standards, drawings, specification etc. transportation of coated pipes to ROU along the route, stringing, aligning, bending, welding, NDT including radiography by X-ray (Gamma ray will only be permitted in inaccessible area like tie-in pit etc., where Engineer-in-charge feels necessary and decision of Engineer-in-charge shall be final & binding to the contractor) and ultrasonic (if required), inspection, field weld joint coating including supply of all materials, protective coating of long radius including supply of materials as per specifications, sand padding, laying and lowering of the pipeline, back filling, slope breakers as required, carrying out road, canal, utility and submerged minor water course crossings including bank stablisation of water course crossings as required, crossing of nallah/ canal by conventional method. Supply and installation of antibuoyancy measures viz. continuous concrete coating, saddle weights, extra cover etc. on pipeline as shown in approved drawings and as directed by OWNER, installation of supports wherever required, supply of select backfill material as required, clean-up, pigging, flushing, hydrostatic testing with the quantity of inhibitor as required, dewatering with the additive, at required dosage, swabbing, pre- commissioning and commissioning of complete pipeline system, including all associated works as per relevant specifications, standards and approved drawings.
- 3.2.2.12** Welding of all tie-in joints including tie-in joints and bends on either side of major river crossings/ with adjoining pipeline installed by others/ other facilities as required, cutting of test header, rebeveling and tie-in with adjacent pipeline segments.
- 3.2.2.13** Field weld joint coating shall be by heat shrink sleeve (Raychem / Canusa) / other suitable material as per specification enclosed with bid package compatible of pipe coating material.
- 3.2.2.14** Carrying out corrosion coating of Long Radius (LR) bends if any. Coating shall be carried out by heat shrink sleeve (Raychem / Canusa) / other suitable material as per specification enclosed with bid package for field joint coating as mentioned in clause 3.2.2.13 above.
- 3.2.2.15** Installation of casing pipes (by open cut/ trenchless method) assembly, including supply of all materials viz. casing pipe, casing insulators and end seals, vents and drains etc. complete, at cased crossings as per the drawings/ specifications enclosed with bid package.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Cased crossings shall be installed at locations indicated in alignment sheets or as per SOR or as per instruction of owner. The number of crossings indicated in alignment sheets or as in SOR is subject to change based on engineering, construction and statutory requirements or the requirements of the authority having jurisdiction over a utility crossing.

3.2.2.16 All works/ provisions including installation of slope breakers to be provided in the trench in areas where slope is more than 1 in 10.

3.2.2.17 Sand/ soft soil padding around pipe wherever required in areas where trenching has been done in hard soil area / rocky area including supply of sand/ soft soil. The thickness of sand/ soft soil padding at the top of coated pipe shall be minimum 150 mm and bottom of coated pipe shall be minimum 150 mm or as per standard drawing, whichever is more.

3.2.2.18 Installation of all inline/ online instruments/ valves/ insulation joints/ Barred Tees / appurtenances etc. as per requirements of approved drawings.

3.2.2.19 Crossings

Crossing to be crossed through HDD/ Cased/ Uncased shall be finalized during the joint site visit with the successful bidder. In all cases execution philosophy to be adopted for crossing shall be well accepted by the EIC. In case of any dispute, decision of EIC shall be final and binding to the contractor.

All crossings shall be crossed by heaviest wall thickness carrier pipe among available pipes at site or as per approved drawings/ as decided by Engineer-in- charge.

3.2.2.19.1 Railway Crossings

The general arrangement drawings for railway crossings shall be approved by Indian Railways and construction shall be carried out accordingly. These drawings shall be made available to the Contractor at appropriate time during the execution of the project. Pipeline at railway crossings shall be provided with a casing pipe. The casing pipe shall be at least three nominal pipe sizes larger than carrier and shall be installed by boring/ jacking. It should be noted that the extent of casing pipe generally specified by Railways, is 15.0m beyond centrelines of the outermost tracks on either side or 0.6 meter beyond the ROU limits of railways on either side, whichever is more. All railway crossings shall be cased crossings. The railway crossing shall comply with the requirements of API 1102 and Indian Railway regulations. The crossing angle shall be as close to 90° as possible.

3.2.2.19.2 Road Crossings



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- i) Contractor shall firm the method of crossing of roads such as open cut/ boring up in consultation with concerned authorities and Company. The Contractor shall also take due care to identify and take due precautions so as not to disturb or damage the utilities like cables, water lines and other structures.
- ii) After laying the pipeline in a road crossing by open cut method, the Contractor shall either completely backfill the road & make ready for restoration or completely restore the road to its original condition depending upon instructions of Owner / EIC.
- iii) While laying the pipeline in road crossings by open cut method the Contractor should ensure that the traffic is not stopped during the execution of work. This may be done by cutting half of the road at a time so as to enable the traffic to pass on the remaining half of the road. Alternatively, the Contractor can provide diversion roads to maintain the flow of traffic.
- iv) The Contractor shall provide proper caution boards during day time and danger lights during night time when the cutting operation of the road is going on.

For cased crossings, the pipeline should be taken through the casing pipe which should be at least 1.2 metres below the road top as specified or as per the requirements of local authorities, whichever is higher. All national highway and state highway as indicated in relevant drawings/ alignment sheets/ or as directed by Engineer-in-charge shall be cased crossing.

3.2.2.19.3 Crossings of rivers/ streams/ canals by conventional method:

- i) No damage should be caused to any irrigation sources, while laying the pipeline through canal crossings.
- ii) The flood banks of the River/ Canal should be brought to the original condition, if they are damaged by the laying of the pipeline. Stabilisation of banks shall be carried out as per requirements of concerned authorities.
- iii) In general the top of the pipeline shall be taken at least 1.5 metre below the scour level of river crossing. If scour level is not known minimum 2.5m cover should be kept unless specified otherwise.
- iv) The top of pipeline shall be at least 1.5m to 2.0m below the drain/ canal bed unless specified other wise.
- v) Pre-construction survey, preparation of the detailed construction methodology/ plan and time etc. shall have to be finalised by Contractor in consultation with concerned authorities having jurisdiction over canals/ rivers. Company shall provide assistance by providing intro-



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

ductory letters.

- vi) Pre-construction surveys, preparation of detailed construction method statement and calculations for Owner's approval.
- vii) Geo-technical investigations, if required.

viii) Site preparation, arranging required land for setting up of string fabrication yard and obtaining necessary permissions from concerned authorities.

ix) Preparation of pipeline Launch way, continuous concrete coating of pipes, repair of damages to corrosion and concrete coating, string preparation, field welding, NDT including radiography, pretest of completed strings, corrosion and concrete coating of field joints. Trenching, laying at approved depth, stabilisation of banks, post installation hydro-test, capping, providing and installing of markers, etc.

x) The major canals with lining/ perennial canals need to be crossed by HDD/ boring method only.

3.2.2.19.4 Crossings by Horizontal Directional Drilling (HDD)

Contractor shall cross the roads / water crossings by HDD method at various depth in different locations as directed by Owner / Consultant either as per site conditions or as per instruction received from concerned authorities, whichever will be higher / stringent and decision of Owner / Consultant in this regard shall be final & binding to the contractor. Before start of HDD, the contractor shall ascertain by pre-construction survey all underground obstacles namely electrical/ telecommunication cable, foreign pipeline, water line, drain/ sewerage line etc. and prepare crossing profile drawings showing all elevations & levels. The contractor shall also ascertain, the type of soil & their terrain whether rocky or normal by way of trial pit or by geo-technical survey in case of river etc. before start of job. The contractor shall submit procedure, profile drawing with complete design calculations of HDD as per requirement of ASME B31.8/ OISD norms and safety requirement that pipe is not under stress during and after crossing for Owner/ Consultant's approval prior to start the execution of works.

Contractor shall determine the minimum allowable elastic bend radius for pipe from the following considerations:

i. Maximum longitudinal stress during installation

Total maximum longitudinal stress in the pipeline due to tension and bending at any location shall not exceed 90% of the SMYS of the pipe material. Contractor shall in order to check this requirement evaluate the maximum tensile forces to which the pipeline is subjected to at any phase of its installation during the pulling operation.

ii. Maximum equivalent stress during final hydrostatic test.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

After installation the pipeline shall be hydrostatically tested (for 4 hours) at a pressure stipulated in the Special Conditions of Contract / relevant Particular Job Specification. During hydrostatic testing the combined equivalent stress in the pipeline due to bending and test pressure shall not exceed 90% of the SMYS of pipe material.

iii. Maximum equivalent stress during service

Permissible values of maximum equivalent stress during service shall be governed by the requirements of ASME B31.8. The details of pipeline operating parameters are provided in the Special Conditions of Contract.

The minimum allowable radius of curvature for the pipeline shall be the highest value of the minimum pipeline elastic radius as computed from the considerations outlined in clause no. i), ii) & iii) above after correction for drilling inaccuracies (or multiplication by the factor 1.85) whichever results in the highest permissible value of minimum elastic bend radius.

Contractor shall ensure all safety norms regarding distances from end point or from bottom of crossing and also ensure that external coating of pipe is not damaged during pulling & handling of pipe for crossing. For field joint coating in pipeline string made for HDD, special type of heat shrink sleeve shall be used as per specification enclosed with the tender. For line pipe coating repair, special type of high shear strength repair patch material shall be used which characteristic shall be same or equivalent as original wrap around heat shrink sleeve used in pipeline string for HDD crossing.

The contractor shall ensure that no any underground existing utilities/ pipelines/ cable etc. are damaged. It shall be responsibility of contractor to compensate any loss or damage to other agency if damaged while crossing. Contractor shall arrange all statutory permission from concerned authority before start of job. Contractor shall deploy only GAIL / consultant approved HDD agency and approval of HDD agency shall be sought before deploying HDD agency.

HDD Works

HDD works shall be carried out as per the scope detailed in particular job specification enclosed as **Appendix -A** and SOR enclosed elsewhere with the tender.

3.2.2.20 Hydrostatic Testing, Dewatering, Swabbing and Drying of Pipeline

Contractor shall hydro test the pipeline as per specification enclosed with tender. **The test duration shall be minimum 24 hours.** After successful completion of hydrostatic testing of the pipeline, Contractor shall dewater the pipeline.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



After completion of dewatering operations, Contractor shall carry out swabbing of pipeline by running high/ medium/ low density foam pigs propelled by compressed air through the pipeline. Prior to their launching, Contractor shall weigh the pigs. On arrival of the pigs at the receiving end they shall be re- weighed. **The swabbing operation shall be repeated till the weight of the last received foam pig does not increase by more than 25% of initial.**

The pipeline/ section(s) of pipeline shall never be left empty (filled with air) after dewatering/ swabbing. Contractor shall take up dewatering and swabbing of pipeline after hydrotesting only when Contractor is ready for carrying out the drying operation immediately following pipeline swabbing. Till such time Contractor is ready to start drying of pipeline, the pipeline/ section(s) of pipeline after hydro testing shall be kept filled with inhibited water or the pipeline/ section(s) of pipeline shall not be dewatered. Preservation of pipeline using inhibited water from the time of completion of hydro testing till Contractor is ready for drying of pipeline, shall be carried out by Contractor as part of his scope of work at no extra cost to Owner.

After the results of swabbing operation has been accepted by Owner, nitrogen purging of line may be started for pre-commissioning activities as per specification. Pre-hydrotesting of aboveground mainline section shall be carried out separately and test duration shall be minimum 4 (four) hours.

3.2.2.21 Leak Detection

- a) Contractor shall submit a detailed procedure for detection of anticipated/ probable leak which is likely to be found during hydro test. Such method of detection shall consume minimum possible time to complete the hydrotest activity within contractual completion schedules. This procedure needs prior approval.
- b) For Major Leak/ Burst (attributable to Owner) which can be traced visually by re-excavation – rates for locating and rectification shall be paid as per item included in main-line SOR for each Leak/ Burst.
- c) For Minor suspected Leak (attributable to Owner) which can not be visually located and which requires sectionalising of pipeline or any other suitable means, rates of activities for leak detection shall be derived from rates of equipments and manpower available in the Contract. However for the pipe which needs to be replaced after the leak has been located, the payment will be made as per SOR item i.e. same as (b) above.

In case after sectionalisation/ other method no leak is detected, for such eventuality no payment will be made for efforts made for sectionalising/ other means.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



3.2.2.22 Hydrostatic Test Pressure

The pipeline shall be hydrostatically tested @ 1.5 times design pressure.

3.2.2.23 All tie-in joints including tie-ins with existing facilities, if any. All tie-ins shall be welded tie-ins.

3.2.2.24 Markers

Installation of all types of markers including all associated civil works. Any other work not specifically mentioned above but required for making the entire pipeline system ready for operation.

3.2.2.25 CATHODIC PROTECTION – Scope of Work as per respective PJS, SOR & technical specification

Temporary Cathodic Protection works shall be carried out as per the scope detailed in particular job specification enclosed as Appendix-B and SOR enclosed elsewhere with the tender.

3.2.2.26 Priorities

The Contractor shall start the execution work for entire length of mainline simultaneously and shall deploy adequate manpower, machinery, tool & tackles etc. accordingly.

However, Owner may, at its sole option, assign priority of construction of any section of total pipeline length or to any part/ segment of the work. Contractor shall comply with such priority of execution and their deployment without any time and cost implication to the Owner.

3.2.2.27 Forest/ Plantation Areas

Where the pipeline route passes through forest/ plantation areas, Contractor shall clear only the minimum width required for laying the pipeline as per Owner approved procedure for pipeline construction. Number of trees/ plants to be felled down shall be restricted to a minimum.

3.2.2.28 Restoration of ROU

Clean-up and restoration of ROW and other conveniences like road, rail, canals, cultivable land etc. to original conditions as per specification and drawings to the entire satisfaction of OWNER and/ or Authorities having jurisdiction over the same, including disposal of surplus construction materials to a location identified by CONTRACTOR approved by local authority without causing any disturbance to environment, locals and to the entire satisfaction of OWNER.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Upon restoration of ROU the Contractor shall furnish documentary evidence in support of acceptance of the same duly signed by land Owner without any extra cost.

3.2.2.29 Preparation and submission of as built drawings, pipe books, documents, photographs of major activities, and project records as per specification and instructions of the OWNER including furnishing of all Test Certificates/ Inspection Reports for all materials used for permanent installation in requisite numbers as mentioned elsewhere in this document.

3.2.2.30 Idle Time Preservation of the Pipeline (if required)

Preservation of pipeline sections and associated facilities (in event of delay in ROU acquisition, commissioning, other unforeseen reasons) including supply of nitrogen, all consumables, all equipment, man-power, etc. complete as per the requirements of specifications, other provisions of Contract document and instructions of Engineer-in-charge.

3.2.2.31 ROW Clearing

During ROU clearing, the vegetation shall be cut off at ground level leaving the roots intact. Only stumps and roots directly over the trench shall be removed for pipeline installation.

3.2.2.32 Pre-commissioning and Commissioning Assistance

3.2.2.32.1 Drying and pre-commissioning including supply of all materials, consumables and manpower of the complete pipeline system and terminal piping work.

3.2.2.32.2 Making the entire system ready for commissioning and providing assistance during the complete duration of commissioning operations.

3.2.2.32.3 Completion of all mainline activities as detailed in SOR.

3.2.2.32.4 Complete N₂ purging before the start of welding at all hook up works as indicated/ shown in schematic drawing enclosed in Tender Document.

3.2.3 Terminals (Tap-off Point, various MRS at Industrial Consumer's Stations / DRS)

3.2.3.1 Piping Works

Supply of assorted pipe, fasteners, gaskets, fittings, flanges, utility piping & piping supports and other supply wherever specified as per SOR.

- Taking delivery of free issue materials from GAIL's designated stores and its transportation to site.
- All fabrication, erection, testing and commissioning of piping above ground at all elevations and below ground at all depths including provision shall be kept for installation of temporary



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

flanged end header for Pig Launching, all valves, insulating joints, barred tee and other fittings and associated piping works as per drawings and specifications.

All mechanical works of underground and above ground, complete piping including fabrication, welding, all non destructive testing of welds repairs/ pretesting, hydrostatic testing, cleaning/ flushing, functional testing, cutting of mainline and bevelling (if required), excavation in all types of soil for installation of piping and pipe supports.

- Installation of all inline/ online instruments.
- Obtaining all necessary approvals and work permits from concerned local authorities having jurisdiction including hot work permit as applicable for performing the work.
- Carrying out welding including cutting, edge preparation (inclusive of grinding the edges on fittings, flange, etc. to match with the matching edges of different thickness wherever required, bending, pre-heating wherever required, NDT including radiography by X-ray / Gamma- ray and other non-destructive tests specified. NDT requirements for process and other piping shall be in accordance with relevant specifications enclosed with the tender document.
- Preparation of plot plan cum piping GAD based on schematic drawings provided in the tender document for tap-off station, various MRS at Industrial Consumer's Stations / DRS & SV stations. Preparation of isometric drawings and final Bill of Material based on piping detail GA drawings prepared by contractor & duly approved by Owner /Consultant.
- Cleaning and servicing of all free issue materials including equipment, valves to make it suitable for installation.
- Completion of all mechanical works as detailed in SOR.
- SV station, branch piping shall be hydrostatically tested to the test pressure in accordance with Specification for piping fabrication, erection. Test pressure shall be 1.5 times design pressure and minimum duration of test shall be four (4) hours. All ball and plug valves in the piping network being hydro tested shall be kept in the partially open position.

3.2.3.2 Equipment and Vessels – As per SOR

3.2.3.3 Civil & Structural Works

Civil works shall be carried out as per the scope detailed in particular job specification enclosed and SOR enclosed elsewhere with the tender.

3.2.3.4 TELECOM



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

Telecom works shall be carried out as per the scope detailed in particular job specification enclosed as elsewhere with the tender.

3.2.3.4.1 Survey Works

Survey works shall be carried out as per the scope detailed in particular job specification enclosed and SOR enclosed elsewhere with the tender.

3.2.3.4.2 SCADA & Telecom – Scope of Work as per respective PJS, SOR & technical specification

3.2.3.5 Painting

- Painting (including supply of all materials) of all equipment, piping, structural steel elements for pipe supports, and all structural miscellaneous items as required and as directed by Company. Paint shall be suitable for highly corrosive environment as per specification providing total DFT of 345 μ minimum as per Specification Painting shall include primer and finish coats as per specifications. Prior to painting surface shall be sand blasted as per instruction of Engineer-in-charge.
- For equipment, valves and other free issue items only one finish coat of final paint will be provided.

3.2.3.6 Other Works

- Obtaining all necessary approvals and work permits, as applicable, for performing the work.
- Carrying out all additional surveys, test and collection of data not furnished by company but required for construction of facilities.
- Provision is to be kept in the terminal for installation of Permanent Cathodic System.
- Extension/ provision of the utilities at desired locations from the consumers battery limit, the utilities are fire water, instrument air, plant air, drinking water, service water and electrical power.
- Any other work not specifically listed herein but required for the construction of the terminals and making it ready for the operation.

4.0 SCOPE OF SUPPLY

4.1 Material to be supplied by Company as Free Issue

4.1.1 Line pipe (Bare/ Coated)

Three Layer PE Coated line pipes shall be provided to the contractor as free issue material.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Contractor shall receive and take over the pipes from owner's designated store under the respective GA.

Any repairs to 3-Layer Polyethylene coating shall be carried out by Contractor using suitable material compatible with parent coating system and meeting the requirements of coating system specified in specification for 3-layer polyethylene coating. The coating repair material and procedure for application shall be submitted to CMC for approval prior to start of construction.

4.1.2 Deleted

4.1.3 Contractor to note that quantities of line pipe indicated in the bid document includes contingency/ extra length over and above the actual requirements. Surplus pipes shall be taken over by the Installation Contractor from Coating Contractor at storage yard after completion of installation works. It is the responsibility of Installation Contractor to return surplus pipes to the COMPANY storage yard as per instructions Engineer In- Charge after completion of installation works.

4.1.4 Receiving and taking over of bare and coated line pipes at Storage yard including its inspection. All trucks / trailers for transportation of line pipes from storage yards to site/ ROU/ Contractor's storage Yard shall be supplied by contractor. The coating contractor shall load the coated/ bare line pipes onto the truck/ trailers supplied by Contractor.

4.1.5 Contractor shall note that Chainage indicated for SVs are approximate and may vary along the pipeline chainage, based on the availability of land and NH/ SH/ Rail approach. The exact location of Company's storage yard shall be intimated to the Contractor at the time of award. Contractor shall be responsible for performing all works as per scope of work at the finally selected storage yard location by the COMPANY at no extra time/ cost to the COMPANY.

4.1.6 Transportation of pipes and other free issue material from place of issue is in Contractor's scope. Contractor shall note that the prices indicated in the Schedule of Rates shall be inclusive of taking the delivery and transportation of line pipes and other material from the above storage yard / stockyard to work place (s).

4.1.7 Bevel Protectors of the line pipes shall be the property of the pipeline installation Contractor. He has to collect and dispose off the bevel protectors. Contractor shall quote accordingly.

4.1.8 Supply of Telecommunication, Civil & Structural items as elaborated in respective particular job specification and SOR enclosed elsewhere with the tender document.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



4.2 Company's storage point for free issue material of this project shall be as mentioned in Annexure-2 to SCC.

Contractor shall arrange all trucks/ trailers, cranes etc. for transportation of above materials including loading at Company store, unloading at contractor's storage yard/ work site, arrangement of cranes, handling etc.

Contractor shall return all surplus material to company designated storage yard as decided by Engineer- In- charge.

4.3 Conditions for issue of Company Supplied Material

Contractor shall prepare and submit Material Issue Vouchers to enable stage wise issue of materials. All materials shall be issued for incorporation in permanent works only and shall not be used for any temporary or ancillary works without the written consent of Engineer-in-charge. These materials shall be issued to the contractor from the Owner's storage points. Contractor shall be responsible, at this own cost, for lifting of the materials from Owners issue points, measuring, weighing, loading, unloading, transportation and return of materials to designated storage points. Contractor shall also be responsible for constructing covered godowns with adequate supports and clearances for safe storage of materials.

Every month the contractor shall submit an account for all the materials issued by the owner in the proforma prescribed by the Engineer-in-charge. On completion of the work, the contractor shall submit materials appropriation statement for all materials issued by Owner.

4.3.1 All materials issued by the COMPANY to the CONTRACTOR shall be preserved against deterioration and corrosion. Any damages/losses suffered on account of poor or improper storage while under CONTRACTOR'S custody and non-compliance with the requirements stipulated herein shall be considered as losses suffered due to willful negligence on the part of the CONTRACTOR and he shall be liable to compensate the COMPANY, for the losses suffered, at penal rates as elaborated elsewhere in the bid document.

Various equipments/ materials intended for the installation will be received by COMPANY in unpacked, skidded, crated, packed or loose condition and will be stored in the COMPANY warehouses & open yards. In general, material will be issued to the CONTRACTOR in "as-received" condition. It will be the CONTRACTOR'S responsibility to draw, load and transport all materials from COMPANY's designated place (s) of issue to the point of installation.

The CONTRACTOR at his own cost shall duly protect all materials supplied by the COMPANY with appropriate preservative like primer/lacquer coating, grease etc, if required.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



The Contractor shall be required to take Insurance Cover in terms of general conditions of contract.

4.3.2 The CONTRACTOR shall check that valves, fittings and specials are not subject to corrosion from hydrostatic test liquid remaining saturated in the packing. Any such conditions when detected should be brought to the notice of the Engineer-in-charge and remedial measures taken as directed. Small and medium size pipe, fittings shall be stored in rack to be constructed from this purpose in a covered godown. When large size pipe fittings are to be stored, these may be kept in the open on surfaced storage yards on proper wooden supports.

4.3.3 All machined surfaces shall be properly greased and shall be maintained and protected from damages.

4.3.4 Openings of equipment, machinery, valves etc. shall be kept blocked/ covered with blinds to prevent entry of foreign matter.

4.3.5 All valves, instruments, pressure gauges, thermometers etc. supplied independently, as well as alongwith equipment and machinery shall be stored separately, inside the covered godown on racks.

4.3.6 As far as possible materials shall be transported to the erection site, just prior to their actual erection and shall not be left laying around indefinitely. Instructions for the Engineer-in-charge shall be followed strictly in this regard.

4.3.7 Repairs of Pipe Defects

Immediately prior to aligning pipe for welding, the bevelled ends of each joint of pipe and the area immediately adjacent thereto (at least 25 mm from the edge on the inside and outside of the pipe) shall be thoroughly cleaned of paint, rust mill scale, dirt or other foreign matter by use of power driven wire buffing wheels, disc sanders, or by other method approved by COMPANY. This shall be done at no extra cost.

All damaged ends of pipe that are bent, cut or otherwise mutilated such that, in the opinion of the COMPANY, faulty alignment or unacceptable welding would result, shall be repaired or cut-off and rebevelled to the correct angle with a bevelling machine of a type approved by COMPANY. No compensation shall be allowed by reason of such re-cutting or bevelling, except when required because of the original bevel being damaged before the pipe is "taken over" by CONTRACTOR.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



CONTRACTOR shall remove dents in bevels with a depth of less than 1 mm during cleaning and grinding, ahead of the welding in the field. No compensation shall be paid to Contractor on this account.

CONTRACTOR shall rebevel dented bevel ends with a depth of dent between 1 and 3 mm. Dents over 3 mm depth shall be repaired by cutting and rebeveling. The CONTRACTOR shall be entitled for extra compensation only for cutting and rebeveling of defects recorded at the time of taking delivery as per the rate set forth in the "Schedule of Rates".

4.4 Material to be supplied by Contractor

The procurement and supply, in sequence and at appropriate time and place, including inspection and expediting, of all materials and consumables required for completion of the work as defined in this bid document except the materials specifically listed under para 4.1 above as COMPANY free issue material, shall be entirely the CONTRACTOR's responsibility and the item rates quoted for the execution of the WORK shall be inclusive of supply of all these materials. All materials supplied by the CONTRACTOR shall be strictly in accordance with the requirements of relevant COMPANY material specifications enclosed with the Contract document. All equipments, materials, components etc. shall be new and specifically purchased for this job from Company approved vendors, duly inspected by third party inspection agency, only manufacturer certificate shall not be adequate.

Contractor shall appoint anyone of the following TPIA for inspection purpose as per **PNGRB (T4S) approved and valid TPI agency**. Contractor has to propose minimum 4 nos. of agencies for approval by GAIL / Consultant.

Apart from inspection by TPIA, inspection may also be performed by PMC / GAIL's personnel.

As a minimum, the materials to be supplied by CONTRACTOR shall include but not be limited to the following

4.4.1 Mainline

- 4.4.1.1** All equipment's & consumable such as welding electrodes, oxygen, acetylene, inert gases, all types of welding electrodes, filler wires, solder wires, brazing rods, flux etc. for welding/ cutting and soldering purposes.
- 4.4.1.2** Supply of 1.0 mm thickness & width (D+300) warning mat. The material of warning mat shall be of high density polyethylene and non-biodegradable type. It shall have non-toxic and anti-rodent properties.
- 4.4.1.3** All materials and consumables required for external corrosion coating and concrete coating (where required) of field weld joints.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- 4.4.1.4** All materials required for field joint coating, corrosion coating of LR bends, pup pieces of sectionalizing valves and repair of damaged corrosion coating of line pipe. Contractor shall confirm that proposed field joint coating material is suitable for type of terrain encountered along pipeline route. Contractor shall take prior approval from COMPANY for field joint coating material to be used. The cut back length shall be 150 mm + 20 (-0) mm.
- 4.4.1.5** All material, equipment & consumables for HDD works including Direx heat shrink sleeves by Covalence Raychem or TBK heat shrink sleeves by Canusa- CPC or equivalent.
- 4.4.1.6** All materials required for carrying out two component epoxy coating for internal surface of casing pipe, wherever required by statutory authorities.
- 4.4.1.7** All materials required for sand/ soft soil padding around pipeline and optical fibre cable, PVC warning mats, select backfill of approved quality, slope breakers, bank stabilization of water crossings etc.
- 4.4.1.8** Mobilizing and providing all necessary barricading material, safety signboards, warning lights etc to safeguard the pipeline against accidents during construction of line in city area.
- 4.4.1.9** All safety tools, tackles, devices, apparatus, equipment etc. including ladders and scaffolding complete as required.
- 4.4.1.10** All stud bolts, nuts, jack screws, all type of gaskets (metallic spiral wound gaskets) in required quantities to be used for permanent installation into the system for all sizes and ratings of flanges and flanged valves, equipment etc., including nuts, bolts, gaskets, washers, U bolts, clamps, clips etc. for pipe/ equipment supports. All materials for supports shall be in contractors account.
- 4.4.1.11** All types of coating and painting materials including primer and paints suitable for normal corrosive environment for painting above ground piping and 100% solid high build epoxy (minimum 500 micron thk) for underground piping/ valves, etc.
- 4.4.1.12** All pipes, fittings, flanges, blind flanges, gaskets, nuts, bolts, clamps, strainers, equip-



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



ment/ consumable, metallic blinds, temporary gaskets as required for filling, pressurising, hydrostatic testing and dewatering, swabbing etc. including test headers for pigging and hydrotesting.

4.4.1.13 All materials required for repair/ restoration of pavements, roads, bunds, walls, other structures affected/ damaged by Contractor's construction activities. Materials shall be equivalent/ superior to those used for original construction of the facility.

4.4.1.14 All equipment and consumables required for hydrostatic testing like pumps, pressure and temperature gauges, test water and corrosion inhibitors for test water for hydrostatic testing.

4.4.1.15 All materials, consumables and equipment required for welding and for all types of tests and NDT such as radiography, ultrasonic testing, magnetic particle, dye penetrate examination etc. including radiography film, X-ray/ gamma ray machines, developing equipment and consumables, Ultrasonic equipments etc.

4.4.1.16 All safety tools, tackles, devices, apparatus, equipment etc. including ladders and scaffolding complete as required.

4.4.1.17 All materials for corrosion protection of buried piping, pipe fittings, valves, casing pipes, etc.

4.4.1.18 Mobilizing Pipe/ cable locator for locating existing pipelines/ cables

4.4.1.19 Corrosion inhibitor, oxygen scavengers and bactericides for water used for hydrostatic testing including water for testing.

4.4.1.20 Required quantities of nitrogen for idle time preservation and pre- commissioning of Pipeline and associated facilities, if required.

4.4.1.21 Required quantities of nitrogen for commissioning of Pipeline and associated facilities.

4.4.1.22 All pigs for cleaning, gauging, filling, dewatering, swabbing, drying, pre- commissioning



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



and commissioning of the pipeline.

4.4.1.23 All materials i.e. fittings, flanges, valves, blind flange etc. required for isolation and nitrogen purging for pipe section, manpower, equipment, pigs, consumables, nitrogen required for carrying out commissioning of pipeline along with necessary piping and instrumentation connection for monitoring flow rate, pressure, temperature etc. providing temporary facilities for venting/ flaring along with necessary piping, valves and instrumentation etc. shall be contractors scope.

4.4.1.24 All other materials not specified above but required for successful completion of the entire work whether temporary or permanent in nature.

4.4.1.25 Coating repair material compatible and suitable for 3 layer PE coated line pipe comprising of repair patches (i.e. PERP-80 or equivalent) complete with adhesive.

4.4.1.26 All materials for all types of pipeline markers / warning marker including HDPE Warning Sheet, cement, sand, reinforcements, structural steel etc.

4.4.1.27 All materials required for continuous concrete coating/ saddle weights for providing negative buoyancy to the pipeline wherever required.

4.4.1.28 Supply of nitrogen and other consumables, tools and tackles required for venting, predrying, purging and filling of mainline.

4.4.1.29 Supply of bare casing pipe including all other material like casing insulators, end seals, vent & drain assembly etc. for cased crossing if required as indicated in SOR.

4.4.1.30 Supply of Bends of radius ($R=3D$) in contractor's scope as detailed in SOR.

4.4.1.31 All other items/ materials as may be required for completion of contractual scope of work and not covered under material to be supplied by company as free issue material at 4.1.

4.4.2 Terminals



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

4.4.2.1 Piping, Equipment & Vessels

- a) Studs, nuts, washers, U bolts, clamps, clips, pipe supports, gaskets for piping works.
- b) Shims, wedges and packing plates (machined wherever required).
- c) Galvanized steel piping of all sizes for instrument air/ service air.
- d) Portable Fire Extinguisher System.
- e) Painting material

All other items/ materials as may be required for completion of contractual scope of work and in SOR but not covered under material to be supplied by company as free issue material at 4.1.

4.4.2.2 Civil & Structural

All materials as elaborated in respective SOR and PJS enclosed elsewhere with the tender.

4.4.2.3 Cathodic Protection Works – Scope of supply as per respective PJS, SOR & technical specification

4.4.2.4 Instrumentation & Telecom

4.4.2.4.1 Instrumentation – As per SOR

4.4.2.4.2 Telecom – Scope of supply as per respective PJS, SOR & technical specification

4.4.2.5 All painting materials. Paint shall be suitable for highly corrosive environment.

4.4.3 General

4.4.3.1 All consumables for welding such as oxygen, acetylene, inert gases and all types of electrodes suitable for pipes of grades as specified in the specification, low hydrogen electrodes, filler wire, solder wire, brazing rods, flux etc. for welding / cutting and sol-



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



dering purpose.

- 4.4.3.2 Equipment like hydrostatic pump etc., water and corrosion inhibitor for water used for hydrostatic testing including all pipes, fittings and equipment, metallic blinds, temporary gaskets as required for filling, pressurising and dewatering in connection with hydrostatic testing completion.
- 4.4.3.3 All pigs for cleaning, filling, dewatering and swabbing of pipeline.
- 4.4.3.4 All pipes, fittings and equipment metallic blinds temporary gaskets as required for filling, pressuring and dewatering in connection with hydrostatic testing completion.
- 4.4.3.5 All consumables for welding of structural steel.
- 4.4.3.6 Materials and equipment required for all types of test such as radiography, magnetic particle and dye penetrate examination.
- 4.4.3.7 All safety tools/tackles, devices / apparatus / equipment etc. including ladders and scaffoldings etc. complete as required.
- 4.4.3.8 Supply of nitrogen and other consumables, tools and tackles required for venting, predrying, purging and filling of station piping.
- 4.4.3.9 Any other material not specifically listed herein, but required for the execution of the work.
- 4.4.3.10 The item rates quoted for the execution of the work shall be inclusive of supply of all materials mentioned above unless specifically covered otherwise under schedule of rates. The quantities indicated in schedule of rates under Contractor's scope of supply are approximate. Contractor shall carryout MTO of all materials required based on IFC general arrangement drawings, P & IDs and firm up the actual requirement of materials. All escalation/ extra materials procured by Contractor for contingencies shall be Contractor's property and no payments shall be made for such materials. Payment shall be made for actual materials installed by the Contractor as a part of permanent installation.

In case, any item is covered in scope of work but is not present in Schedule of Rates (SOR), it will be assumed that bidder has included cost implication of those items in their total price.

- 4.4.3.11 List of materials to be supplied and quantities indicated in SOR is tentative. These quantities can vary during execution to any extent and the same unit rate shall be applicable for payment. Final quantities will be based on the drawing issued to the contractor for construction. Quantities covered in SOR are for as erected quantities. Bidder will procure additional materials as required to cover cutting, scraps, wastages and damages during erection, testing and commissioning. For these extra quantities no additional payment will be made.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



5.0 Documents, Specification, Standards and Drawings

- 5.1** Owner shall furnish tender purpose drawings as listed in content of Volume- III of III of the tender document and other typical standard drawings attached with respective technical specifications enclosed with Volume-II of III of the tender document. Contractor shall prepare detail engineering drawing, bill of materials and all construction drawings and submit to Consultant for approval prior to start of the job / any procurement.
- 5.2** Contractor shall prepare isometric drawings & bill of materials and submit the same for Owner/ Consultant's approval/ record.
Contractor shall prepare drawing for utilities line as required as per SOR and submit the same for Owner/ Consultant's approval/ record.
- 5.3** No construction small or big shall be carried out without proper construction drawings duly approved by Owner / Consultant.
For Mainline route alignment drawing shall be furnished alongwith bid by Owner. However, detail pipeline route alignment sheets, detail-crossing drawings with crossing methodology shall be submitted by Contractor for prior approval after survey carried out by contractor at site before execution of pipeline work. Any additional survey and data required to complete above shall be also done by Contractor without any extra time & cost implementation to Owner.
- 5.4** After Completion of construction & commissioning of pipeline system, Contractor shall incorporate all the correction in drawings, prepare and issue the drawings "as-built drawings" as listed below to Owner as final submission of drawings. For Mainline pipeline alignment sheet, all X-ing details, all CP drawings, pipe book etc. and for tap-off points, various MRS at Industrial Consumer's Stations / DRS & SV Stations - layout drg., piping GAD, Isometric, all civil drawings. For final submission only 4 sets of documents plus the original transparencies shall be handed over by Contractor. Any construction done by Contractor without duly approved drawings shall be wholly at his risk and cost. Contractor shall also submit soft copy of pipe book in excel alongwith hard copy. Soft copy of all as-built drawings shall be also submitted in AutoCAD. Video graphy/ photograph of all major activities/ milestone achieved shall also be arranged and submitted by the Contractor. For details of documentation to be submitted for mainline and terminal refer enclosed specification for documentation for pipeline construction enclosed elsewhere with the tender.

5.5 Specifications

The work shall be carried out by CONTRACTOR strictly in accordance with the specifications enclosed in Volume II of III of this document.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



5.6 Drawings

The drawings are included in Volume –III of III of the bid package for BIDDER's reference purpose only; Bidders are advised to go through these drawings and also visit the site before submitting their bids. The Contractor shall develop the all type of drawings required for construction works as detailed in respective SCC, PJS & SOR etc.

5.7 Drawing and Documents

5.7.1 The drawings accompanying the Bid document are indicative of scope of work and issued for tendering / bidding purpose only. These drawings indicate the general scheme as well as the route layout to enable the contractor to make an offer in line with the requirements of the owner. Final construction shall be done as per construction drawing prepared by the successful bidder / contractor & duly approved by Owner.

5.7.2 Construction drawings prepared by successful bidder / contractor prior to execution work shall be submitted to Owner progressively based on construction progress achieved by contractor. Owner will take approval period as minimum 7 (seven) working days from the date of receipt of drawings / documents. No extra claims in terms of time & cost, whatsoever shall be entertained for any variation between tender drawings and approved for construction drawings.

6.1 RESOURCES / FACILITIES

6.2 Recruitment of Personnel by Contractor

The Contractor shall not recruit personnel of any category from among those who are already employed by the other agencies working at the sites but shall make maximum use of local labour available.

6.3 Construction Water and Power Supply

No water and power will be provided by the Owner. It should be the responsibilities of the contractor to arrange water and power at his own cost.

6.4 Land for Residential Accommodation

Owner shall not provide any land for residential accommodation of contractor's staff and labour.

7.0 PROJECT SCHEDULING & MONITORING



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



The following schedules/documents/reports shall be prepared and submitted by the Bidder/Contractor for review/approval at various stages of the contract.

7.1 Along with Bid

a) Time Schedule

The Completion Time Schedule for the work (including mobilization period) as per SCC Annexure-3 of Tender in all respect, from the date of issue of telex/telegram/letter/Fax of Intent.

The Bidder is required to submit a Project Time Schedule in Bar Chart Form, alongwith the Bid. The Schedule shall cover all aspects like sub-ordering, manufacturing and delivery, indicated in the Bid Document. The Owner interface activities shall be clearly identified with their latest required dates. Owner reserves the right to disqualify the Bidder if the above Schedule submitted by the Bidder is not in line with the over all Project requirement.

b) Scheduling & Monitoring System

The Bidders should describe their system of Project Scheduling and monitoring, the extent of computerization, level of detailing, tracing methodology etc. with the name of computer package and sample outputs.

7.2 After the Award of Contract

a) Overall Project Schedule

The Contractor shall submit within 1 week of Fax of Intent, a sufficiently detailed over all Project Schedule in the activity network form, clearly indicating the major milestones, inter-relationship/ interdependence between various activities together with analysis of critical path and floats.

The network will be reviewed and approved by Engineer- in-Charge and the comments if any shall be incorporated in the network before issuing the same for implementation. The network thus finalized shall form part of the contract document and the same shall not be revised without the prior permission from Engineer-in- Charge during the entire period of contract.

b) Progress Measurement Methodology



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

The contractor is required to submit within 1 week of award of WORK, the methodology of progress measurement of sub-ordering, manufacturing/ delivery, sub- contracting construction and commissioning works and the basis of computation of overall services/physical progress informed. Owner reserves the right to modify the methodology in part or in full.

c) Functional Schedules

The contractor should prepare detailed functional schedules in line with network for functional monitoring and control and submit scheduled progress covers for each function viz. ordering, delivery and construction.

7.3 Project Review Meetings

The Contractor shall present the programme and status at various review meetings as required.

a) Weekly Review Meeting

Level of :	Contractor's / Consultant's
RCM/ Participation	Site In charge & Job Engineers.

Agenda:	a) Weekly programme v/s actual achieved in the past week
&	program for next week.
	b) Remedial Actions and hold up analysis.
	c) Client query/ approval.

Venue :	Site Office
---------	-------------

b) Monthly Review Meeting

Level of :	Senior Officers of GAIL (I) LTD. CMC and Participation Contractors.
------------	---

Agenda :	a) Progress Status/ Statistics
	b) Completion Outlook
	c) Major holdups /slippages
	d) Assistance required
	e) Critical issues
	f) Client query / approval

Venue :	GAIL (I) LTD. /CMC Office/ Site at the discretion of Owner/ CMC
---------	---



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



7.4 Progress Reporting Performa

A) Monthly Progress Report

This report shall be submitted on a monthly basis within 10 (ten) calendar days from cut-off date, as agreed upon covering overall scenarios of the work. The report shall include, but not limited to the following:

- a) Brief Introduction of the work.
- b) Activities executed / achievements during the month.
- c) Schedule versus actual percentage progress and progress curves for Detail Engg. Sub-ordering, Manufacturing / Delivery, Sub- contracting, Construction, Commissioning and Overall and quantum wise status & purchase orders against schedule.
- d) Area of concern/ problem/ hold-ups, impacts and action plans.
- e) Resources deployment status.
- f) Annexures giving status summary for drawings, MRs, deliveries, sub-contracting and construction.
- g) Procurement status for items to be supplied by Contractor.

B) Weekly Reports

The report will be prepared and submitted by the Contractor on weekly basis and will cover following items:

- a) Activities programmed and completed during the week.
- b) Resource deployed men and machines.
- c) Quantities achieved against target in construction
- d) Record of Man-days lost.
- e) Construction percentage progress schedule and actual.

C) Daily Repots

- a) Activity programme for the day
- b) Progress of the previous day and commutative progress.
- c) Manpower & machinery deployed.

7.5 PROGRESS REPORTS



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



7.5.1 CONTRACTOR shall make every effort to keep the OWNER adequately informed as to the progress of the WORK throughout the CONTRACT period.

CONTRACTOR shall keep the OWNER informed well in advance of the construction schedule so as to permit the OWNER to arrange for requisite inspection to be carried out in such a manner as to minimize interference with progress of WORK. It is imperative that close coordination be maintained with the OWNER during all phases of WORK.

7.5.2 By the 10th (tenth) of each month, CONTRACTOR shall furnish the OWNER a detailed report covering the progress as of the last day of the previous month. These reports will indicate actual and scheduled percentage of completion of construction as well as general comments of interest or the progress of various phases of the WORK. The frequency of progress reporting by the CONTRACTOR shall be weekly.

7.5.3 Once a week, CONTRACTOR shall submit a summary of the WORK accomplished during the preceding week in form of percentage completion of the various phases of the WORK, to the OWNER.

7.5.4 Progress reports shall be supplied by CONTRACTOR with documents such as chart, networks, photographs, test certificate etc. Such progress reports shall be in the form and size as may be required by the OWNER and shall be submitted in at least 3 (three) copies.

7.5.5 Contractor shall prepare daily progress report (DPR) in the desired format and submit it to Engineer-in-charge alongwith schedule of next day to Engineer-in- charge.

8.0 CONSTRUCTION

OWNER reserves the right to inspect all phases of CONTRACTOR's operations to ensure conformity to the SPECIFICATIONS. Owner will have Engineers, Inspectors or other duly authorized representatives, made known to the CONTRACTOR present during progress of the WORK and such representatives shall have free access to the WORK at all times. The presence or absence of a OWNER's representative does not relieve the CONTRACTOR of the responsibility for quality control in all phases of the WORK. In the event that any of the WORK being done by the CONTRACTOR or any SUB-CONTRACTOR is found by OWNER's representatives to be unsatisfactory or not in accordance with the DRAWINGS, procedures and SPECIFICATIONS, the CONTRACTOR shall, upon verbal notice of such, revise the work in a manner to conform to the relevant DRAWINGS, procedures and SPECIFICATIONS.

8.1 Rules & Regulations



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



CONTRACTOR shall observe in addition to Codes specified in respective specification, all National and Local Laws, Ordinances, Rules and Regulations and requirements pertaining to the WORK and shall be responsible for extra costs arising from violations of the same.

8.2 Procedures

Various procedures and method statements to be adopted by CONTRACTOR during the construction as required in the respective specifications shall be submitted to OWNER in due time for APPROVAL. No such construction activity shall commence unless approved by OWNER in writing.

8.3 Field Inspection

CONTRACTOR shall have at all times during the performance of the WORK, a Competent Superintendent on the premises. Any instruction given to such superintendent shall be construed as having been given to the CONTRACTOR.

8.4 Erection and Installation

The CONTRACTOR shall carry out required supervision and inspection as per quality Assurance plan and furnish all assistance required by the OWNER in carrying out inspection work during this phase. The OWNER will have engineers, inspectors or other authorized representatives present who are to have free access to the WORK at all times. If an OWNER's representative notifies the CONTRACTOR's authorized representative not lower than a Foreman of any deficiency, or recommends action regarding compliance with the SPECIFICATIONS, the CONTRACTOR shall make every effort to carry out such instructions to complete the WORK conforming to the SPECIFICATIONS and approved DRAWINGS in the fullest degree consistent with best industry practice.

8.5 Construction Aids, Equipment, Tools & Tackles

CONTRACTOR shall be solely responsible for making available for executing the work, all requisite Construction Equipments, Special Aids and Tools, Tackles and testing equipments and appliances. Such construction equipments etc. shall be subject to examination by Owner and approval for the same being in first class operating condition. Any discrepancies pointed out by OWNER shall be immediately got rectified, repaired or the equipment replaced altogether, by CONTRACTOR. OWNER shall not in any way be responsible for providing any such equipment, machinery, tools and tackles.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



The OWNER reserves the right to rearrange such deployment depending upon the progress and priority of work in various sections.

Tie-end between main line and starting point of terminal is included in the scope of contract, as and when main line section is available for Tie-ins.

9.0 DOCUMENTATION

9.1 "As Built" Drawings

Notwithstanding the provisions contained in standard specifications, upon completion of WORK, the CONTRACTOR shall complete all of the related drawings to the "AS BUILT" stage and provide the OWNER, the following: -

- a) One complete set of all original tracings.
- b) Three complete bound sets of Contractor's specifications Including design calculations.
- c) Three complete sets, in the form of hand bound volumes, of the manufacturer's data book for all the equipments, instruments etc. including certified prints and data. Data books shall be completed with index as to tag numbers associated with manufacturer's data shown, Equipment data shall include as a minimum requirement the principle and descriptions of operations, installation and maintenance instructions, drawings and dimensions, parts list and priced purchase orders including those of major sub-vendors and suppliers. Requirements pertaining to "VENDOR DATA REQUIREMENT" attached with standard specifications for the documents to be included in the Data Book for each equipment, instruments etc. shall also be complied with.
- d) Three bound copies each of the Spare Parts Data Books and the Lubricants Inventory Schedule.
- e) Soft copy of all the as built drawings prepared in AutoCAD in three sets of rewritable compact Disc and photographs covering measure activities at site including all documents in soft copies.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- f) The Contractor shall submit coloured photographs covering all the activities of pipe-line constructions highlighting the progress or other areas of work in 2 sets to Engineer-in-charge at site office alongwith monthly progress report. Similarly photographs for problem areas should be submitted well in advance with a proposed methodology to execute the works and meet the construction schedule. The cost of same shall be deemed to be inclusive in the rates and no separate payment shall be made.
- g) All as-built drawings as mentioned in specification for documentation enclosed elsewhere in the tender.

9.2 Completion Document –

The following documents shall be submitted in hard binder by the CONTRACTOR in THREE sets, as a part of completion documents:

-

- a) Welding Procedure Qualification Report.
- b) Welder Qualification Report.
- c) Radiographic Procedure Qualification.
- d) Radiographic Report alongwith radiographs (Radiographs only with the original).
- e) Batch Test Certificate from manufacturers for electrodes.
- f) Pretesting and final Hydrostatic and other Test results and reports.
- g) All other requirements as specified in the respective specifications.
- h) Test results and reports.
- i) Pre-commissioning/commissioning checklist.
- j) Completion Certificate issued by Owner's Site Engineer.
- k) No claim certificate by the Contractor.
- l) Consumption statements of steel and cement certified by Owner's Site Engineer.
- m) Completion certificate for embedded and covered up works wherever applicable.
- n) Recovery statement, if any.
- o) Statement for reconciliation of all the payments and recoveries made in the progress bills.
- p) Copies of deviation statement and order of extension of time, if granted.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



9.3 Additional Clauses

- 9.3.1 Contractor to note that the minimum requirements of inspection and testing of the bought-out items shall be governed by attached QAP with the tender document. However, contractor shall submit their QAP in line with the requirement specified in attached QAP for Owner's/ Consultant's approval.
- 9.3.2 Contractor to note that all the documents/drawings submitted by them as a part of bid shall be considered only to assess Bidder's technical capability and shall in no way absolve them from complying with all the requirements of the Tender. All works to be performed by the Bidder shall be strictly in accordance with tender conditions.
- 9.3.3 Contractor shall submit duly signed & stamped hard copies of all required documents/ drawings/ data sheets etc to consultant for their review & approval as per terms & condition of tender documents. The date of receipt of these documents/ drawings/ data sheets etc at consultant shall be deemed as the date of submission. If any documents/ drawings/ data sheets etc require re-submission due to any error/ deficiency noticed during review/ approval stage, in that event the additional time required by the contractor to get the revised document/ drawing reviewed/approved by consultant shall be solely to contractor's account and in no case contractor shall be entitled for any time or cost benefit.
- 9.3.4 The drawings/documents/ data sheets etc shall be reviewed, checked, approved and duly signed/stamped by successful contractor before submission. Revision number shall be changed and revisions shall be highlighted by clouds during submission of revised documents/drawings/data sheets by the successful contractor. Whenever the successful contractor requires any sub-supplier drawings to be reviewed/approved by consultant, the same shall be submitted by the contractor after review/ approval and stamped by the Contractor. Direct submission of the sub-supplier's drawings/ documents/ data sheets etc without contractor's approval shall not be entertained.
- 9.3.5 Review/Approval of the contractor's submitted drawings/ documents/ data sheets etc by consultant would be only to review the compatibility with basic design and concepts including mainline work procedure and in no way absolve the successful contractor of his responsibility/contractual obligation to comply with tender requirements, applicable codes, specifications and statutory rules/regulations. Any error/deficiency noticed dur-



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

ing any stage of manufacturing/execution/installation shall be promptly corrected by the contractor without any extra cost or time, whether or not comments on the same were received from consultant during the drawing review stage.

- 9.3.6 Contractor shall make & maintain their own suitable sized Storage yard/ area (covered as well as open space) to store Free Issue Materials (FIM) in proper manner. Contractor shall also maintain the FIM in good condition during entire storage period by using all type of servicing/overhauling such as cleaning, greasing, protecting from rusting/ pitting etc.

Storage Yard/ Area shall have proper motarable approach, adequate indoor & outdoor area lighting, potable & service water, proper rack & wooden sleeper etc. for staking/ storing the material, availability of material handling equipment of adequate capacity etc.

Owner/Consultant's Site In-charge shall visit & inspect the Contractor's Storage yard/ Area and upon his concurrence only, the FIM shall be stored by the Contractor at the particular Storage Yard/ Area.

Delay in issuance of FIM due to non acceptance of Contractor's Storage yard/Area (i.e. mainly because of non compliance of the minimum condition as mentioned Above for Storage Yard/ Area) shall not be attributable to Owner/Consultant.

- 9.3.7 During construction, Owner / Consultant, on their discretion, have reserve right to Take samples for any bought-out item received at site and test the same in a NABL approved or equivalent laboratory even if the lot has already been Inspected and cleared by Consultant / Owner for use in construction. The cost for such Testing shall be borne by the Contractor. In case of failure of the samples, the lot Shall be rejected and the same shall be replaced by the Contractor without any Additional cost to Owner.

10.1 SURVEY AND LEVEL / SETTING OUT WORK

- 10.2 Before the WORK or any part thereof are begun, the CONTRACTOR's agent and the Engineer-in-Charge's representative shall together survey and take levels of the SITE and decide all particulars on which the survey is to be made, and on which measurements of the WORK are to be based. Such particulars shall be plotted by the CONTRACTOR and after agreement the drawings shall be signed by the Engineer-in-Charge.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- 10.3 The CONTRACTOR shall be entirely responsible for the horizontal and vertical alignment, the level and correctness of every part of the WORK and shall rectify any errors or imperfections therein. Such rectifications shall be carried out by the CONTRACTOR at his own cost, when instructions are issued to this effect by the Engineer-in-Charge or his representative.
- 10.4 The Engineer-in-Charge shall furnish the relevant existing grid point with Bench Mark on the land. It shall be CONTRACTOR's responsibility to set out the necessary control points in and to set out the alignment of the various works. The CONTRACTOR shall have to employ efficient survey team for this purpose and the accuracy of such setting out work shall be CONTRACTOR's responsibility.
- 10.5 The CONTRACTOR shall give the Engineer-in-Charge not less than 24 (twenty four) hours notice in writing of his intention to set out or give levels for any part of the WORK so that arrangements may be made checking the same.
- 10.6 WORK shall be suspended for such times as necessary for checking lines and levels on any part of the WORK.
- 10.7 The CONTRACTOR shall at his own expense provide all assistance, which the Engineer-in-Charge may require for checking the setting out of WORKS.
- 10.8 Before commencement of any activity, contractor's quality control set up duly approved by company must be available at site.
- 11.1 ORDER OF WORKS / PERMISSIONS / RIGHT OF ENTRY / CARE OF EXISTING SERVICES**

- 11.2 The order in which the WORK shall be carried out shall be subject to the approval of the Engineer-in-charge and shall be so as to suit the detailed method of construction adopted by the CONTRACTOR, as well as the agreed joint programme. The WORK shall be carried out in a manner so as to enable the other contractors, if any, to work concurrently.

OWNER reserves right to fix up priorities which will be conveyed by Engineer-in-Charge and the CONTRACTOR shall plan and execute work accordingly.

11.3 Existing Service

- 11.3.1 Drains, pipes, cables, overhead wires and similar services encountered in course of the works shall be guarded from injury by the CONTRACTOR at his own cost, so that they may



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



continue in full and uninterrupted use to the satisfaction of the Owners thereof, or otherwise occupy any part of the SITE in a manner likely to hinder the operation of such services.

11.3.2 Should any damage be done by the CONTRACTOR to any mains, pipes, cables or lines (whether above or below ground etc.), whether or not shown on the drawings the CONTRACTOR must make good or bear the cost of making good the same without delay to the satisfaction of the Engineer-in-Charge.

12.0 MAKE OF MATERIAL / BOUGHT OUT ITEMS

Approved vendors for various major items are enclosed as Appendix-I to Particular Job Specification with this tender document. The bidder shall consider such names only as indicated in the aforesaid list and clearly indicate in the bid the name(s) as selected against these items. For any other item not covered in the list enclosed with this tender document, prior approval shall be obtained by the contractor for its make/ supplier's name as per qualification criteria mentioned.

13.0 INSPECTION OF SUPPLY ITEMS

All inspections and tests shall be made as required by the specifications forming part of this contract. Contractor shall advise Owner/ Consultant in writing at least 10 working days in advance of the date of inspection/tests. Manufactures inspection or testing certificates for equipment and materials supplied, may be considered for acceptance at the discretion of Owner/ Consultant. All costs towards testing etc. shall be borne by the contractor within their quoted rates. All inspection of various items shall be carried out based on Quality Assurance Plan, which will be submitted by the Contractor and duly approved by Owner/ Consultant.

14.0 ESCALATION

The Unit Rates quoted shall be kept firm till completion of work and no price Escalation shall be paid.

15.0 DOCUMENTS TO BE SUBMITTED / PRODUCED ALONGWITH R.A. BILLS

- i) Computerized R .A. B ill/ Manual Bill, with IT No./ ST N o./ Labour License No. Printed thereon.
- ii) ESI/ EPF clearance certificates for the last month alongwith R.A. Bills.
- iii) Insurance Policy as per relevant clauses of Contract Agreement.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

- iv) Attendance Register and Salary Records.
- v) Photocopy of the measurement book to be attached with R.A. Bills.
- vi) Any other document required for the purpose of processing the bills.
- vii) Registration Certificate with Sales tax authorities of state concerned.

16.0 Following new clauses are also to be considered wherever required which are specific to city conditions laying.

i) **Preliminary Activities, Design and Detailed Engineering**

- Contractor shall carry out all preliminary activities, surveys of utilities to the extent required for main pipeline and distribution/ branch lines, laying underground pipelines and prepare alignment sheets, crossing drawings alongwith bill of material with all details necessary for construction of the main and branch lines. The minimum pipeline cover shall be kept as follows:

Pipeline Burial Requirement

The entire pipeline shall be buried and provided with a minimum cover as given in Table below:

Pipeline Burial Requirements	
Location	Min. Cover (m)
a) Stream / Canal / Nala and other minor water crossing (below firm bed level)	1.5
b) Cased/ Uncased Road/ cart track crossings	1.2
c) Cased railway crossings	1.7
d) Drainage, ditches at roads/ railway crossings	1.0
e) Industrial, Commercial, Residential and other locations including rocky areas	1.0
f) Major water crossings (below scour level)	2.5
g) River crossing with rocky bed (below scour level)	1.5



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

Note:

- i) The depth of cover shall be measured from the top of the pipe coating to the top of the undisturbed surface of soil or the top of graded working strip, whichever is lower. The fill material in the working strip shall not be considered in the depth of cover.
- ii) The cover shall be measured from the top of road or top of rail, as the case may be;
- iii) For river / water courses that are prone to scour and erosion, adequate safe cover as mentioned above or as advised by concerned authorities (whichever is stringent) shall be provided below the predicted scour profile expected during the life time of the pipeline.
- iv) When scour level is not known, an additional cover of at least 1 m or as advised by concerned authorities shall be provided from the existing firm bed of the river / water course except in case or rocky river bed;
- v) Minimum cover mentioned above against sl. no. a), b), c), d) & e) category may be increased based on the statutory requirements from concerned authorities and authorities requirement shall be final and binding to the contractor.
- vi) Soft soil / sand padding of minimum 100 mm thickness or as mentioned in standard drawing (whichever is stringent) to be provided around the pipeline where gravel / hard soil or rocky area is encountered.
 - Contractor shall carry out detailed engineering as required for preparation of General Arrangement Drawings (GADs) for DRS / MRS Stations, Piping at consumer ends, connection at existing tap-off location and for future connections along with bill of materials.

Owner will provide typical sketches for above ground installation (i.e. at DRS/ MRS Etc.) Contractor shall develop General Arrangement Drawings (GADs) good for construction for various sizes and locations based on typical sketches/ drawings along with bill of materials and submit to Owner for reviews/ approval. Construction work shall be carried out based on construction drawings duly approved by Owner/ Consultant.

- The detailed engineering for above ground installation shall include detail engineering pertaining to all disciplines alongwith bill of materials.
- All the documents/ drawings prepared by the Contractor shall be submitted to Owner/ Engineer-in-charge for review and approval. All works shall be executed based on the approved drawings/ documents only.
- Contractor shall obtain all clearance from Government authorities.
However bank guarantee/ required fee or charges shall be submitted by Owner.
- Contractor shall carry out corrosion survey, design, detail engineering, installation, testing & Commissioning for temporary cathodic protection including supply of all items for design life of 2 years.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



ii) Main and Distribution Pipeline

- "Receiving and Taking-over" as defined in the Specifications of Owner supplied Carbon Steel externally corrosion coated/ bare line pipe of specified sizes and thickness from Owner's designated stacking yard(s), place(s) of issue in/ around the concerned city, transportation including loading, unloading, handling, stacking, hauling and stringing of pipes from Owner's stacking yard(s)/ designated point(s) of issue to Contractor's own stock yard(s)/ work site(s)/ workshop(s)/ pipeline Right-of-Use, including arranging all necessary intermediate storage area(s) required thereof till the pipes are installed in permanent installation. The exact location of the Purchaser's stacking yard near each city shall be intimated to the Contractor after the award of contract.
- Carrying out inspection of pipes and pipe coating at the time of receiving and taking-over and recording all the defects etc., noticed in the presence of Owner's representative and carrying out all repairs including supply of all repair materials.
- Carrying out repairs of the pipes and pipe coating not attributable to Owner (including supply of all materials) including defects/ damage occurring during transportation and/ or handling after receiving and taking-over including supply of all materials.
- Receiving and taking-over of all owner supplied material other than corrosion coated CS line pipe, loading, unloading, handling, stacking, storing and transportation to workshop, work site of all materials that may be used for the construction of pipeline system either supplied by Owner at their designated stockyard(s)/ designated stores and/ or by Contractor as the case may be.
- All additional route/ topographic surveys and/ or soil investigation required for local detours of main line and survey soil data for branch lines as required, including preparation of plan and profile drawings without any extra cost to Owner.
- Staking, clearing, grading, fencing of Right-of-Use (ROU) wherever required, trenching to all depths in all types of soil including soft and hard rock, including chiseling or otherwise cutting etc. to a width to also accommodate the optical fiber cable/ cable conduit as per the relevant standards, drawings, specifications etc. Aligning, bending, welding, NDT including 100% radiography, field weld joint coating, external corrosion coating of long radius bends and buried fittings/ valves including supply of coating material as per



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



the field joint coating specification, laying and lowering, carrying out road, canal, utility and submerged water crossings including bank stabilisation of water crossings as required including arranging all temporary land/ area required for construction purposes; supply and installation of anti-buoyancy measures viz. Continuous concrete coating, select back-fill, extra cover, etc. on pipeline. Blasting of rock is not allowed. The excavated soil is to be kept/ disposed at the place specified by the Engineer-in-charge.

- Barricading of trench as per instruction of EIC / tender drawings wherever required.
- Carrying out corrosion coating of 500 micron thick two component underground coal tar epoxy, applied with minimum three coats for underground valves & fittings.
- Welding of all tie-in joints for pipeline section laid across other utility crossings along-with insulating joints upto and including valves and fittings.
- Placement of PE warning mat D + 300mm wide and 1.0mm thick over pipeline along complete route or as per standard drawing, whichever is stringent.
- Backfilling, temporary restoration including supply of select back fill material wherever required, compaction, clean-up, flushing, pigging, hydrostatic testing with the quantity of corrosion inhibitor as required, de-watering, swabbing of the main pipeline and removal of water by compressed air in branch lines. The backfilling and sand padding shall be carried out as per the instructions of Engineer-in-charge/ any relevant drawing enclosed with tender
- Clean-up and restoration of Right-of-Use as per specification and drawings and other conveniences like road, rail, canal, utility crossings etc. to original condition, to the entire satisfaction of Owner and/ or authorities having jurisdiction and returning excess construction materials to Owner's designated stock- yard(s).
- Obtaining all necessary permissions, approvals and work permits from local authorities as applicable for performing the work including shifting of telephone/ electrical poles, hume pipes etc., if required.
- Pre-commissioning, providing commissioning assistance, nitrogen purging of the complete underground pipe network including supply of all materials such as required type and quantity of pigs, consumables and manpower that are required during pre- commission-



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



ing and commissioning activities including all coordination with and assistance to other agencies/ contractors during commissioning operations and all associated works.

- Installation of all on-line instruments, pressure gauge, valves, insulating joints, appurtenances, etc.
- Loading, unloading, handing over and transportation of all surplus Owner supplied free issue materials including short length pipes to Owner's designated store and stacking the same as per the directions of Engineer-in-charge.
- Cutting/ up rooting of trees within ROU, counting the number and type of trees cut during pipeline laying works in presence of DFO/ concerned authorities and keeping record thereof, staking and banding over of all cut trees as per the direction of Engineer-in-charge.
- All requirements and stipulations of statutory authorities shall be adhered.
- Repair of leaks/ burst, not attributable to Contractor, occurring in Owner supplied material shall be carried out by the Contractor and the Contractor shall be compensated as per provisions of the contract. However repair of such defects attributable to Contractor shall be carried out by Contractor at no extra cost to Owner.
- Hook-up of piping facilities by welding, hot tapping or flanged connection (as shown in AFC drawings) with equipments and at the battery limit with the facilities installed by others including cutting, fit-up, welding, NDT, radiography, interface / co-ordination as required for inlet connection to DRS aboveground installation.
- Any other works not specifically listed herein above but are required to complete in installation work of pipeline and associated facilities in all respects.
- Preparation of as-built drawings, pipe-books, project records and photograph as per specifications and instruction of Engineer-in- charge.

iii) Associated Works for Pipeline Construction

- Installation of casing pipe (by open cut / jacking / boring / HDD) assembly, including



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



supply of all materials viz. casing insulators and end seals etc. complete at cased cross-ings.

- Supply and installation of all types of pipeline markers including their painting, suitable for normal corrosive environment as per specification and all the associated civil works.
- Sand/ soft soil padding around pipe where required including supply of sand/ soft soil.
- Application of continuous concrete coating on line pipe and field joints as required.
- Excavation along existing pipe-route up to 1.6m depth to locate existing underground tap-offs, backfilling, and restoration of excavated soil.
- Valve pits and joint pits shall be made as per drawing enclosed, at locations specified by the Engineer-in-charge.
- Fencing at SV Stations, DRS/ MRS installations shall be carried out by Contractor including supply of all civil & structure materials, complete foundation & civil works, fabrication & installation of chain link fencing, gates, painting etc. as per drawings & specifications.
- Corrosion survey, design, detailed engineering, supply & installation of temporary cathodic protection works as per enclosed specification and as directed by Engineer-in-charge.
- Providing barricading for safety during fabrication, installation and testing of pipe-line as per tender specification.

iv) Future Tap-off Connections

- Complete works for installation of all piping works at all depths inside the pit, including all piping, valves, fittings at all depths inside the pit, all civil works including excavation of pits, pipe supports foundations etc. as shown in the relevant enclosed typical drawing. The side wall and bottom of the pit have a withstand an out side hydrostatic pressure of at least 1 kg/cm².
- Protective coating of 500 micron thick two component coal tar epoxy, applied with the help of minimum 3 coats, duly approved by Owner including supply of materials for all piping, valves, fittings, structural steel etc. for buried and installation inside pit.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- Corrosion coating of all field weld joint coating for buried piping of all sizes including supply of all materials.
- Filling and grading of areas around valve station for avoiding any local flooding of the area.

v) Restoration of Existing Facilities

All restoration works damaged during construction such as roads, pavements, utilities, cables, pipeline, sewers, streams, drains, ditches and any other facilities. All restoration work shall be carried out to original condition to entire satisfaction of Owner and concerned authorities.

All roads, footpaths (including roads and footpaths inside colonies) shall be restored to original condition, and to the satisfaction of the Engineer- in-charge and the concerned authority. The specification for restoration work shall be inline with the technical specification of various elements such as footpath, filling work, curb stores, drains, pavement, service road, main road and highways as per the respective concerned Government Authorities such as PWD local civic authority etc. In case of any dispute, the decision of Engineer-in-charge shall be final and binding on the Contractor.

In the event of Contractor's failure to adhere to these specifications and time schedule owner reserves the right to get these restoration work completed by approaching a third agency at Contractor's risk and cost.

Contractor shall obtain clearance certificate regarding satisfactory restoration from concerned Authority.

The concrete surfaces shall be restored and the concrete shall be placed with a minimum thickness of 50mm in footpaths and 100mm in roadways and driveways. To retard curing of the installed concrete, wet sack cloth is to be placed on the finished surface and kept damp for a period of 36 hours.

Where slabs and blocks are to be restored, the level of the compacted sub-base is to be adjusted according to the slab/ block thickness. The slabs or blocks should be laid on moist bedding material, which should be graded sand, mortar or mortar mix. The slab or blocks should be tapped into position to ensure they do not rock after laying.

The restored slabs or blocks should match the surrounding surface levels. Joint width should match the existing conditions, and be filled with a dry or wet mix of mortar.

Turf shall be replaced in highly developed grassed area. In lesser- developed grassed areas topsoil should be replaced during the restoration process.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



When permanent surface restorations cannot be completed immediately, the Contractor shall provide and maintain a suitable temporary running surface for vehicular traffic and pedestrians. The Contractor will be responsible for the maintenance of all restoration carried out, for the duration of the contract guarantee period.

The Contractor is to ensure the restoration work is properly supervised, and that the material used is suitable for the purpose and properly compacted. Where the required standards are not achieved the Contractor will be required to replace the defective restoration work.

Note that payment for pipe laying will only be authorised on satisfactory restoration, and where the sites has been cleared of all surplus materials etc.

Markers are to be installed as part of the reinstatement process. The types of markers area as specified in the specification attached.

All trees to be uprooted at the time of pipe-laying activities should be properly replanted to a nearby area as directed by the Engineer- in- charge so that there is minimum loss of plantation In some areas restoration will be carried out by respective statutory authority. In this case Contractor has to backfill and compact the trench and remove all surplus material as per the instructions of Engineer-in- charge.

17.0 Following points shall be taken care by the contractor before/ during execution works.

- i) Contractor shall be responsible for taking necessary precautions regarding traffic (installation of notice / warning boards).
- ii) Contractor shall be totally responsible for the occurrence of any accident during excavation of road and shall be liable for damages / expenses due to the same.
- iii) Concerned authority / Owner shall not be responsible for any loss / damage.
- iv) One copy of the permission shall be made available with contractor's responsible workman at the place where excavation is undertaken.
- v) While executing the subject work, excavation shall be done in consultation with the concerned authority engineer of that area.
- vi) Necessary safety measures shall be taken for the gas pipeline, since high tension lines and other services carriers are running alongwith in gas pipeline route in the area.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



18.0 Special note pertaining to Schedule of Rates (SOR).

- i) All SOR item shall be quoted by the bidder in the price part of the bid, other-wise bid will be rejected.
- ii) The quantities given above against individual items are indicative and shall not be considered to be binding. The quantities may be increased, decreased or deleted at site at the time of actual execution and as per discretion of Owner / Engineer-in-charge. The unit rate shall be operated to work out the final payment due to Contractor.
- iii) The payment will be made as per actual certified measurement at site.
- iv) The scope as mentioned in the SOR is of indicative nature only and shall include all activities as detailed in the relevant clauses of the respective Particular Job Specifications, Technical Specifications, Data Sheets & drawings, etc.
- v) The quantities mentioned in SOR for contractor supplied items shall be finalized and procured by contractor only after due approval of Engineer-in-charge. Contractor supplied any surplus item during reconciliation shall not be accepted / taken by the Owner.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



**20. LIST OF PREFERRED MAKE MANUFACTURER / SUPPLIERS
FOR MAJOR BOUGHT-OUT ITEMS (APPENDIX-I TO
PARTICULAR JOB SPECIFICATION FOR MAINLINE,
MECHANICAL & ASSOCIATED WORKS)**



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



APPENDIX-I

**List of Manufacturer / Supplier for Bought Out Items
(Mechanical & Fire Fighting Equipment)**

A) Mainline & Mechanical

i) PIPE CARBON STEEL TO INDIAN STANDARDS

1. A.S.T.PIPES PVT. LTD.(AST GROUP)
2. ADVANCE STEEL TUBE LTD.
3. APL APOLLO TUBES LTD.(ER.BIHAR TUBES LTD.
4. ASIAN MILLS PVT.LTD.
5. ASRANI TUBES LIMITED
6. DADU PIPES(P) LTD.
7. ESSAR STEEL LIMITED (ERHAZIRA PIPES MILL)
8. GAURANG PRODUCTS PVT LTD.(AST GROUP)
9. GOODLUCK STEEL TUBES LTD.
10. HI-TECH PIPES LIMITED
11. INDUS TUBE LIMITED
12. JINDAL INDUSTRIES LTD
13. JINDAL PIPES LTD.
14. JINDAL SAW LTD(KOSI WORKS)
15. JOTINDRA STEEL & TUBE LTD
16. LALIT PIPES AND PIPES LTD.
17. MAHARASHTRA SEAMLESS LTD.
18. MAN INDUSTRIES(INDIA) LTD.–PITHAMPUR
19. MAN INDUSTRIES(INDIA) LTD.ANJAR
20. MUKAT TANKS & VESSELS LTD.
21. NEZONE TUBES LIMITED
22. NORTH EAST ERNTUBES LIMITED
23. PRATIBHA INDUSTRIES LIMITED
24. PRATIBHA PIPES & STRUCTURAL LTD.
25. PSL LTD(CHENNAI)
26. PSL LTD(V1,V2&NC)
27. RAMA STEEL TUBES LTD.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

28. RATNAMANI METALS AND TUBES LTD.
29. RAVINDRA TUBES LIMITED
30. SAMSHI PIPE INDUSTRIES LIMITED
31. SURYA ROSHNI LTD.
32. SWASTIK PIPES LTD.
33. UTKARSH TUBES & PIPES LTD.(FORMERLY BMW)
34. ZENITH BIRLA(INDIA)LIMITED

ii) PIPE & TUBULARS TO A.P.I. STANDARDS

1. ARCELOR MITTAL TUB-
ULAR PRODUCT SRO-
MANSA, ROMANIA
2. BHEL(TRICHY), INDIA
3. DALMINE SPA(ENQUIRY TO TENARIS),UAE
4. EEW KOREA CO. LTD(GERMANY),KOREA
5. EEW KOREA CO. LTD.(KOREA), KOREA
6. EISENBAU KRAMER GMBH,GERMANY
7. HYUNDAI RBCO. LTD. SOUTH KOREA
8. ILVA LAMIERE E TUBI SRL(ENQ TO ILVA
SPA,ITALY)
9. INOX TECH. SPA, ITALY
10. ISMT LTD.AHMEDNDR, INDIA
11. ISMT LTD. BARAMATI, INDIA
12. JINDA LPIPES LTD., INDIA
13. JINDAL SAW LTD.(KOSI WORKS), INDIA
14. JINDAL SAW LTD.(NASHIK WORKS), INDIA
15. LALIT PIPES AND PIPES LTD., INDIA
16. MAHARASHTRA SEAMLESS LTD., INDIA
17. MAN INDUSTRIES (I) LTD.(PITHAMPUR),INDIA
18. MUKAT TANKS &VESSELS LTD.,INDIA
19. PRATIBHAINDUSTRIESLIMITED,INDIA
20. RATNAMANI METALS AND TUBES LTD.,INDIA
21. SIDERCA S.A.I.C (ENQUIRY TO TENARIS),UAE
22. SUMITOMO METAL IND.LTD.,INDIA
23. SURYA ROSHNI LTD.,INDIA
24. SWASTIK PIPES LTD,INDIA



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

25. TATA STEEL UK LIMITED(FORMERLY C702)
26. TUBOS DE ACERO DE MEXICO
SA(ENQ.TENARIS),UAE
27. TUBOS REUNIDOS SA SPAIN
28. UMRAN STEEL PIPE INC(TURKEY),TURKEY
29. VALCOVNY TRUB CHOMUTOV, CZECH REPUB-
LIC
30. VALLOUREC AND MANNESMANN TUBES,
FRANCE
31. WELSPUN CORP LIMITED (DAHEJ), INDIA

iii) PIPE / TUBE CS (SEAMLESS) TO ASTM STDS

1. ARCELOR MITTAL TUBULAR PRODUCT SROMANSA,
ROMANIA
2. BHEL (TRICHY),INDIA
3. CHANGSHU SEAMLESS STEEL TUBE CO.
LTD., CHINA
4. DALMINE SPA (ENQUIRY TO TENARIS, UAE)
5. HEAVY METALS & TUBES LIMITED
(MEHSANA), INDIA
6. ISMT LTD. AHMEDNGR, INDIA
7. ISMT LTD.BARAMATI INDIA
8. JFE STEEL CORPORATION, UAE
9. JINDAL SAW LTD(NASHIK WORKS) INDIA
10. KLT AUTOMOTIVE AND TUBULAR PROD-
UCTS LTD. INDIA
11. MAHALAXMI SEAMLESS LIMITED, INDIA
12. MAHARASHTRA SEAMLESS LTD, INDIA
13. PRODUCTS TUBULAR ESS. A. U, SPAIN
14. RATNADEEP METAL TUBES LTD., INDIA
15. STAINLEES TUBES PVT LTD., INDIA
16. SUMITOMO METAL IND. LTD., INDIA
17. TUBOS REUNIDOS SA SPAIN
18. VALCOVNY TRUB CHOMUTOV, CZECH REPUBLIC
19. VALLOUREC AND MANNESMANN TUBES FRANCE



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



**20. YANGZHOU CHENGDE STEEL PIPE CO. LTD DU-
BAI(UAE)**

iv) PIPE CARBON STEEL (WELDED) TO ASTM STDS

1. EEW KOREA CO. LTD. (GERMANY), KOREA
2. EEW KOREA CO. LTD.(KOREA) , KOREA
3. EISENBAU KRAMER GMBH, GERMANY
4. HYUNDAI RBCO.LTD., SOUTH KOREA
5. INOX TECH. SPA, ITALY
6. JINDAL SAW LTD(KOSI WORKS), INDIA
7. LALIT PIPES AND PIPES LTD., INDIA
8. MAN INDUSTRIES (I)L TD.(PITHAMPUR), INDIA
9. MAN INDUSTRIES(INDIA) LTD. ANJAR, INDIA
10. MUKAT TANKS & VESSELS LTD., INDIA
11. RATNAMANI METALS AND TUBES LTD., INDIA
12. SUMITOMO METAL INDIA LTD., INDIA
13. TATA STEEL UK LIMITED

v) Valve

a) Globe Valves

- 1) M/s Weir BDK Valves (A unit of Weir India Pvt.Ltd.)
- 2) M/s Datre Corpn (Calcutta)
- 3) M/s KSB Pumps Ltd., Coimbatore, India
- 4) M/s L&T Audco
- 5) M/s Neco Schuber &Salzer Ltd. (New Delhi)
- 6) M/s Niton Valve India Pvt. Ltd.,I ndia
- 7) M/s Ornate Valves (Mumbai)
- 8) M/s Panchavati Valves &Flages (P)Ltd.,I ndia
- 9) AV Valves Ltd., India
- 10) BHEL (Trichy), India
- 11) Econo Valves Pvt Ltd, India
- 12) Fouress Engg (I) Ltd (Aurangabad), India
- 13) Leader Valves Ltd, India



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

- 14) Oswal Industries Ltd,India
- 15) Petrochemical Engineering Enterprises, India (Fouress Group)
- 16) Sakhi Engineers Pvt Ltd.,India
- 17) Shalimar Valves Pvt Ltd.,India
- 18) Steel Strong Valves India Pvt Ltd, India
- 19) Petro Valves Pvt. Limited, Ahmedabad
- 20) Fluid Line Valves Co.(P)Ltd., India
- 21) MICON Engineers (Hubli)(P) Ltd., India

b) Check Valves

1. M/s Advance Valves Pvt. Ltd., Noida
2. M/s Aksons & Mechanical Enterprises, Mumbai
3. M/s Larsen & Toubro Limited (M/s Audco India Limited, Chennai)
4. M/s AV Valves Ltd., India
5. M/s Weir BDK Valves (A unit of Weir India Pvt. Ltd.)
6. M/s BHEL, Trichy
7. M/s Datre Coroportion Limited, Calcutta
8. M/s Leader Valves Ltd., Jalandhar
9. M/s Neco Schubert & Salzer Ltd., New Delhi
10. M/s Niton Valves Industries (P) Ltd., Mumbai
11. M/s Precision Engg. Co., Mumbai
12. Econo Valves Pvt Ltd, India
13. Fouress Engg (I) Ltd (Aurangabad)
14. KSB Pumps Ltd (Coimbatore), India
15. NSSL Ltd. (Neco Schubert & Salzer Ltd)
16. Oswal Industries Ltd, India
17. Panchvati Valves & Flanges Pvt Ltd, India
18. Petrochemical Engineering Enterprises, India (Fouress Group)
19. Sakhi Engineers Pvt Ltd
20. Shalimar Valves Pvt Ltd
21. Steel Strong Valves India Pvt Ltd, India
22. Fluid Line Valves Co.(P)Ltd., India



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



23. MICON Engineers (Hubli) (P) Ltd., India

c) Plug Valves

1. M/s Breda Energia Sesto Industria Spa, Italy
2. M/s Fisher Sanmar Ltd., Chennai
3. M/s Larsen & Toubro Ltd., (Audco) New Delhi
4. M/s Nordstrom Valves, USA
5. M/s Serck Audco Valves, UK
6. M/s Sumitomo Corporation India Pvt. Ltd., New Delhi
7. M/s Z Corporation, Korea
8. M/s Hawa Valves (India) Pvt. Ltd., Mumbai
9. M/s Steel Strong Valves India Pvt. Ltd., Navi Mumbai
10. M/s Econo Valves Pvt. Ltd., India (WSSL Ltd. Group Co.)
11. M/s Flow-Serve PTE (Mfr. SERCK), India
12. ZED valves Company Private Limited, Ahmedabad

a) Ball Valves

1. M/s Hawa Valves (India) Pvt. Ltd, Navi Mumbai
2. M/s Larsen & Toubro (Audco), India
3. M/s Oswal Industries Ltd., India
4. M/s Virgo Engineers Ltd., Delhi
5. M/s Boteli Valve Group Co. Ltd., China
6. M/s Cameron Italys.r.l., Italy
7. M/s Dafram S.P.A., Italy
8. M/s Fangyuan Valve Group Co. Ltd., China
9. M/s Franz Schuck GmbH, Germany
10. Kita Mura Valve Manufacturing Co. Ltd., India
11. Petrol Valve S.R. Italy
12. Piploviesse S.P.A. Italy
13. Tormene Gas Technology S.P.A. Valvetalia Group, Italy
14. Valbart S.R.L. Italy
15. KMC Corporation, South Korea



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

16. MSA a.s. CzeekRepublic
17. OMS Aleri, Italy
18. PCC Valvess.r.l.Italy
19. Perar s.p.a.(Engineering. ToTRPsrl),Italy
20. Italys.r.l., Italy
21. MIR Valves,Malaysia
22. ZED valves Company Private Limited, Ahmedabad

vi) Flow Tee

- 1) M/s Coprosider SPA, Italy
- 2) M/s GEA Energy System India Limited,Chennai
- 3) M/s Multitex Filtration
- 4) M/s Pipeline Engineering,UK
- 5) M/s Scomark Engg. Limited (U.K.)
- 6) M/s Skeltonhall Limited,England(U.K.)
- 7) M/s Technospecial SPA, Italy
- 8) M/s Tectubi SPA,Italy
- 9) M/s RMA Germany

vii) Split Tee

- 1) M/s Ipsco, Canada
- 2) M/s TD Willamsons,USA

viii) Flanges

1. M/s Aditya ForgeLtd.,Vadodara
2. M/s Amforge Industries Ltd.,Mumbai
3. M/s CD Engineering Co.,Ghaziabad
4. M/s Echjay Forgings Pvt.Ltd. (Bombay),Mumbai
5. M/s Echjay Industries Ltd., Rajkot
6. M/s Forge & ForgePvt. Ltd.,Rajkot



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



7. M/s Golden Iron & Steel Works, New Delhi
8. M/s JK Forgings, New Delhi
9. M/s Metal Forgings Pvt. Ltd., Mumbai
10. M/s Perfect Marketings Pvt. Ltd., New Delhi
11. M/s SkyForge, Faridabad
12. M/s S&G, Faridabad
13. Chaudhry Hammer Works Ltd, India
14. JAV Forgings (P) Ltd, India
15. Kunj Forgings Pvt Ltd, India
16. MS Fittings Mfg. Co. Pvt. Ltd.
17. R.N. Gupta & Co. Ltd, India
18. R.P. Engineering Pvt Ltd, India
19. Sanghvi Forgings & Engineering Ltd
20. Shri Ganesh Forgings Ltd., India
21. Uma Shankar Khandelwal & Co., India
22. Sawan Engineers, Baroda
23. Stewarts & Lloyds of India Ltd., Kolkata
24. Engineering Services Enterprises
25. Abasi Engineering Works, India
26. Anandmayee Forgings Pvt Ltd, India
27. CD Industries., India
28. Fivebros Forgings Pvt Ltd., India
29. Good Luck Engineering Co., India
30. Korea Flange, South Korea
31. Lal Metal Forge Ltd, India
32. Melesi Officine
33. Amlrojie Melesi & C. srl. Italy
34. Nicola Galperti & Figlio S.P.A. India
35. Paramount Forge, India
36. Pradeep Metal Limited, India
37. Punjab Steel Works (the), India
38. R.D. Forge, India
39. Shah Industrial & Comml. Corporation, India
40. Ulma Forja S. Coop.
41. Vivial Forge Pvt. Ltd., Vadodara
42. N J Engineers



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



ix) Fittings

1. M/s Commercial Supplying Agency, Mumbai
2. M/s Dee Development Engineers Ltd.
3. M/s Eby Industries, Mumbai
4. M/s Flash Forge Pvt.Ltd., Vishakhapatnam
5. M/s Gujarat Infra Pipes Pvt.Ltd., Vadodara
6. M/s M.S. Fittings Mfg.Co. Pvt.Ltd., Kolkata
7. M/s Stewarts & Lloyds of India Ltd., Kolkata
8. M/s Teekay Tubes Pvt. Ltd., Mumbai
9. M/s PipeFit, Baroda
10. M/s Sky Forge, Faridabad
11. M/s S&G, Faridabad
12. M/s Sawan Engineers, Baroda
13. Eby Fasteners, India
14. R.N. Gupta & Co.Ltd, India
15. Exten Engg PvtLtd
16. Sivananda Pipe & Fittings Ltd
17. Chero Piping SPA, Italy
18. CSA Fittings, India
19. EBY Fasteners, India
20. Fittnox SRL, Italy
21. Keonsae High Pressure Co. Ltd., South Korea
22. Munro & Miller Fittings Ltd., U.K.
23. TK Corporation, South Korea
24. TubeTurn (India) Pvt Ltd., India
25. Topaz Piping Industries, India
26. Technoforge SPA, Italy
27. P.K. Tubes & Fittings Pvt. Ltd., India
28. Vivial Forge Pvt. Ltd., Vadodara
29. N J Engineers

x) Gaskets



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

1. IGP Engineers (P)Ltd.,Madras
2. Madras Industrial Products, Madras
3. Dikson & Company,Bombay
4. Banco Products (P) Ltd.,Vadodara
5. Goodrich Gaskets Pvt Ltd
6. Starflex Sealing India Pvt Ltd, India
7. Teekay Meta Flex Pvt Ltd
8. UNIKLINGER Ltd
9. HEM Engg. Corp.
10. Unique Industrial Packing Pvt.Ltd.

xi) Fasteners

1. Nireka Engg.Co.(P)Ltd., Calcutta
2. PrecisionTaps&Dies,Bombay
3. AEP Company,Vithal Udyoug Nagar
4. FixFitFasteners, Calcutta
5. Precision Engg. Industries, Baroda
6. Echjay Forgings Pvt. Ltd., Bombay
7. Capital Industries,Bombay
8. Boltmaster India PvtLtd,India
9. Deepak Fasteners Limited, India
10. Fasteners &Allied Products PvtLtd,India
11. Hardwin Fasteners PvtLtd, India
12. J.J. Industries, India
13. Multi Fasteners Pvt Ltd, India
14. Nexo Industries,India
15. Pacific Forging & Fasteners PvtLtd,India
16. Pioneer Nuts & Bolts Pvt Ltd,India
17. Precision AutoEngineers, India
18. President Engineering Works, India
19. Sandeep Engineering Works, India
20. Syndicate Engineering Industries, India
21. BEA SRL, Italy



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



22. Korea Parts & Fasteners(KPF), South Korea
23. Kundan Industries Ltd.,India
24. Mega Engineering Pvt.Ltd., India
25. OME Metallurgica ERBESES.R.L, Italy
26. Pankaj International, India
27. Udehra Fasters Ltd.,India

xii) Welding Electrodes

1. For Mainline –Lincoln /Bohler make
2. For Terminal –For rootpass-Lincoln / Bohler Make
For otherpasses –Lincoln,
D&H or equivalent make

xiii) Fire Fighting Equipments

a) Fire Extinguishers

1. Avon Services (Production&Agencies) Pvt.Ltd.,Bombay
2. Kooverji Devshi&Co., Bombay
3. Zenith Fire Services, Bombay
4. Safex Fire Services, Bombay
5. Reliable (FireProtection) India Ltd.,Bombay
6. Brij Basi Hi
7. tech Udyog
8. Bharat Engg Works, India
9. Gunnebo India Ltd
10. Nitin Fire Protection Industries Ltd, India
11. Supremex Equipments, India
12. Vimal Fire Controls PvtLtd., India

b) Fire Hydrants, Monitors, Deluge Valve, Nozzles

1. Zenith



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

2. Minimax
3. Newage
4. HDFire
5. VijayFire
6. Asco Strumech PvtLtd, India
7. Brij Basi Hi
8. tech Udyog
9. Gunnebo India Ltd
10. Nitin FireProtectionPvtLtd
11. Shah Bhogilal Jethamal&Brothers
12. Venus Pumps&Engineering Works

c) **RRL Hose**

1. Jayshree
2. Newage

d) **Hoses**

1. Ashit Sales Corporation, Bombay
2. Royal India Corporation, Bombay
3. Gayatri Industrial Corporation
4. Simplex Rubber Products Ltd., Ahmedabad
5. Zaverchand Marketing Pvt. Ltd., Baroda
6. Presidency Rubber Mill, Calcutta
7. The Cosmopolite, Calcutta
8. SimplexRubber Products, Thane

e) **Hose Delivery**

1. Chhatarya Rubber & Chemical Industries,
2. Nitin Fire Protection Industries Ltd, India

f) **Fire Hose Accessories**

1. Asco StrumechPvtLtd
2. Brij Basi Hi-tech Udyog
3. Gunnebo India Ltd



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

4. Shah Bhogilal Jethamal & Brothers
5. Vimal Fire Controls PvtLtd., India

xiv) **Heat Shrinkable Sleeves**

1. Covalence Raychem (Berry Plastics Corporation)
2. Canussa – CPS
3. Shri Narayan Impac India LLP

xv) **Cold Applied Tapes**

1. Denso GmBH
2. Polyken (BerryPlastics Corporation)

xvi) **PUR Coating**

1. Powercrete (BerryPlastics Corporation)

xvii) **Casing End Closure**

1. Raci, Italy
2. Raychem RPG Limited

xviii) **Rock shield**

1. Raychem RPG Limited

xix) **Warning mat**

1. Sparco Multiplast Pvt. Ltd., Ahmedabad
2. M/s Raychem RPG Limited
3. Singhal Industries Private Limited

xx) **High Build Epoxy Coating**

1. Berry Plastics –Powercrete
2. Specialty Polymer Canada



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

3. Denso Protal, Canada

xxi) Casing Insulators

1. Raci, Italy
2. Raychem RPG Limited
3. Veekay Vikram

xxii) NDT AGENCY

1. NDT Services, Ahmedabad
2. GEECY Industrial Services Pvt.Ltd., Mumbai
3. Corrosion Control Services, Mumbai
4. Perfect Metal Testing & Inspection Agency, Calcutta
5. Inter Ocean Shipping Co., New Delhi
6. RTD, Mumbai
7. Sievert, Mumbai
8. X-Tech, Vizag
9. Industrial X Ray and Allied Radiographers (I) Pvt. Ltd.
10. Inspection Technology, Mumbai

xxiii) LONG RADIUS BENDS

- i) M/s BHEL, Trichy, Tamilnadu
- ii) M/s Jindal SAW Limited, (Koshi Works), U.P.
- iii) M/s PSL Limited, Gandhidham, Gujarat
- iv) M/s Welspun, Gujarat
- v) M/s Fabricon, Belgium

xxiv) INSULATING JOINTS (IJ)

- i) M/s IGP Engineers, Chennai
- ii) M/s Basco (UK)
- iii) M/s Bramsthal Postfach, Germany
- iv) M/s Nuovagiungas, Italy
- v) M/s Phoceene DeMetallurgic, France
- vi) M/s Piping Technology, France (Erstwhile M/s Lall Storm)
- vii) M/s Prochind SPA, Italy



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

- viii) M/s Zunt Italiana
- ix) M/s Meteor Pvt.Ltd.
- x) M/s Alpha Engineering,italy
- xi) M/s Igawara Industrial Services and TradingPvt.Ltd.
- xii) M/s Sanghai Fiorentini Equipment
- xiii) M/s RMA Maschinen
- xiv) M/s Franz Schuk
- xv) M/s Advance Electronics Systems,Vadodara
- xvi) M/s Veekay Vikram, Vadodara
- xvii) M/s Langfang VBA Mechanical Co. Ltd., China

TPI AGENCY

Only enlisted, approved, and valid TPI agencies as per PNGRB T4S guidelines for CGD shall be considered.

Note:

1) For procuring the above listed bought out item(s) from the vendor/ supplier, whose name is not appearing in the above preferred make list, bidders can supply those item(s) from such vendors/suppliers who have earlier supplied same item(s) for the intended services and the offered item(s) is in their regular manufacturing/ supply range and the same may be accepted subject to following: -

a) The Vendor/ Supplier of bought out item(s) is a Manufacturer/ Supplier of the said item(s) for intended services and the same are in their regular manufacturing/ supply range.

b) The vendor/supplier should not be in the Holiday list of Client/ BANDR/ Other PSU.

c) For items to be purchased with measurement unit either in length or in weight: - Should have supplied for intended services at least 15% of SOR quantity of same size, thickness, schedule, pressure & temperature ratings, SDR, etc. or higher (as applicable) as per technical details mentioned in SOR & Tender specification and the same should have been supplied within last seven (07) year from the date of approval request made by the contractor.

d) For items to be purchased with measurement unit in number: - Should have supplied for intended services at least 15% of SOR quantity of same size, thickness, schedule, pressure & temperature ratings, SDR, etc. or higher (as applicable) as per technical details mentioned in SOR & Tender specification and the same should have been supplied within last seven (07) year from the date of approval request made by the contractor.

2) For procuring any other item(s) {i.e. not listed above} for which the vendor/ supplier name is not appearing in above preferred make list, bidders can supply those item(s) from such vendors/suppliers



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



who have earlier supplied same item(s) for the intended services and the offered item(s) is in their regular manufacturing/ supply range and the same may be accepted subject to following: -

- a) The Vendor/ Supplier of bought out item(s) is a Manufacturer/ Supplier of said item(s) for intended services and the same are in their regular manufacturing/ supply range.
- b) The vendor/supplier should not be in the Holiday list of Client/ BANDR/ Other PSU.
- c) For items to be purchased with measurement unit either in length or in weight: - Should have supplied for intended services at least 15% of SOR quantity of same size, thick-ness, schedule, pressure & temperature ratings, SDR, etc. or higher (as applicable) as per technical details mentioned in SOR & Tender specification and the same should have been supplied within last seven (07) year from the date of approval request made by the contractor.
- d) For items to be purchased with measurement unit in number: - Should have supplied for intended services at least One (01) number of same size, thickness, schedule, pressure & temperature ratings, SDR, etc. or higher (as applicable) as per technical details mentioned in SOR & Tender specification and the same should have been supplied with-in last seven (07) year from the date of approval request made by the contractor.

Remarks for Note 1 & 2:

- i. To meet the criterion mentioned above, the successful bidder/ contractor is required to submit documentary evidences such as copy of FOA/ Purchase Order (PO)/ sub-purchase order and their supply record like Inspection certificates/report, Inspection re-lease note, Tax paid invoice, performance certificates (if available), etc. from which it can be established that vendor have executed supplied the order. These documents shall require to be submitted by them within 30days from date of Placement of Order for approval to CLIENT / PMC/ Consultant.
- ii. The details of vendors indicated in this list are based on the information available with PMC/CGD projects under PSU's. The contractor shall verify the capabilities of each vendor to produce the required quantity and ensure that the items are within their regular manufacturing range. PMC does not take any guarantee or responsibility for the performance of the vendor. It is the contractor's responsibility to verify the correct status of the vendor and their quality control before proposing the vendor's name to the CLI-ENT/PMC for approval. It is also the responsibility of the contractor to expedite the material in time.
- iii. For those vendors whose names do not appear in the above-listed items but are registered with PMC/CGD projects under PSU's, they can also be considered for the supply of the items. The contractor has to propose such vendors' names along with their valid registration letter issued by authority, or the vendor has to submit the PTR with all documents showing they have supplied materials for CGD in gas service, gas pipeline, hydrocarbon, cross-country pipeline, etc., for any PSU/government sector within the last 7 years.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

B) Architectural

List of Approved Manufacturers of Architectural /Building Products

	Item/NameofManufacturer	Place	BrandName
1.0	Floor Finishing		
1.1	Terrazzo Tiles		
A	Nitco	Delhi	NITCO
B	Hindustan Tiles	Delhi	HindustanTiles
1.2	Ceramic Tiles		
A	Regency Ceramics Ltd.	Hyderabad	Regency
B	Kajaria Ceramics Ltd.	Delhi	Kajaria
C	Orient Ceramics & Industies Ltd.	Delhi	Orient
D	Bell Ceramics	Vadodara	BELL
E	SPL Ltd.	Delhi	Somany
F	H&R Johnson (I) Ltd.	Mumbai	Johnson
G	Spartek Ceramics	Chennai	Spartek
H	Murudeshwar Ceramics Ltd.	Hubli	Naveen
1.3	Vitrified Tiles		
A	Regency Ceramics Ltd.	Hyderabad	Regency
B	Orient Ceramics & Industies Ltd.	Delhi	Orient
C	SPL Ltd.	Delhi	Somany
D	H&R Johnson (I) Ltd.	Mumbai	Johnson
E	Murudeshwar Ceramics Ltd.	Chennai	Spartek
F	Kajaria Ceramics Ltd.	Hubli	
1.4	Acid Resistant Tiles		
A	Regency Ceramics Ltd.	Hyderabad	Regency
B	H&R Johnson (I) Ltd.	Mumbai	Endura
1.5	PVC Tiles/ Rolls		
A	All Manufacturers Listed (Having Operativeand Valid License) by HISAIBIS Web Site http://www.bis.org.in		
B	Armstrong WorldInsutries	Mumbai	Excelln
C	Bhor Industries	Delhi	MARBLFX
D	Shyam Vinyl	Chennai	ShyamVinyles
1.6	PVC Tiles/ Rools/ Anti-Static)		



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

A	Armstrong World Insutries	Mumbai	SolidLG1
B	Premier Poly Film Ltd.	Delhi	ANSTAT
1.7	EpoxyCoating		
	Fosroc Chemical (I) Pvt. Ltd.	Bangalore	NitofloorSL2000/1000
B	Sika	Kolkata	SikaFloor
C	Buildtech Products (I) Pvt. Ltd.	Delhi	Buildpoxy-SL
D	Anupam Industries	Kolkata	-
E	STP	Delhi	
1.8	Floor Hardener		
A	Cico Technologies Limited	Delhi	CICO
B	Samcock Chemicals (P) Ltd.	Ahmedabad	SamhardSTD
C	PCCCSS Procfssorand Traders	Kolkata	Doronite

Sl. No.	Item/NameofManufacturer	Place	BrandName
1.9	Designer Paver Tiles/ Interlocking Tiles ISI Marked/ Grass-Jointed Only)		
A	Pavit, Ultra, Hindustan, Eurocon, Vyara, National Tiles, Gem, Unistone, Konkrete		
B	Rammica Indusries	Delhi	Rammica
C	The Bombay Burmah Trading Corpn.	Delhi	Formica
2.0	Wood Work		
2.1	Block Board/ Flush Door		
A	All Manufacturers Listed (Having Operative and Valid License) by HISAIBIS Web Site http://www.bis.org.in		
2.1	Plywood		
A	All Manufacturers Listed (Having Operative and Valid License) by HISAIBIS Web Site http://www.bis.org.in		
2.2	Laminates		
A	All Manufacturers Listed (Having Operative and Valid License) by HISAIBIS Web Site http://www.bis.org.in		
2.3	MDF Boards		
A	Nuchem Limited	Faridabad	NULAM/NVWUD
B	Mangalam Timber Products Limited	Delhi	Nuwud



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

C	Western Bio Systems Ltd.	PUNF	Ecoboard
D	Bajaj Eco-Tech Products Limited	Noida	Bajaj
2.4	Particle Board (Plain/ Veneered/ Pre-Laminated)		
A	All Manufactureres Listed by BIS Under is		
	3097(Having Operative and Valid License) at BIS Web Site http://www.bis.org.in/		
2.5	Pressed Steel Door Frames/ Cup board and Window Frames (Fabricators)		
	M/s SAIL		
	M/s TATA		
3.0	Steel/ Aluminium/Fire Rated Doors, Windows, Ventilators		
3.1	Pressed Steel Doors/ Windows		
A	SKS Steel Ind.	Delhi	-
B	Dhiman Steel	Delhi	-
C	Supper Steel Windows Co.	Delhi	-
D	RDG Engineering	Mumbai	-
E	Anand Industries	Delhi	-
F	Raymus Engineering	Gurgaon	-
G	M/s Loyal Safe Works Maya-pur	NewDelhi	
H	M/s Multiwyn Industrial Corpn. Clacutta	Kolkata	
I	M/s Metal Window Corpn.	NewDelhi	
J	M/s Chhabra Steel Udyog	260 Sadar Bazar, Meerut Cantt	
K	M/s Delite Safe Works,	Rani Jhansi Road, New Delhi	
L	M/s Ishwar Industries,	175/ABomay Bazar, Meerut Cantt	
M	M/s Chandni Industries	J-142, Patelnagar1st,	



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

Sl. No.	Item/Name of Manufacturer	Place	BrandName
		Ghaziabad	
3.2 A	Aluminium/ Doors/ Windows Sections		
A	Jindal Aluminium Limited	Bangalore	
B	Hindalco	Mumbai	
3.2 B	Alluminiuml Door/ Windows/ Glazing		
B	Fabricator and Anodized		
A	M/s Alumilite Pvt. Ltd., C. AHLCON	NewDelhi	
B	M/s Ajit India Pvt. Ltd.	Mumbai	
3.3	Fire Proof Doors		
A	Navair International	Delhi	Viper
B	RDG Engineering	Bombay	Radiant
3.4	Steel Windows, Ventilators (asper IS-1038 of 1983) & frames pressed steel dorr/ window)		
A	M/s Multiwyn Industrial Corpn Calcutta	Kolkata	
B	M/s Metal Window Corp N/ Delhi	New Delhi	
C	M/s Govind Enterprises, Delhi	Delhi	
D	M/s Chhabra Steel Udyog 260, Sadar Bazar, Meerut Cantt, Agent Steel MFG Pvt. Ltd. Ahmedabad, Godrej.		
E	M/s Chandni Industries, J-142, Patel Nagar Ist, Ghaziabad	Ghaziabad	
3.5	Rolling Shutters (ISI marked)		
A	Swastic	Mumbai	
B	Hercules	Bangalore	
C	Shubdwar		



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

D	M/s Bharat Rolling Shutters Industries Agra Rama Rolling Shutter Works		
E	Gandhi Entrance Automations Private Limited		
4	Door/ Windows Fittings		
4.1	Mortice Locks with Handles		
A	Godrej & Boyce	Mumbai	Godrej
B	Everite Agencies (P) Ltd.	Delhi	Everite
C	Golden Industries	Delhi	Golden
4.2	Hydraulic Door Closer (Overhead/ Floor Mounted)		
A	All Manufactureres Listed by BIS Under is 3087 (Having Operative and Valid License) at BIS Web Site http://www.bis.org.in/		
B	Door king Industries	Delhi	Doorking
4.3	Misc. Door Fittingse. g. Hingee, Tower Bots, Latches, Stoppers etc.		
A	All Manufacturers Listed by BI Sunder IS:3087 (Having operative and valid license) at BISWeb Site http://ww.bis.org.in/		
B	EveriteAgencies (P) Ltd.	Delhi	Everite
C	EBCO Industries	Delhi	EBCO
D	ECIE (P) Ltd.	Mumbai	ECIE
D	Hardwyn Traders	Mumbai	Hardwyn

Sl. No.	Item/Name of Manufacturer	Place	BrandName
	Aluminium/Doors/WindowsFittings		
	M/s Wlite Enterprises C/6 Shalimar Hardware 133, Jarg Mahal, Dhobitalao Mumbai 400002		



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

	M/s Mohan Metal Industries 178/2-A, Bhole Nath Nagar, Shahadara, Delhi 110032		
	Mepro, Argent New Delhi, Classic, New Delhi		
	Argent New Delhi,		
	Golden Industries Pvt. Ltd.	Delhi	
4.4	Automatic Glass Door		
A	Ditec (Gandhi)	Mumbai	
4.5	Aluminium Grill		
A	Alu Grill, Arihant Aluminium Corporation, Decogrille	Bangalore	Decogrille
4.6	Builders Hardware		
A	M/s Golden Industries Pvt. Ltd. Everite, Solo	Delhi	
5.0	Roof Treatment (Water-Proofing)		
5.1	P.U. Based Water proofing (One Component)		
A	Llyod Insulations (I) Ltd.	Delhi	IsothaneEma
B	Cico Technologies Ltd.	Delhi	Corchem2061
C	Fosroc Chemical (I) Pvt. Ltd.	Bangalore	Nitoproof
5.2	P.U. Based Water proofing (Two Component)		
A	Shivalik Agro Poly Products Pvt. Ltd.	Delhi	Shivabond903
B	Industrial Product Manufacturing Company	Pune	EZECOAT
C	Fosroc Chemical (I) Pvt. Ltd.	Bangalore	Brushbond
D	Sika	Kolkata	Sikalastic
E	Sip Industries Limited	Chennai	Sipguard
5.3	Approved Membrane		
A	Llyod Insulations (I) Ltd.	Delhi	LloyedPlastolan
B	Buildtech Products Pvt. (I) Ltd.	Delhi	BuilDwrapP
C	Cico Technologies Ltd.	Delhi	CICOShield
D	Fosroc Chemical (I) Pvt. Ltd.	Bangalore	Proofex
F	Sika	Kolkata	SikaWPSHIELD
G	STP Ltd	Kolkata	SuperThermolay
H	IWL India Ltd.	Chennai	Hyperplas
I	Pure Leathers Pvt. Ltd.	Delhi	Roofseai



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

6.0	Painting Works		
	Plastic/Acrylic Emulsion Paint	Jodhpur	
6.1	(Internal and External, Distemper/ Acrylic Distemper)		
A	ICI Paints/ ICI India Ltd.	Kolkata	
B	Berger Paints	Kolkata	LewisBerger
C	Asian Paints	Mumbai	AsianPaint
D	Shalimar Paints	Mumbai	ColorSpace
E	Nerolac Paints	Mumbai	
F	Acropaints/ Imited	Delhi	
G	Godavari Paints Pvt. Ltd.	Mumbai	
H	NE Paint Udyog	Sivasagar (Assam)	

Sl. No.	Item/ Name of Manufacturer	Place	BrandName
6.2	Synthetic Enamel Paint (for Building Works)		
A	ICI Paints/ ICI India Ltd.	Kolkata	
B	Berger Paints	Kolkata	
C	Asian Paints	Mumbai	
D	Shalimar Paints	Mumbai	
E	Nerolac Paints	Mumbai	
F	Godavari Paints Pvt. Ltd.	Mumbai	
G	NE Paint Udyog	Sivasagar (Assam)	
6.3	WaterproofCementPaint		
A	Killick Nixon Ltd.	Mumbai	Snowcem
B	Godavari Paints Pvt. Ltd.	Mumbai	Superemcem
C	Acropaints/ Imited	Delhi	Acrocfm
D	Snow White Industrial Corpn	Chennai	Superclm
E	Rajdoot Paints	Delhi	Xlracem78SuperCe mentPaint
6.4	Decorative Textured Coating		
A	Luxture Surface Coatings Pvt. Ltd.	Ajmer	Luxture
B	Bakelite Hylam Ltd.	Secundrabad	Heritage
C	NCL Alltek and Seccolor Ltd.	Hyderabad	Alltek
D	Acropaints Ltd.	Delhi	Acrotextures



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

E	Unitile	Delhi	Unitile
F	Spectrum Paint	Delhi	Spectrum
6.5	Polishing (for Wood work)		
A	Asian Paints	Mumbai	AsianPaint
B	Shalimar Paints	Mumbai	Mellac
7.0	Roofing Sheets & Accessories		
7.1	Precoated Profiled G.I./ Galvalume/ Zinalume Sheets		
A	Llyod Insulations (I) Ltd.	Delhi	Lloydeck
B	Interarch Building Products (P) Ltd.	Noida	Tracdek
C	Multi Colour Steel (I) Pvt. Ltd.	Delhi	Multi.....
D	Hardcastle & Waud Mfg. Co. Ltd.	Mumbai	FeroColour
E	Japan Metal Building Systems Pvt. Ltd.	Bangalore	JMBS
F	TATA Bluescope Steel Limited	Pune	TrimdfCK
G	Era Building Systems Limited	Delhi	ERA
H	Shree Precoated Steels Limited	Mumbai	Metacolour
7.2	C.G.I. Sheet		
A	ISPAT Industries Ltd.	Delhi	Everest
B	Steel Authority of India Ltd.	-	SAIL
C	TATA Steel	-	TISCO
7.3	Aluminium Sheet		
A	Jindal Aluminium Limited	Bangalore	
B	Hindalco	Mumbai	
7.4	Fiber Glass Sheet & Panels		
A	Simba Frp (P) Ltd.	Delhi	
8.0	Sanitary, Plumbing Fittings & Fixtures		
8.1	Sanitary Fittings		

Sl. No.	Item/Name of Manufacturer	Place	Brand Name
A	All Manufacturers Listed by BIS under IS:3087 (Having operative and valid license) at BIS Web Site http://www.bis.org.in/		
8.2	Plumbing Fittings and Fixtures		



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

A	Jupiter Aqua Lines Ltd.	Mohali	Jupitor
B	Othello Faucets Pvt. Ltd.	Delhi	Mayur
C	Orient Ceramics	Delhi	Orient
D	Gem International	Faridabad	Gem
E	Parkash Brassware Industres	Delhi	Parko
F	Jaquar & Company Ltd.	Delhi	Jaquar
G	Plastocraft Sanitary India Pvt. Ltd./ HSW	Delhi	Kingston
8.2H	Cast Iron Pipes and Fittings Hinddustan Engineerng Products Compa- ny	Calcutta	
8.2I	RCC Pipes		
A	Indian Hume Pipe Company	Delhi/ Al- lahabad/ Chandi- garh/ Lucknow	
B	Hindustan Pressure Pipes	Kolhapur	
C	Dhere Concrete Products	Pune	
8.2J	GI Pipes		
A	Indian Tube Company	Culcutta	
B	Kalinga Tubes Limited	RanchiGujarat	
C	Steel Tube		
D	Zenith Tube Co.	Kolaba	
E	Bharat Steel Tube	NewDelhi	
F	Jindal		
G	Shivmoni Steel Tubes Limited	Bangalore	
H	Sekhar Iron Works	Calcutta	
I	Jain Tubes,	Ghaziabad	
J	Khandelwal Tubes	Nagpur	
8.2K	G.I.F ittings		
A	International Pipe Works	Calcutta	
B	R.M. Engineering Works	Jalandhar	
C	Bombay Metal Company	Bombay	
D	Tarapada Das & Sons	Howrah	
E	Annapurna Metal Works	Calcutta	



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

8.2L	Gun Metal Valves and Copper Alloy Valve		
A	Leader Engineering Wroks	Jalandhar	
B	Neta Engineering Works	Jalandhar	
C	Lakshmi Metal Works	Jalandhar	
D	Bombay Metal & Alloys Company	Bombay	
E	Luster Sanitary Fittings	Jalandhar	
F	Annapurna Metal Works	Calcutta	
8.2 M	Sluice Valves, Check Valves etc.		
A	Shiva Durgalron Works,	Howrah	
B	Leader Engineering Wroks	Jalandhar	
C	Kirloskar Bros Limited	Pun	
D	Indian Valve	Calcutta	
E	GeetaIron & Brass Works	Baroda	
8.2 N	Brass Fittings		
A	Leader Engineering Wroks	Jalandhar	
B	L&K Mathura		
C	Luster Sanitary Fittings	Jalandhar	
D	Annapurna Metal Works	Calcutta	
E	Neta Engineering Works	Jalandhar	
F	Honey Industril Corporation	Bombay	
8.2 O	C.P. Fittings		
A	Ego Metal Works	Ballabhgarh	
B	Jaquar & Company Ltd.	Delhi	
C	Soma Plumbing Fixtures Limited	Calcutta	
D	Gem Sanitary Appliances Pvt. Ltd.	Delhi	
E	Essco Sanitations	Delhi	
F	Bilmet	Bombay	
8.2 P	Hydrants		
A	Brady's	Bombay	
B	Firex	Bombay	
C	Upadhya Valves	Calcutta	
D	Eddy Foundry	Calcutta	



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

E	Minimax	Delhi	
8.2 Q	Stone Ware (Salt-Glazed) Pipes		
A	Hind Ceramics Limited	Orissa	
B	Ceramic Industries Limited	Sambalpur	
C	Shrikamakshi Agencies	Madras	
D	Binary Udyog Pvt. Limited	Howrah	
E	Tirumati Moulds Limited	Nagpur	
F	Kiran Potteries	Hyderabad	
G	Perfect Sanitary Pipes	Bharatpur	
8.3	Mirror/ Glass		
A	Atul Glass	Delhi	Atul
B	Gujarat Guardian Ltd./ Modi/ Saint Govin	Delhi	Modiguard
C	Triveni Glass	Kolkata	Triveni
D	Continental Float Glass	Delhi	Continental
E	Hindustan Safety Glass	Kolkata	Hindustan
9.0	False Ceiling		
9.1	Aluminium Strip/ Tray Type		
A	Interarch Building Products (P) Ltd.	Noida	Trac
B	Hunter Douglas	Delhi	Luxalon
C	Mascot Oversfas	Delhi	Mctacie/ Trulon
D	Llyod Insulations (I) Ltd.	Delhi	Lloyd Lineal Celings
9.2	Gypsum Board		
A	Saint- Gobain Guproc India Ltd., LA, IP Board	Mumbai	Gypboard
9.3	False Ceiling (POP/ Gypsum Board)		
A	Armstrong, Daiken, Luxalon, Llyods		
10.0	False Flooring		
A	United Insulation	Mumbai	
B	Llyod Insulations (I) Ltd.	Delhi	
C	Muti Floors	Delhi	
D	A.R & Brothers	Chennai	
E	Bestlock System & Concepts, Goderej	Mumbai	



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

11.0	Insulation		
11.1	Underdeck Insulation		
A	Bakelite Hylam Ltd.	Secundrabad	Phenotherm
B	Llyod Insulations (I) Ltd.	Delhi	Isolloyd
C	UPT wiga Fibre Glass Limited	Delhi	TWIGA
11.2	Overdeck Insulation		
A	Llyod Insulations (I) Ltd.	Delhi	Lloyad Spray Foam
B	Best Plastronics Ltd.	Delhi	Best Plastronics
12.0	Miscellaneous Items		
12.1	Water Proofing Compound in Plaster		
A	Cico Technologies Ltd.	Delhi	CICONo.1
B	Pidilite Industries	Mumbai	Pidi proof LA
C	Ami tChemicals (P) Ltd.	Delhi	CRETOADMIX
12.2	CPRX Bituman Mastic		
A	ShaiImar Tar Products	Delhi	ShalimarTar
13.0	Concrete Admixtures		
13.1	Water Proofing Compound		
A	Cico Technologies Ltd.	NewDelhi	CICONo.1
			CICOSuper
			CICOAcry
B	Kryton Buildmat Co Pvt. Ltd.	Delhi	KIM
C	Sika India Pvt. Ltd.	Kolkata	Plastocrete Plus
			Noleek
13.2	Water Reducing Compounds		
A	CICO Technologies Ltd.	Delhi	CICOPLAST Super
B	Fairmatf Chemicals Pvt. Ltd.	Vadodara	FaircreteNFairflo
			FairfLOS
C	SikaIndia Pvt. Ltd.	Kolkata	Plastiment BV Plastiment 81 Plastiment 70 Si- kament FF Si- kament NN Si- kament NN (BWS) Sikament NNSP1Skamen1 Sikarapid1



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

			Sikaviscocrl: L20HE SikaviscocreT- ER550(I) SikaAER
14.0	Construction Chemicals		
14.1	Polysulphide Sealant		
A	Cnowksfy Chemicals Pvt. Ltd.	Mumbai	Techseal
B	Cico Technologies Ltd.	Delhi	CICOSEAL- ANIT58 0
C	Fosroc Chemical	Delhi	Thioflex660
D	Pidilite Industries	Mumbai	PidisealPS42P
E	Sika India Pvt. Ltd.	Kolkata	SIKAPolysulPH: DE(SikaAST:C) Construction
14.2	Silicon Sealants		
A	Pidilite Industries Ltd.	Mumbai	Dr.FixitSilic onSealantW X
15.0	Anchor Fasteners		
15.1	Mechanical Anchor Fasteners		
A	Hilti India Pvt. Ltd.	Delhi	
B	Fischer Fixing Systems (MICO) Ltd.	Bangalore	
15.2	Chemical Anchor Fasteners		
A	Hilti India Pvt. Ltd.	Delhi	
B	Fischer FixingS ystems (MICO) Ltd.	Bangalore	
16.0	Electro-Forged Gratings		
A	Greatweld Steel Gratings Pvt. Ltd.	Pune	
B	Indiana Gratings Pvt. Ltd.	Mumbai	
17	Modular Partitions/ Furniture		
A	Godrej, Blowplast, Featherlire, Duriar		
18.0	Wall Care Putty for Base Preparation (1st Quality Only)		
A	Birla Wall Care Putty		
B	M/s Sahlimar Hardware		
C	Berger	Delhi	
D	Jenson & Nichoison	Gurgaon	
E	JK White	Udaipur	



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

19.0	White Cement (1st Quality Only)		
A	Birla, JK		
20.0	Sheet Glass/ Structural Glazing		
A	Hindustan Pilkington Glass Works	Chennai	
B	Saint Gobain	Chennai	
C	Modi Float	Delhi	
D	Triveni FloatGlass	Allahabad	
F	ASI		
G	Fresca		
H	Emirates		
21.0	Polycarbonate Sheet		
A	GE Plastic, Everest		
22.0	Multiell/ Multiwall Polycarbonate Panel		
A	M/s Coxwell Domes Engineering, Delhi	Delhi	
B	M/s Lexan, M/s Galina India Pvt. Ltd.	NewDelhi	
C	M/s Vijaynath Interiors & Exteriors Products	Mumbai	
23.0	Stainless Steel Railing		
A	Jindal		
24.0	Punch Tape Concetina Coil		
A	Global Technocrat, S.G. Engineers	Delhi	
25.0	Punch TapeIn Plastic Spool		
A	Global Technocrat, S.G. Engineers	Delhi	
26.0	Stainless Steel Railing		
A	Jindal	New Delhi	
27.0	SGSW Pipes (IS-651) ISI marked		
A	Perfect Agra, Devraj Ind. Gaziabad, Buran, RK, Prince, Supreme Pipe and Fittings		
28.0	CI (Centrifugally Cast) Pipes for Sewage Disposal ISI Marked		
A	NICCO, SRIF, A-1Singhal Casting CoAgra, Jindal Saw, Kesoram		
29.0	PVC Rain Water/ Sewage Pipes (IS-4985)		
A	Reliance, Finolex, Supreme, Kisan, Prince		
30.0	HDPE Water/ Sewage Pipes (Rotational Moulded)		



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

A	Sintex, Swift, Nutech, Sheetal		
31.0	Asbestos Cement Pipes and Fittings		
A	Ganga Asbestos Limited	U.P	
B	Hyderabad Asbestos Cement Products Limited		
C	J.K. Super Pipes Industries	Nanded	
D	Konark Cement and Asbestos Limited	Orissa	
E	Maharashtra Asbestos Limited	Bombay	
F	Poddar Industrial Corporation	Patna	
G	Sarbamangala Mfg. Company	Calcutta	
32.0	Wind Driyen Air Ventilators		
A	Multi Colour		
	Anchit Ispat Pvt. Ltd.	Faridabad	
	Apurva Enterprises	Mumbai	
	SVS Wind Driven Turbo Ventilator	Ahmadnagar	
	Real Green Engineers Pvt. Ltd. Bagalores	Bangalore	
	Sun Green Ventilation System Pvt. Ltd	Mylapore	



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

A) **Electrical**

AirConditioner

1. O General
2. Daikin

Hitachi Batteries (LeadAcid)

1. Amco Batteries Ltd.
2. Exide IndustriesLtd.
3. HBLNIFEPower SystemLtd.
4. Amara Raja Batteries Ltd.

Batteries (NickelCadmium)

1. Amco Batteries Ltd. HBLNIFE-
Power Systems Ltd.

BatteriesCharger/DC-DCConverter

1. Amara Raja Power System(P)Ltd.
2. BCH.
3. Chhabi Electricals Pvt.Ltd.
4. Caldye AutomaticsLimited
5. Dubas
6. HBLNifePower SystemsLtd.
7. Universal Industries Products
8. Universal InstrumentMfg CoPvtLtd

Cable–

FireAlarm & CommunicationCables

1. Cords Cable Industries Ltd.
2. CMI
3. Deltoncables Ltd.
4. ELKAY Telelinks
5. KEI IndustriesLtd.
6. Reliance Engineers Ltd.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

Cable-HT (XLPE)

1. Universal CableLtd.
2. KEI IndustriesLtd.
3. IndustrialCables
4. NICCOCorporationLtd.
5. Uniflex
6. Polycab.
7. Torrentcables Ltd.

Cable-LTPowerandControl

1. Cords Cable Industries Ltd.
2. Universal CableLtd.
3. KEI IndustriesLtd.
4. Havells.
5. Delton
6. ElkayTelelinks
7. EvershineElectricals
8. Ecko
9. Ravin
10. Rallison.
11. Suyog
12. Netco
13. Uniflex
14. Paramount
15. Gloster
16. Associated cables PvtLtd.
17. CMI
18. Gemscab
19. Industrial cables
20. NICCO
21. Polycab
22. Torrent



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

Cable–Gland

1. Baliga
2. Comet
3. Flexpro
4. Flameproof
5. FCG
6. Electro Werke
7. Dowels
8. CCI

Cable–Lugs

1. Dowels
2. Jainson
3. Ismal

Cable–Tray

1. Ercon Composites
2. Yamuna Power &InfrastructureLtd.

CableTerminationandJointingKit

1. CCI
2. Raychem
3. M-Seal

Ceiling/Exhaust/PedestalFans&Circulators

1. Bajaj Electricals Ltd.
2. Crompton GreavesLtd.
3. KhaitanElectricals Ltd.
4. Havell's



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

Contractors–ACPower

- 1 Andrew Yule
- 2 ABB
- 3 BHEL
- 4 C&S
- 5 Havell's
- 6 L&T
- 7 Schneider
- 8 Siemens Ltd.
- 9 Telemechanique

Control Transformer

1. AE
2. Indushree
3. Intra Vidyut
4. Kalpa Elektrikals
5. Transpower IndustriesLtd.
6. Siemens

EarthingMaterials

1. Rukmani Electrical &Components PvtLtd.
2. Indiana Grating PvtLtd.

FlameproofLDB's/JB,s/ControlStation/switches

1. FCG
2. Sudhir
3. Prompt Engineering Works
4. Flame Proof equipments Pvt. Ltd.
5. Baliga Lighting Equipments Pvt. Ltd.
6. Flexpro Electricals Pvt.Ltd.

HighMast

1. Bajaj Electricals Limited



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

2. Crompton Greaves Limited.
3. Philips India Limited
4. Surya Roshani

High Voltage PCC/MCC panels

1. BHEL
2. Control and Switchgear
3. Siemens
4. TricoliteElectrical Industries
5. Schneider
6. CGL
7. L&T

IndicatingLamps

1. Alstom Ltd.
2. BCH
3. L&TLtd.
4. Siemens Ltd.
5. Vaishno Electricals

IndicatingMeters

1. ABB
2. AMCO
3. AE
4. Alstom Ltd. (EE)
5. Conzerv/Schneider
6. Elecon Measurement Pvt. Ltd.
7. HPL Electric & Power Pvt. Ltd.
8. MECO Instruments Ltd.
9. Minilec
10. Rishabh Instruments Pvt. Ltd.
11. Trinity energy system
12. kaycee
13. Salzer



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



Lighting Fixtures

1. GE Lighting Pvt. Ltd.
2. Bajaj Electricals Ltd.
3. Crompton Greaves Ltd.
4. Philips India Ltd.

Lighting Fixtures–Flameproof

1. Bajaj Electricals Ltd.
2. Baliga Lighting Equipment Pvt. Ltd.
3. Crompton Greaves Ltd.
4. CEAG Flame proof Controlgear Pvt. Ltd.
5. Flexpro Electricals Pvt. Ltd.
6. Philips India Ltd.
7. Sudhir Switchgears Pvt. Ltd.
8. FCG.

Miniature Circuit Breakers(MCBs)and Lighting DB

1. ABB
2. Hagger
3. Havell's India Ltd.
4. Indo Asian Fusegear Ltd.
5. Legrand
6. MDS Switchgear Ltd.
7. Schneider
8. Siemens Ltd.
9. HPL

Moulded Case Circuit Breaker(MCCBs)

1. ABB
2. Andrew yule
3. Larsen&Toubro



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

4. Schneider
5. Siemens
6. Control and Switchgear

Protection Relays–Thermal

1. BCH
2. L&TLtd.
3. Siemens Ltd.
4. Telemenchanique & Controls (India) Ltd.

Low Voltage Power Control Center(PCC)/MCC/PDB/MLDB/LDB

1. ABB
2. BCH
3. C & S
4. Elecmech Switchgear &Instrumentation
5. KMG ATOZ
6. L&T
7. PyrotechElectronics Pvt.Ltd.
8. Risha controlEngineersPvt.Ltd.
9. Siemens
10. Tricolite Electrical Industries
11. Unilec Engineers ltd.
12. Vidyut ControlIndia Pvt.Ltd.
13. Control and Schematic
14. Zenith Engineering

Push Buttons

1. BCH
2. Alstom Ltd.
3. L&T
4. Siemens Ltd.
5. Telemenchanique & Controls (India) Ltd.
6. Vaishno Electricals



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

Switches-Control

1. BCH
2. Easum Reyrolle Relays & Devices Ltd.
3. Alstom
4. Kaycee Industries Ltd.
5. L&T
6. Siemens Ltd.

Switches-5/15A Piano/Plate, Switch Socket

1. Anchor Electronics & Electricals Pvt. Ltd.
2. Kingal Electricals Pvt. Ltd.
3. North-West Switchgear Ltd.

Switch Socket Outlets (Industrial)

1. Alstom Ltd.
2. Best & Crompton Engineering Ltd.
3. BCH
4. Crompton Greaves Ltd.
5. Essen Engineering Company Pvt. Ltd.

Solar Modules

1. Tata BPSolar (I) Ltd.
2. REIL, Jaipur.
3. CEIL, Sahibabad.

Solar Street Lighting

1. Tata BPSolar (I) Ltd.
2. REIL, Jaipur.
3. CEIL, Sahibabad.

Terminals Blocks

1. Connectwell



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

2. Controls & Switchgear Co. Ltd.
3. Elmex Controls Pvt. Ltd.
4. Essen Engineering Co. Pvt. Ltd.

Transformers

1. ABB
2. Andrew Yule
3. Areva
4. BHEL
5. BharatBijlee
6. Crompton Greaves
7. EMCOLtd.
8. Intra Vidyut
9. Indushree
10. Indcoil
11. Kirloskar
12. Skippers Electricals
13. Transformers & Rectifiers (I) Ltd.
14. Voltamp

UPSS System and Inverter

1. DB POWER
2. APLAB
3. KELTRON
4. HI-REL
5. DUBAS
6. Toshiba Corporation

7. Fuzi Electric Co Ltd

Solar Street Lighting

- 1) Tata BPSolar (I) Ltd.
- 2) REIL, Jaipur
- 3) CEIL, Sahibabad

D) **Instrumentation**



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



I) PRESSURE REGULATOR AND SLAM SHUT VALVE

- 1) M/s Pietro Fiorentini S.P.A.(Italy)
- 2) M/s Emerson Process Management(Singapore)
- 3) M/s RMG-Regel Messtechnik (Germany)
- 4) M/s Nirmal Industrial Controls(India)-
formaximum300#andsizeφ8"
- 5) M/s Gorter Controls (Netherlands)
- 6) M/s Dresser

II) FLOW CONTROL VALVE

- 1) M/s Forbes Marshall (Pune)
- 2) M/s ABB Ltd.(Nashik)
- 3) M/s Fisher Xomox(NewDelhi)
- 4) M/s Fouress Engg. (NewDelhi)
- 5) M/s Instrumentation Ltd.(Palghat)
- 6) M/s MIL Controls Ltd. (Noida)
- 7) M/s Samson Control (Thane)
- 8) M/s Dresser

III) A) ULTRASONICFLOWMETER

- 1) M/s Emerson Process (represented by M/s Daniel Measurement & Control)
- 2) M/s Instromet International, Belgium (represented by M/s Siddha Gas Instromet(I) Ltd.)
- 3) M/s FMCMeasurementSolution,
UK(representedbyM/sTrimax Engg., Mumbai)



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



- 4) RMGMesstechnikGMBH
- 5) M/s SICK MAHAIK, (Represented by-
ChemtrolsIndustries, Mumbai)

B) TURBINE METER

- 0) M/s Instromet(Belgium)
- 1) M/s RMG (Germany)
- 2) M/s Elster (Germany)
- 3) M/s FluidComponents(USA)
- 4) M/s Barton Instruments(UK)
- 5) M/s Bopp &Reuther (Germany)
- 6) M/s Daniel Industries (USA)
- 7) M/s Hoffer Flow(USA)
- 8) M/s Rockwin Flow Meters

IV A) PANEL MOUNTED FLOW COMPUTERS

- 1) M/s Barton Instruments System Ltd. (UK)
- 2) M/s Daniel Measurement and Controls (M/sEmerson Group)
- 3) M/s Instromet International, Belgium (M/sEster-Instromet,
India)
- 4) M/s RMGMesstechnikGmbH (Germany)
- 5) M/s Omni Flow Computers Inc. (USA)/(
RockwinFlow Meter India)

IV B) FIELD MOUNTED FLOWCOMPUTER

- 1) M/s Barton Instruments System LLC (UK)
- 2) M/s Daniel Measurementand Controls (M/s Emerson Group)
- 3) M/s Bristol Babcock(USA)



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



V) GAS CHROMATOGRAPH

- 1) ABB Ltd, India
- 2) Daniel Measurement&Control AsiaPacific, India
- 3) InstrometInternationa,NV
- 4) RMG Regal+MesstechnikGmbH

VI) L.E.L DETECTION SYSTEM

- 1) Crowcon Detection Instruments Ltd
- 2) Detection Instruments (I) PvtLtd
- 3) Detector Electronics Corporation
- 4) MSA – Minessafetyappliances.
- 5) Oldham France S.A.
- 6) Drager SafetyAG&Co.KGAA
- 7) Honeywell

VII) CONTROL AND SIGNAL CABLES

1. M/s ASSOCIATED CABLES
2. M/s DELTON Cables Ltd,India
3. M/s KEI Industries LtdINDIA
4. M/s – Cords Cable Industries Ltd, India
5. M/s Polycab Wires Pvt Ltd, India
6. M/s. T. C. Communication Pvt. Ltd., Delhi

VIII) ZENER BARRIERS/ISOLATORS

- 1) M/s MTL
- 2) M/s P& F



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



IX) RTDs

- 1) M/s General Instruments Ltd., Mumbai
- 2) M/s Nagman Sensors (Pvt.) Ltd.
- 3) M/s Pyro Electric, Goa

X) PRESSURE TRANSMITTERS, TEMP. TRANSMITTERS & DIFF. PRESSURE TRANSMITTER

- 1) M/s Fisher Rosemount (Emerson)
- 2) M/s Yokogawa
- 3) M/s Honeywell

XI) PRESSURE GAUGES, D. P. GAUGES & TEMPERATURES GAUGES

- 1) M/s AN Instruments Pvt. Ltd., New Delhi
- 2) M/s General Instruments Ltd., Mumbai
- 3) M/s WIKA

XII A) SS TUBE FITTINGS

- 1) M/s Swagelok (USA)
- 2) M/s Parker (USA)
- 3) M/s Aura Inc
- 4) M/s Arya Crafts & Engineering Pvt. Ltd.
- 5) M/s Comfit & Valves Pvt Limited, Mumbai.

XII B) SS TUBE

- 1) M/s Sandvik, Sweden



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

- 2) M/s Ratnamani metals&tubes
- 3) M/s Heavy Metals& TubeLimited (Mehasana)
- 4) M/s Choksy Tube Co Ltd.
- 5) M/s Scorodite Stainless India Pvt Ltd, Mumbai

XII C) SS VALVES & MANIFOLDS

- 1) M/s Swagelok(USA)
- 2) M/s Parker (USA)
- 3) M/s Aura Inc
- 4) M/s Arya Crafts & Engineering Pvt. Ltd.
- 5) M/s Comfit & Valves Pvt Limited, Mumbai

XIII) JUNCTION BOXESAND CABLESGLANDS

- 1) M/s EX-PROTECTA
- 2) M/s FLAMEPROOFCONTROLGEARS
- 3) M/s BALIGA
- 4) M/s FLEXPLO ELECTRICALS

XIV) PUSHBUTTONS/LAMPS:

- 1) L&T
- 2) SIEMENS

XV) MCB'S:

- 1) HAVELL'S
- 2) INDO ASIAN
- 3) MDS



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



XVI) RELAYS:

- 1) OEN
- 2) JYOTI

XVII) POWER SUPPLY UNIT:

- 1) ELNOVA
- 2) APLAB

**XVIII) CONTROL ROOME QUIPMENT CONTROL PANEL & AC-
CESSORIES**

- 1) M/s Keltron Controls Ltd., Kerala
- 2) M/s RITTAL
- 3) M/s Pyrotech
- 4) M/s Positronics Pvt. Ltd.

XIX) INDICATORS/CONTROLLERS/RECORDERS

- 1) M/s ABB
- 2) M/s EUROTHERN
- 3) M/s TATA HONEYWELL
- 4) M/s MASIBUS

XX) HDPE DUCT

1. M/s Kirti Industries (India) Ltd., Indore.
2. M/s Kulja Industries., Solan
3. M/s Veekay Plast, Jaipur
5. M/s Jain Irrigation Systems Ltd. Jalgoan



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



6. M/s Shree Mohit Industries, Burhanpur
7. M/s Duraline India Pvt. Ltd., New Delhi

XXI) OFC

1. M/s Finolex Cables Ltd, Pune
2. M/s RPG Cables Ltd. New Delhi
3. M/s UM Cables Limited, New Delhi
4. M/s Himachal Futuristic Communication Ltd., New Delhi
5. M/s Birla Ericsson Optical Ltd., Rewa
6. M/s APAR Industries
7. M/s Sterlite Optical Technologies Ltd., New Delhi
8. M/s Aksh Optifibre Ltd, Bhiwadi.
9. M/s Gupta Power

XXII) JOINTING CLOSURES&ELECTRONIC MARKER / LOCATOR

1. M/s Raychem
2. M/s Siemens
3. M/s Tyco Electronics
4. M/s 3 M

XXIII) FTC

1. M/s 3 M
2. M/s Raychem
3. M/s Krone

SS TUBE

- 6) M/s Sandvik, Sweden
- 7) M/s Ratnamani metals&tubes
- 8) M/s Heavy Metals& Tube Limited (Mehasana)
- 9) M/s Choksy Tube Co Ltd.

SS VALVES & MANIFOLDS



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

- 6) M/s Swagelok(USA)
- 7) M/s Parker (USA)
- 8) M/s Dawsons Tech Components LLP

JUNCTION BOXES AND CABLES GLANDS

- 5) M/s EX-PROTECTA
- 6) M/s FLAME PROOF CONTROL GEARS
- 7) M/s BALIGA
- 8) M/s FLEXPLO ELECTRICALS

PUSHBUTTONS/LAMPS:

- 1) L&T
- 2) SIEMENS

MCB'S:

- 1) HAVELL'S
- 2) INDO ASIAN
- 3) MDS

RELAYS:

- 1) OEN
- 2) JYOTI

POWER SUPPLY UNIT:

- 1) ELNOVA



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



2) APLAB

CONTROL ROOM EQUIPMENT CONTROL PANEL & ACCESSORIES

- 1) M/s Keltron Controls Ltd., Kerala
- 2) M/s RITTAL
- 3) M/s Pyrotech
- 4) M/s Positronics Pvt. Ltd.

INDICATORS/CONTROLLERS/RECORDERS

- 3) M/s ABB
- 4) M/s EUROTHERN
- 5) M/s TATA HONEYWELL
- 6) M/s MASIBUS

TPI AGENCY

Only enlisted, approved, and valid TPI agencies as per PNGRB T4S guidelines for CGD shall be considered.

Note:

- 1) For procuring the above listed bought out item(s) from the vendor/ supplier, whose name is not appearing in the above preferred make list, bidders can supply those item(s) from such vendors/suppliers who have earlier supplied same item(s) for the intended services and the offered item(s) is in their regular manufacturing/ supply range and the same may be accepted subject to following: -
 - a) The Vendor/ Supplier of bought out item(s) is a Manufacturer/ Supplier of the said item(s) for intended services and the same are in their regular manufacturing/ supply range.
 - b) The vendor/supplier should not be in the Holiday list of Client/ BANDR/ Other PSU.
 - c) For items to be purchased with measurement unit either in length or in weight: - Should have supplied for intended services at least 15% of SOR quantity of same size, thickness, schedule,



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



pressure & temperature ratings, SDR, etc. or higher (as applicable) as per technical details mentioned in SOR & Tender specification and the same should have been supplied within last seven (07) year from the date of approval request made by the contractor.

- d) For items to be purchased with measurement unit in number: - Should have supplied for intended services at least 15% of SOR quantity of same size, thickness, schedule, pressure & temperature ratings, SDR, etc. or higher (as applicable) as per technical details mentioned in SOR & Tender specification and the same should have been supplied within last seven (07) year from the date of approval request made by the contractor.
- 2) For procuring any other item(s) {i.e. not listed above} for which the vendor/ supplier name is not appearing in above preferred make list, bidders can supply those item(s) from such vendors/suppliers who have earlier supplied same item(s) for the intended services and the offered item(s) is in their regular manufacturing/ supply range and the same may be accepted subject to following: -
- a) The Vendor/ Supplier of bought out item(s) is a Manufacturer/ Supplier of said item(s) for intended services and the same are in their regular manufacturing/ supply range.
- b) The vendor/supplier should not be in the Holiday list of Client/ BANDR/ Other PSU.
- c) For items to be purchased with measurement unit either in length or in weight: - Should have supplied for intended services at least 15% of SOR quantity of same size, thickness, schedule, pressure & temperature ratings, SDR, etc. or higher (as applicable) as per technical details mentioned in SOR & Tender specification and the same should have been supplied within last seven (07) year from the date of approval request made by the contractor.
- d) For items to be purchased with measurement unit in number: - Should have supplied for intended services at least One (01) number of same size, thickness, schedule, pressure & temperature ratings, SDR, etc. or higher (as applicable) as per technical details mentioned in SOR & Tender specification and the same should have been supplied within last seven (07) year from the date of approval request made by the contractor.

Remarks for Note 1 & 2:

- i. To meet the criterion mentioned above, the successful bidder/ contractor is required to submit documentary evidences such as copy of FOA/ Purchase Order (PO)/ sub-purchase order and their supply record like Inspection certificates/report, Inspection release note, Tax paid invoice, performance certificates (if available), etc. from which it can be established that vendor have executed supplied the order. These documents shall require to be submitted by them within 30days from date of Placement of Order for approval to CLIENT / PMC/ Consultant.



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**



TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

- ii. The details of vendors indicated in this list are based on the information available with PMC/CGD projects under PSU's. The contractor shall verify the capabilities of each vendor to produce the required quantity and ensure that the items are within their regular manufacturing range. PMC does not take any guarantee or responsibility for the performance of the vendor. It is the contractor's responsibility to verify the correct status of the vendor and their quality control before proposing the vendor's name to the CLIENT/PMC for approval. It is also the responsibility of the contractor to expedite the material in time.
- iii. For those vendors whose names do not appear in the above-listed items but are registered with PMC/CGD projects under PSU's, they can also be considered for the supply of the items. The contractor has to propose such vendors' names along with their valid registration letter issued by authority, or the vendor has to submit the PTR with all documents showing they have supplied materials for CGD in gas service, gas pipeline, hydrocarbon, cross-country pipeline, etc., for any PSU/government sector within the last 7 years.



TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



SECTION-VII

SCHEDULE OF RATE (SOR)

[Validate](#)[Print](#)[Help](#)**Item Rate BoQ**

Tender Inviting Authority: GAIL (India) Limited / EPMC: B AND R

Name of Work: LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION NETWORK (1 YEAR ARC)

Contract No: GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101 Tender ID: 2026_GAIL_278290_1

Name of the Bidder/ Bidding Firm / Company :							
PRICE SCHEDULE (This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevant columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)							
Sl. No.	Item Description	SAC Code	GST in Percentage	GST Amount in INR	TOTAL AMOUNT With Taxes	TOTAL AMOUNT With Taxes	TOTAL AMOUNT In Words
1	GST rate/ amount, SAC & Total amount incl. GST		18.00%	0.00	0.00	0.00	INR Zero Only
Total in Figures					0.00	0.00	INR Zero Only
Quoted Rate in Words		INR Zero Only					

Tender Inviting Authority: GAIL (India) Limited / EPMC: B AND R

Name of Work: LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION NETWORK (1 YEAR ARC)

Notice Inviting e-Tender (eNIT) No : GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101 Tender ID: 2026_GAIL_278290_1

Name of the Bidder/
Bidding Firm /
Company :

PRICE SCHEDULE

(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevant columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)

Sl. No.	Item Description	Item Code	Quantity	UOM	Estimated Rate (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees Rs. P	TOTAL AMOUNT (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees	TOTAL AMOUNT In Words
1	2	3	4	5	6	53	55
1	SECTION-A :MAINLINE WORKS						
2	CARBON STEEL PIPELINE LAYING						
3	PIPELINE LAYING / INSTALLATION BY OPEN CUT / HDD / MOILING (WITHOUT CASING) METHOD AS PER THE PERMITTING AUTHORITY AND CMC/GAIL AUTHORITY.	A00100					
4	"Receiving and taking over" as defined in the specifications, handling, loading, transportation and unloading of Owner supplied 3-Layer PE coated and bare linepipes from Owner's designated stack-yard to Contractor's stock yard/workshop/work-site including preliminary activities, preparation of drawings, wherever required for crossing etc. including handling, stacking, stringing on the pipeline Right-of-Use/ pipeline route alignment, carrying out inspection of company supplied materials including linepipes at the time of taking over, laying/ installation of coated linepipes as per specification wherever required depending on site condition including execution of all works, "taking over", handling , including loading and unloading, transportation of Owner supplied materials other than linepipe from Owner's designated place (s) of issue to work site, arrangement of all						
5	Additional lands required for Contractor's storage, fabrication, access for construction, procurement and supply of all materials (except Owner supplied materials), consumables, equipment, labour and other inputs, carrying out all temporary, ancillary, auxiliary works, ready for commissioning of pipeline as per drawings, specifications, other provisions of Contract document and instructions of Engineer-in-charge, including but not limited to						
6	Surveying of route and detours required at the time of execution including marking the same in topographical sheet, preparation of construction drawings showing survey details, and submit same to Owner for review / approval.						
7	Staking and installation of construction markers, clearing, fencing, grubbing, full filling all the requirements of various statutory/ environment authorities to the entire satisfaction of concerned authorities. During construction, methodology of laying of steel pipeline (i.e. open cut/ HDD/ moling without casing) shall be decided as per requirement of various Government statutory/ environment authorities and the same methodology of steel laying shall be binding to the contractor for Authority's entire satisfaction. Grading / clearing of work area and shifting of all obstruction within the ROU/ Pipeline route alignment viz. electrical lines/ poles, telephone line / poles, foreign pipeline, etc. with co-ordination with concerned authorities and obtain permissions from these						
8	Barricading the pipeline construction area prior to execution of the works as per drawings enclosed with tender document and / or to the entire satisfaction of Owner / Engineer-in-charge.						
9	Carrying out repairs of pipe defects/ replacement in case of irreparable defects and repairs of defects of pipe coating not attributable to Owner including defects/ damages occurring during transportation / handling.						
10	Stringing of line pipes along pipeline trench / ROU on sand/soft soil bags including all supplies, manpower & machinery etc.						
11	Checking, cleaning, aligning, bending, cutting and bevelling (as required) of pipes for welding and field adjustments including pipe fittings, welding, carrying out non-destructive testing of welds as required including 100% radiography by X-ray and providing all requisite equipment, labour, supervision, materials, films, consumables, all facilities and personnel to process, develop, examine and interpret radiographs and other tests as required, carrying out repairs of weld joints found defective by Engineer-in-Charge, carrying out re-radiography and other tests as required on repaired joints.						
12	Coating of field weld joints, long radius bends (R=3D), elbows, buried fittings and valves etc. including supply of coating materials etc. (i.e. heat shrinkable sleeves and high build epoxy etc.) as per PJS & Technical Specification compatible with 3 layer PE coating material of the line pipe.						
13	Installation of LR Bend (R = 3D) , as per specification wherever required depending on site condition.						
14	For Open cut method:						

Sl. No.	Item Description	Item Code	Quantity	UOM	Estimated Rate (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees Rs. P	TOTAL AMOUNT (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees	TOTAL AMOUNT In Words
15	Trenching to all depths and to a width to accommodate the carrier pipeline during lowering & backfilling by excavation in all types of soils, rocky and slag strata including different type of pavement / footpath / roads etc. including breaking, chiselling or otherwise cutting etc. as required. Excavation of hard rock only, wherever hard rock of single piece exceeding 1.5 meter in any direction within the trench dimension with respect to length, width & depth and removal only by pneumatic chisel/ drill/ rock-breaker are payable by separate item rate mentioned elsewhere in the SOR. Storing of excavated soil, reusable materials at designated area as directed by Engineer in charge and to a width to accommodate the pipeline as per the relevant standard/ specification etc. [The minimum depth of the top of pipeline shall be 1.2 meter measured from top of pipeline coating to the top of undisturbed surface of the soil or as per SCC/ relevant code, whichever is higher]. Dewatering of trenches if required as per site condition.						
16	Pipeline laying / installation in a built-up surface / Hard surface/ Slag Surface: Raking up of hard surface of any type including concrete, tiled, brick lined soft/ hard rock which is breakable in pieces manually (without use of pneumatic machine) etc. All tiles/slabs/ curb stones etc. removed during excavation shall be placed properly.						
17	Installation / lowering the pipeline in trench to required depth as per PJS, Technical Specification & drawings and providing required padding over and around the pipeline with sand/graded material approved by Engineer-In- Charge (in rocky areas) including padding around pipeline with suitable soil/sand duly approved by EIC including supply of padding material, backfilling and its compaction to the satisfaction of concerned authorities with excavated earth / borrowed select soil including supply of borrowed select soil/sand duly approved by EIC before backfilling and make ready for restoration to be done by Owner / concerned authorities.						
18	Installation of warning mat on the entire length of the pipeline as per specification. Warning mat should have anti rodent properties.						
19	Supply and installation of slope breakers, wherever required or, as directed by Owner / Engineer-in-charge.						
20	Crossing the all-foreign pipeline / HT line / cable / any other utilities etc. with necessary concrete / PVC protection including coordination with all agencies and obtaining NOC.						
21	Stabilisations of bank protection along with Supply of backfill materials duly approved by EIC for pipeline trench and banks falls under minor water body crossing as per technical specification & Std. Drg., wherever required or, as directed by Owner / EIC.						
22	Training and diversions of streams in steep slope area, wherever required.						
23	For HDD method						
24	Complete work of laying of pipeline in restricted ROU along with adjacent road/nala (if minor road/nala falling under the laying profile and not considered under separate crossing) by HDD method including "Receiving and taking over" owner supplied 3LPE coated line pipes from owner's designated place to issue/dump site(s) and transportation to contractor's stock yard/work site including all handling, loading, uploading, aligning etc. supply of all contractor supplied material including consumables, manpower, equipment, other resources to work site(s) and acquiring the required land for storage. Execution of, but not limited to, following works in accordance with specifications and instruction of engineer-in-charge and as per all provision of Contract Document.						
25	Pre-construction survey, necessary cover required over the carrier pipeline, based on site visit, collection of data (if required) from concerned Authority including design and detail engineering and making of drawings for getting their approval from concerned Authority/Engineer-in-charge, getting work permit/NOC for utilities crossings (if any) encountered prior to start the execution of work						
26	Drilling to required depth from top of ground (<i>min 2.0 mtrs.</i>) including maintenance of drill hole in all types of soil, rocky and slag strata, all depth to accommodate the pipeline at all conditions encountered by approved HDD methods for providing minimum cover specified in code/specification or the actual depth as decided by concerned authority whichever is more						
27	Laying of the pipeline by the approved HDD method including pipeline string preparation, welding, testing, 100% radiography by X-ray, welding repair and retest, coating of field joints with special type Dirax Heat Shrink Sleeve or equivalent (including supply of coating material) and repair of pipeline coating with special PERP-80 repair patch or equivalent material (including supply of repair patch) as per specification, pre-hydrotest of complete						
28	Backfilling of the Pit/ ditch/trench including restoration and clean-up of area, disposal of drilling fluid & waste etc. to the satisfaction of Engineer-in-charge and/or as directed by concerned Authority.						
29	Pigging, Cleaning, Post installation hydrotest, dewatering and tie-in with pipeline at either banks or other adjacent pipeline section maintaining minimum pipeline cover 1.2 to 1.5 meter etc. all other works including pigging, Cleaning, final hydrotesting etc. along with mainline works (as mentioned above) required as per specifications, codes, approved drawings, calculations, methods and as directed by Engineer-in-charge and provision of contract document, getting NOC from all concerned authority of the facilities.						
30	For Manual/ Machine Molling technique (without Casing)						
31	Survey of under ground utilities, execution of the work as per specification, including excavation of pits molling with the hole size not exceeding 20% of the pipe dia, jointing and insertion of carrier pipe, testing & commissioning and restoration of the pits to original condition, submission of As-Built Graph as per specifications and the instruction of Engineer-in-charge						

Sl. No.	Item Description	Item Code	Quantity	UOM	Estimated Rate (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees Rs. P	TOTAL AMOUNT (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees	TOTAL AMOUNT In Words
32	Carrying out air cleaning, pigging, flushing, cleaning and hydrostatic testing of complete pipeline, supply of required quantity of corrosion inhibitor, if required including pre-testing of carrier pipeline string made for cased crossing, HDD section and other designated sections complete as per specification and approved by Engineer-in-charge to specified pressures indicated elsewhere and duration after stabilization as per specification, providing all equipment, pumps, fittings, instruments, dead weight tester, pressure recorder, thermocouples etc., and services, supervision, labour, consumables, water including supply of corrosion inhibitor, air, etc. as required, locating of leaks and rectification of defect attributable to Contractor (rectification of defects in linepipe material not attributable to contractor shall be paid separately as per other item of schedule of rate), re-testing after rectification, dewatering after successful completion of hydrotesting of entire section and as approved by Engineer-in-Charge.						
33	(Note : Leak detection, its rectification and successfully re-hydrotesting shall be carried out by Contractor with a view that completion of all activity for successful hydrotesting is not inordinately extended, which will hamper the overall project schedule. Further, no extra payment claim shall be entertained for re-hydrotesting and leak detection if defects found attributable to Contractor						
34	All tieing-in, including the tie-in(s) of the pipeline with the adjacent sections of pipeline including cutting of test header, rebeveling as required, radiography and other NDT examination, joint coating as per specification.						
35	Final clean-up & restoration of right-of-use or area disturbed by contractor including obtaining NOC from respective land owner and statutory authorities during their construction activities for laying of pipeline works and disposal of debris and returning all surplus material to designated disposal areas / storage yard as and backfilling of trench and compaction of the same as per satisfaction of Owner and / Or as directed by						
36	Restoration of land, facilities and boundary wall etc. and associated facilities dismantled/damaged by the Contractor during construction;						
37	Installation of all buried valves inside the valve pit and making provision to operate the valve.						
38	Protective coating of 1000 micron thick two component (applied with the help of minimum three coats) liquid epoxy including supply of materials duly approved by Owner for all piping valves, fittings, structural steels etc. for buried installation and inside the valve pit as approved by the Engineer-in-charge.						
39	Carrying out all temporary, ancillary, auxiliary works and all incidental works required to make the pipeline ready for pre-commissioning;						
40	Hook-up work with existing pipelines.						
41	Obtaining work permits/ NOC from various statutory authorities having jurisdiction, before and after execution of the work, and complying with all stipulation/conditions/recommendation of the said authorities;						
42	Preparation of as-built drawings, pipe-book and other records as specified in the specifications. SOR shall be read in conjunction with job specific requirements, specifications, standards, drawings and other provision of contract document. All above works line pipe laying and installation all above works for buried pipeline as per following details:						
43	Installation of Coated Line Pipes by open cut / HDD / moiling (without casing) methods as per following details:						
44	Pipe Dia- In mm NB Material -API 5L Gr. X-52 Coating Type - 3 Layer PE Coating (Externally) Length of each pipe-approx. 11.5 m to 12.5 m						
45	For All Starta						
46	By Open Cut Method Size-100 NB , 6.4 mm Thk.	A00101	1000.00	Meter	3,110.00	3110000.00	INR Thirty One Lakh Ten Thousand & Paise Zero Only
47	By HDD Method Size-100 NB , 6.4 mm Thk.	A00102	5500.00	Meter	5,808.00	31944000.00	INR Three Crore Nineteen Lakh Forty Four Thousand & Paise Zero Only
48	By Open Cut Method Size-150 NB , 6.4 mm Thk.	A00103	500.00	Meter	6,718.00	3359000.00	INR Thirty Three Lakh Fifty Nine Thousand & Paise Zero Only
49	By HDD Method Size-150 NB , 6.4 mm Thk.	A00104	2500.00	Meter	7,920.00	19800000.00	INR One Crore Ninety Eight Lakh & Paise Zero Only
50	By Open Cut Method Size-200 NB , 6.4 mm Thk.	A00105	100.00	Meter	7,464.00	746400.00	INR Seven Lakh Forty Six Thousand Four Hundred & Paise Zero Only
51	By HDD Method Size-200 NB , 6.4 mm Thk.	A00106	400.00	Meter	9,600.00	3840000.00	INR Thirty Eight Lakh Forty Thousand & Paise Zero Only
52	Note:						
53	This item shall be applicable for the underground steel grid main pipeline & branch pipeline including tap-off for distribution pipelines, valves, barred tees, insulating joints, bends (R=3D), flanges & fittings, accessories etc. and including fabrication, NDT, Testing & Installation of SVs (all types), tie-in of valve assembly including radiography of tie-in joints as per Schematic Layout Drawings and technical Specification alongwith aboveground approach pipeline upto Insulating Joint (including installation of aboveground / underground insulating joint) for various						
54	Supply of all valves, flanges, fittings, assorted pipes, barred tees & insulating Joints, LR bend etc. shall be paid by separate item mentioned elsewhere in SOR.						
55	In above item, backfilling of pipeline trench by borrowed select soil duly approved by Owner / EIC shall be paid by separate item mentioned elsewhere in the SOR.						
56	Contractor shall execute any pipeline activities along ROU with specified hard barricading in continious stretch per Std. Drg. and other safety measures.						
57	The lengths of pipelines are tentative. Items except above are covered separately.						

Sl. No.	Item Description	Item Code	Quantity	UOM	Estimated Rate (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees Rs. P	TOTAL AMOUNT (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees	TOTAL AMOUNT In Words
58	A large part of the proposed pipeline route may falls along NH / SH / MDR/ City road / Asphalt Road etc. However, in case of non-availability of ROU along MDR/ Asphalt Road etc., the pipeline route may change and this may also require a new tap-off point at suitable location on Pipeline of M/s GAIL (I) Ltd. This may cause increase / decrease in SOR quantities						
59	The rates shall be applicable for the work within all locations / region within Jamshedpur Geographical Area (GA).						
60	The above rate is excluding of major crossings by HDD, Boring, moiling (with casing), open cut conventional Method mentioned under separate item.						
61	Contractor shall ensure that no tree/plant cutting shall be carried out during Pipe Line Laying operations.Trenching shall be carried out manually if needed, so as to ensure no damage to plant/tree/water pipe line /telephone line/sewage line/electric cable and other under ground utilities.						
62	For Pipeline laying by opencut / HDD / moiling method - While formulating bid, Bidders are advised to visit the site & familiar themselves with the site condition for actual assessment of extent of laying of the pipeline by open cut / HDD / moiling method and to assess the maximum extent of cover which may have to be provided. Actual string length for HDD shall be as per design calculations so that pipe is not under stress as permitted by codes/ specifications. Final length of string shall be decided after decision of minimum cover requirement by concerned						
63	To lay / install the pipeline multiple section of HDD string may required, however single HDD string length may not be more than 750 mtrs. It is bidder's responsibility to plan and lay the pipeline either by using of above methodology as per site conditions in such a manner so that all associated requirements to complete the pipeline sections in totality such as installation of tap-off points, valves, TCP etc. as per specificaions / OISD & PNGRB						
64	RESTORATION OF ROADS						
65	Restoration of asphalt / concrete / red stone roads / pavement/ pavor block including compaction of soil, to original condition as per requirement and to the entire satisfaction of EIC and / or concerned Owners having jurisdiction for following thickness.						
66	Restoration of Asphalt road including tack coar with compaction as per MoRTH	A00201	12.00	CUM	12,000.00	144000.00	INR One Lakh Forty Four Thousand & Paise Zero Only
67	Restoration of Concrete road / concrete over protection of pipeline with less soil cover	A00202	80.00	CUM	9,000.00	720000.00	INR Seven Lakh Twenty Thousand & Paise Zero Only
68	Restoration of red stone road / footpath / pavement upto 4 inch thickness	A00203	80.00	SQM	1,500.00	120000.00	INR One Lakh Twenty Thousand & Paise Zero Only
69	Restoration of brick work including new construction (if required) Cement Mortar 1:4 (1cement : 4 sand)	A00204	6.00	CUM	6,500.00	39000.00	INR Thirty Nine Thousand & Paise Zero Only
70	Supplying and Fabricating and Fixing in position HYSD Steel Reinforcements/ TMT Grade Fe-415/Fe 500D conforming to IS1786-2008 at all levels and positions including the Cost of transportation, Straightening, Cutting, Bending, Cranking, Binding, Welding, Provision of necessary Chairs and Spacers, Preparation of bar bending schedule, getting the same approved by EIC etc., complete as per Drawings and Specifications and including Cost of binding wire, Labour etc., all complete in all respects as per scope of work, detailed construction drawings, technical specifications and direction of Engineer-in-charge. The Chairs and Spacer Bars provided will not be	A00205	0.50	MT	90,000.00	45000.00	INR Forty Five Thousand & Paise Zero Only
71	BORROWED SELECT EARTH MATHERIAL FOR BACKFILLING						
72	Additional work over and above item 1.0 for supply of specified and approved quality of sand in place of available excavated material and / or other suitable soil as per applicable standards / specifications, including backfilling of excavated trench for specified length after laying and padding of pipeline, including local transportation of such special backfill material over all distances, complete.	A00301	120.00	CUM	550.00	66000.00	INR Sixty Six Thousand & Paise Zero Only
73	RAIL by HDD Method						
74	Complete work for installation of pipeline by HDD method including "Receiving and taking over" owner supplied three layer PE coated line pipes from Owner's designated place to issue/ dump site(s) and transportation to Contractor's stock yard/ work shop/ work site including all handling, loading, unloading, aligning etc. supply of all Contractor supplied material including consumables, manpower, equipment, other resources to work site(s) and aquiring the required land for storage., Execution of, but not limited to, following works in accordance with specifications and instruction of Engineer-in-charge and as per all provision of Contract Document.						
75	Pre-construction survey, necessary cover required over the carrier pipeline from lowest bed level of the stipulated water crossing to be obtained from concerned authority, bed strata data including design & detail engineering and making of crossing drawing for getting their approval from concerned Authority/ Engineer-in-charge, getting work permit/ NOC for water crossings as well as utility crossings (if any) encountered during water crossing prior to start the execution of work. getting work permit/ NOC for water crossings as well as utility crossings (if any) encountered during water crossing prior to start the execution of work.; obtaining historical data/ scour depth (for river) from concerned authority, if required, ascertaining under neath soil & strata, necessary cover required over the carrier pipeline from lowest bed level of the stipulated water crossing including design & calculation and detail engineering and making of crossing drawing for getting the approval from concerned Authority/ Engineer-in- charge, getting work permit/ NOC for water crossings as well as utility crossings (if any) encountered during water crossing prior to start the execution of work. For road crossings,pre-construction survey based on site visit, collection of data (if required) from concerned Authority including design and detail engineering and making of crossing drawings for getting their approval from concerned Authority/ Engineer-in-charge, getting work permit/ NOC for the crossing as well as utility crossings (if any) encountered during crossing prior to start the execution of work.						

Sl. No.	Item Description	Item Code	Quantity	UOM	Estimated Rate (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees Rs. P	TOTAL AMOUNT (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees	TOTAL AMOUNT In Words
76	In case of road crossing, drilling to required depth from top of road including maintenance of drill hole in all types of soil starta (ie; soft/hard soil, soft/hard rock/ slag. etc), all depth to accommodate the pipeline at all conditions encountered during road crossing by approved HDD methods for providing minimum cover specified in code/ specification or the actual depth as decided by concerned authority, whichever is more.						
77	Laying of the carrier pipeline (for both water body and road crossing) by the approved HDD method across the crossing including, strings preparation of carrier, welding, testing, 100% radiography by x-ray, welding repair and retest, coating of field joints with special type Dirax Heat Shrink Sleeve or equivalent (including supply of coating material) and repair of pipeline coating with special PERP-80 repair patch or equivalent material (including supply of repair patch) as per specification, pre-hydrotest of complete strings made for crossing as per specification etc.						
78	Preparation of string, fabrication and welding as per specification and laying along with carrier pipeline across the crossing as per approved profile.						
79	Backfilling of the Pit/ditch/ trench including restoration and clean-up of area, disposal of drilling fluid & waste etc. to the satisfaction of Engineer-in-charge and /or as directed by Concerned Authority.						
80	Pigging, Cleaning, Post installation hydrotest, dewatering and tie-in with pipeline at either banks etc. all other works including pigging, cleaning, final hydrotesting etc. alongwith mainline works (as mentioned in item no. 1.0 above) required as per specifications, codes, approved drawings, calculations, methods and as directed by Engineer-in-charge and provision of contract document; getting NOC from all concerned authority of the facilities						
81	Laying of 6" (152.4 mm) OD, 6.4 mm wall thk of API 5L Grade X-52 pipe by HDD Method	A00503	600.00	Meter	10,890.00	6534000.00	INR Sixty Five Lakh Thirty Four Thousand & Paise Zero Only
82	Note: (i) Crossing width may vary as per site condition. Tenderer are advised to visit the site for actual assessment of extent of crossing and to access the maximum extent of cover which may have to be provided. Actual string length for HDD shall be as per design calculations so that pipe is not under stress as permitted by codes/ specifications. Final length of string shall be decided after decision of minimum cover requirement by						
83	(ii) Payment for the length of final tied-in carrier pipeline string are inclusive in the above item rate and no separate payment shall be made under other item mentioned elsewhere.						
84	(iii) Width of above crossings indicated are tentative and for multiple crossings. This shall be as per requirement at site for crossing at different locations. Tenderer/ Contractor shall not be entitled for any extra payment due to either location / area constraint and/or placement of higher capacity of rig required for crossing by HDD Method.						
85	(iv) Rate for providing end seal at both ends as per specification is included in above quoted rates						
86	SUPPLY OF WARNING MAT Supply of warning mat for pipeline as per the technical specification enclosed in the bid document. The material of warning mat shall be of high density polyethylene and non biodegradable type. It shall have non-toxic and anti rodent properties						
87	8" NB Pipeline	B00101	100.00	Meter	100.00	10000.00	INR Ten Thousand & Paise Zero Only
88	6" NB Pipeline	B00102	500.00	Meter	90.00	45000.00	INR Forty Five Thousand & Paise Zero Only
89	4" NB Pipeline	B00103	1000.00	Meter	80.00	80000.00	INR Eighty Thousand & Paise Zero Only
90	REPAIR OF COATING DEFECTS (NOT ATTRIBUTED TO CONTRACTOR)						
91	Repair of Holiday in Coating (Noted and recorded at the time of "receiving and taking over")						
92	Supply of all coating repair materials as per requirements of specification to be compatible with line pipe coating material, supply of all consumables, utilities, equipments and all manpower required, pipe cleaning and surface preparation, repairing of coating defects (resulting in holiday) and testing including all handling, transportation, etc. for line pipes, performing all works necessary for the completion of the works strictly in accordance with relevant specification and instructions of Engineer-In-Charge. This rate shall be applicable per sq. cm of the exposed steel area exposed steel area.	B00301	60.00	SQ.CM	75.00	4500.00	INR Four Thousand Five Hundred & Paise Zero Only
93	PERMANENT MARKERS						
94	Supply, fabrication and installation of all types of permanent markers along the route including all associated civil works such as excavation in all types of soil, construction in all types of soil, construction of pedestals and grouting with concrete, clearing, supply and application of approved colour and quality of primer and paint, stencil letter cutting for numbers, direction, change etc., restoration of area to original condition and performing all works as per drawing, specification and instruction of engineer-in-charge.						
95	Pipeline RCC boundary / route marker as per drawing	B00401	400.00	Nos	950.00	380000.00	INR Three Lakh Eighty Thousand & Paise Zero Only
96	Pipeline warning markers with post & foundations	B00402	60.00	Nos	8,500.00	510000.00	INR Five Lakh Ten Thousand & Paise Zero Only
97	LEAK / BURST (ATTRIBUTABLE TO OWNER)						
98	All works for locating leak / burst in Company's supplied material only (occurred during hydro-static testing) including necessary repairing/replacing defective pipe lengths including cutting and out and removing the defective pipe, pre-testing and welding of replacement pipe, NDT of welds, repair and retesting of defective welds, coating/painting of replacement pipe, pretesting the replacement pipe into mainline/branch line, coating/painting of welding joints, cleanup, retesting including cost of all labour materials, consumables and performing all works in accordance with the provisions of the Contract document and as directed by Owner						
99	For 8" NB Line	B00501	2.00	Nos	50,000.00	100000.00	INR One Lakh & Paise Zero Only
100	For 6" NB Line	B00502	2.00	Nos	45,000.00	90000.00	INR Ninety Thousand & Paise Zero Only
101	For 4" NB Line	B00503	2.00	Nos	40,000.00	80000.00	INR Eighty Thousand & Paise Zero Only

Sl. No.	Item Description	Item Code	Quantity	UOM	Estimated Rate (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees Rs. P	TOTAL AMOUNT (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees	TOTAL AMOUNT In Words
102	Note:						
103	This rate is applicable for manufacturing defects in Owner supplied material only.						
104	Leak detection, its rectification and successfully re-hydrotesting shall be carried out as per approved procedure by Contractor with a view that completion of all activity for successful hydrotesting is not inordinately extended which will hamper the overall project schedule.						
105	PRE-COMMISSIONING & COMMISSIONING ASSISTANCE OF ENTIRE UNDERGROUND PIPELINE LENGTH AND STATIONS						
106	Pre-commissioning activities and pre-commissioning checks to the specified acceptance criteria, making the entire pipeline system ready for commissioning, providing assistance during the complete duration of commissioning operations, supply of all equipment, manpower, consumables (including pigs and required quantity of nitrogen for valve operations) materials for all temporary works and performing all associated works, complete as per the relevant specifications, other provisions of Contract document and instructions of Engineer-in-Charge.						
107	Swabbing of pipeline sections						
108	8" Pipeline	C00101	500.00	Meter	40.00	20000.00	INR Twenty Thousand & Paise Zero Only
109	6" Pipeline	C00102	3000.00	Meter	30.00	90000.00	INR Ninety Thousand & Paise Zero Only
110	4" Pipeline	C00103	6500.00	Meter	15.00	97500.00	INR Ninety Seven Thousand Five Hundred & Paise Zero Only
111	Notes:- i) Above quantities for various pipelines sections.						
112	ii) For swabbing, a minimum of five (5) runs using a combination of low-density and high-density pigs shall be carried out. Swabbing shall continue until the acceptable limit, as mentioned in the technical specifications, is reached						
113	Complete work of carrying out drying by Vacuum drying / Super air drying / Super dry nitrogen & commissioning of pipeline section including supply of manpower, equipments & consumables (nitrogen required for purging etc.), materials for all temporary works and performing all associated works, complete as per the relevant specifications, other provisions of Contract document and instructions of Engineer-in-Charge.						
114	Drying by Vacuum drying / Super air drying / Super dry nitrogen						
115	8" Pipeline	C00104	500.00	Meter	40.00	20000.00	INR Twenty Thousand & Paise Zero Only
116	6" Pipeline	C00105	3000.00	Meter	30.00	90000.00	INR Ninety Thousand & Paise Zero Only
117	4" Pipeline	C00106	6500.00	Meter	20.00	130000.00	INR One Lakh Thirty Thousand & Paise Zero Only
118	Note: The quantities mentioned above for various pipeline sections. Final methodology of drying shall be decided by EIC at the time of execution.						
119	Commissioning assistance / commissioning for underground pipeline length and stations						
120	8" Pipeline	C00107	500.00	Meter	25.00	12500.00	INR Twelve Thousand Five Hundred & Paise Zero Only
121	6" Pipeline	C00108	3000.00	Meter	20.00	60000.00	INR Sixty Thousand & Paise Zero Only
122	4" Pipeline	C00109	6500.00	Meter	15.00	97500.00	INR Ninety Seven Thousand Five Hundred & Paise Zero Only
123	Note:- The above rates are applicable for no. of pipeline sections. Final methodology of commissioning shall be decided by EIC at the time of execution.						
124	Preservation of Pipeline						
125	Preservation of pipeline sections and associated facilities (in event of delay commissioning, other unforeseen reasons) including supply of nitrogen, all consumables, all equipment, man-power, etc. complete as per the requirements of specifications, other provisions of Contract document and instructions of Engineer-in-charge.						
126	By filling and pressurizing with nitrogen to a pressure of 2 bar(g) for a period of one month.						
127	For 8" NB Pipeline	C00201	500.00	Meter	40.00	20000.00	INR Twenty Thousand & Paise Zero Only
128	For 6" NB Pipeline	C00202	3000.00	Meter	20.00	60000.00	INR Sixty Thousand & Paise Zero Only
129	For 4" NB Pipeline	C00203	6500.00	Meter	15.00	97500.00	INR Ninety Seven Thousand Five Hundred & Paise Zero Only
130	For every additional period of one month or part thereof						
131	For 8" NB Pipeline	C00204	500.00	Meter	15.00	7500.00	INR Seven Thousand Five Hundred & Paise Zero Only
132	For 6" NB Pipeline	C00205	3000.00	Meter	10.00	30000.00	INR Thirty Thousand & Paise Zero Only
133	For 4" NB Pipeline	C00206	6500.00	Meter	5.00	32500.00	INR Thirty Two Thousand Five Hundred & Paise Zero Only
134	Notes: i) The above length is not for a single section but for no. of sections.						
135	ii) All accessories ie;Two nos. of dished end caps and two nos tappings of 3/4 inches,PG to be considered per section and rate for the same shall be quoted by bidder under this item.						
136	iii) If month is partially complete, payment shall be made on prorata basis.						

Sl. No.	Item Description	Item Code	Quantity	UOM	Estimated Rate (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees Rs. P	TOTAL AMOUNT (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees	TOTAL AMOUNT In Words
137	LONG RADIUS BENDS						
138	Supply of Long Radius Bends (R = 3D) for 8" dia.pipe,x-56 (thk. 6.4 mm) as per specification enclosed in Tender Document.						
139	20° - 30°	C00301	2.00	Nos	5,800.00	11600.00	INR Eleven Thousand Six Hundred & Paise Zero Only
140	31° - 45°	C00302	2.00	Nos	8,300.00	16600.00	INR Sixteen Thousand Six Hundred & Paise Zero Only
141	46° - 60°	C00303	2.00	Nos	11,000.00	22000.00	INR Twenty Two Thousand & Paise Zero Only
142	61° - 90°	C00304	2.00	Nos	15,000.00	30000.00	INR Thirty Thousand & Paise Zero Only
143	Supply of Long Radius Bends (R = 3D) for 6" dia.pipe,x-56 (thk. 6.4 mm) as per specification enclosed in Tender Document.						
144	20° - 30°	C00305	4.00	Nos	4,500.00	18000.00	INR Eighteen Thousand & Paise Zero Only
145	31° - 45°	C00306	2.00	Nos	5,000.00	10000.00	INR Ten Thousand & Paise Zero Only
146	46° - 60°	C00307	2.00	Nos	6,500.00	13000.00	INR Thirteen Thousand & Paise Zero Only
147	61° - 90°	C00308	2.00	Nos	7,500.00	15000.00	INR Fifteen Thousand & Paise Zero Only
148	Supply of Long Radius Bends (R = 3D) for 4" dia.pipe, X-52 (thk. 6.4 mm) as per specification enclosed in Tender Document.						
149	20° - 30°	C00309	4.00	Nos	3,500.00	14000.00	INR Fourteen Thousand & Paise Zero Only
150	31° - 45°	C00310	2.00	Nos	4,500.00	9000.00	INR Nine Thousand & Paise Zero Only
151	46° - 60°	C00311	2.00	Nos	5,500.00	11000.00	INR Eleven Thousand & Paise Zero Only
152	61° - 90°	C00312	2.00	Nos	6,500.00	13000.00	INR Thirteen Thousand & Paise Zero Only
153	Note : The quantities of LR Bends may vary. For final quantity, approval shall be taken by EIC before order. Line pipe shall not be Free Issue to the contractor.						
154	SECTION-B(TCP WORKS)						
155	Design, detail engineering, Manufacturing, Inspection/FAT (Factory acceptance test), supply, Packing, insurance, transportation to site, storage at site, Handling, Transportation, Loading, installation, testing & commissioning of the temporary Cathodic protection system using Mg (Min 5.0 Kg Each) galvanic anodes to protect the external surface of 3LPE Coated pipeline against corrosion for a design life of minimum 2 year or till commissioning of existing PCP system whichever is later in the Geographical Area (GA) of Varanasi as per standard specification No.- BR/TS/064 for temporary cathodic protection system, Scope of work, Data Sheets & tender drawings. Scope shall also include but not limited to the following for completion of jobs:						
156	Soil resistivity Survey & soil/water chemical analysis						
157	Measurement of soil resistivity along the right of way of the main pipeline (At 500mtr Interval) & collection of additional data as per specification for corrosion survey BR/TS/065 & applicable NACE standard incuding preperation of Design, detailed engineering, preparation of design document, preparation of Test station schedule & Bill of Material, PCP hook-up/bonding methodology as per the corrosion survey, Chemical analysis of Soil / Water samples and site visit for Cathodic Protection system of pipelines.	D00101	10.00	KM	12,000.00	120000.00	INR One Lakh Twenty Thousand & Paise Zero Only
158	Sacrificial anodes- Pre packed Mg/Zn anodes						
159	Prepacked Magnesium/zinc anodes for Carrier/Casing Pipe protection (Min 5.0 Kg Each) as per tender specification (1/2/3/4 Nos. of anodes). The total nos. of anodes shall be calculated as per the corrosion survey, soil chemical analysis, total weight and current requirement of the pipeline section. However, Min one anode is to be installed at every one KM with test station	D00201	10.00	Nos	18,000.00	180000.00	INR One Lakh Eighty Thousand & Paise Zero Only
160	Supply, laying, termination, Glanding and ferruling TCP-Cables--The Cables shall be annealed high conductivity, stranded copper conductor, 650/1100V grade, XLPE Insulated & PVC Sheathed in new/existing test stations and junction boxes.						
161	1c x 6 mm ² - Anode tail cable - unarmored	D00301	40.00	Meter	400.00	16000.00	INR Sixteen Thousand & Paise Zero Only
162	1 core x 6 mm ² - Potential Measurement, TLP to pipeline, armored	D00302	80.00	Meter	500.00	40000.00	INR Forty Thousand & Paise Zero Only
163	1 core x 10 mm ² - current measurement cable & Pipeline to Test station- armored	D00303	80.00	Meter	550.00	44000.00	INR Forty Four Thousand & Paise Zero Only
164	1 core x 25 mm ² -Bonding, Earthing, Surge diverter, HT line, etc.	D00304	60.00	Meter	700.00	42000.00	INR Forty Two Thousand & Paise Zero Only
165	Test Stations						
166	New test stations Normal Size-(Weather Proof with IP-55) as per tender drawings with name plate	D00305	6.00	NOS	25,000.00	150000.00	INR One Lakh Fifty Thousand & Paise Zero Only
167	New test stations Big Size-(Weather Proof with IP-55) suitable for Polarisation Cells as per tender drawings with name plate	D00306	2.00	NOS	28,000.00	56000.00	INR Fifty Six Thousand & Paise Zero Only
168	All Cable to pipe connections by Exothermic Process or Pin Brazing for all sizes (Upto 1C x 25mm ²) for complete TCP system of whole pipeline.	D00307	28.00	NOS	500.00	14000.00	INR Fourteen Thousand & Paise Zero Only

Sl. No.	Item Description	Item Code	Quantity	UOM	Estimated Rate (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees Rs. P	TOTAL AMOUNT (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees	TOTAL AMOUNT In Words
169	Solid State type Polarisation cells (3.7 kA @ 30 Cycle) for HT power line crossings (66KV & above).	D00308	2.00	NOS	1,70,000.00	340000.00	INR Three Lakh Forty Thousand & Paise Zero Only
170	20 Kg Sacrificial Zinc anodes for HT line crossing, Earthing of block valves on Cathodically Protected portion of pipeline.	D00309	2.00	NOS	22,000.00	44000.00	INR Forty Four Thousand & Paise Zero Only
171	HDPE sheet (Non-toxic and Rodent Resistant, 6mm thick & 5000mm wide (1200mmx5)) between the GAIL pipeline and the other CP protected foreign pipelines at the crossing locations for providing electrical isolation.	D00312	20.00	MTR	1,000.00	20000.00	INR Twenty Thousand & Paise Zero Only
172	Supply, installation, testing, commissioning of the complete earthing protection system, earth electrodes/ pit, earth main ring, earthing of electrical equipments, instrument panels, field instruments, process equipments and pipes/ flanges including all associated civil work with all material and labour as per specification and drawings approved by the company.						
173	Earthing Electrodes 65mm dia x 3mtr long & 4.5 mm thick GI pipe for earthing of cathodically unprotected pipeline at CNG station/consumer station/DRS station/Metering skid and earthing. Total grounding resistance shall be limited to 2-3 Ohm max.	D00313	2.00	NOS	22,000.00	44000.00	INR Forty Four Thousand & Paise Zero Only
174	GI Strip (50X6) mm	D00314	20.00	MTR	380.00	7600.00	INR Seven Thousand Six Hundred & Paise Zero Only
175	GI Strip (25X3) mm	D00315	20.00	MTR	200.00	4000.00	INR Four Thousand & Paise Zero Only
176	Copper Strip (25X3) mm	D00316	20.00	MTR	880.00	17600.00	INR Seventeen Thousand Six Hundred & Paise Zero Only
177	GI Wire (8mm-Stranded), Cu- wire rope (Min 8 mm dia solid) and all balance earthing material including copper strip (50 mm x 2 mm thick) jumper for flanges etc. as per the specification for all stations.	D00317	2.00	LS	10,000.00	20000.00	INR Twenty Thousand & Paise Zero Only
178	Monitoring of the TCP system, on monthly basis, till commissioning of the permanent cathodic protection system.	D00318	24.00	MONTH	10,000.00	240000.00	INR Two Lakh Forty Thousand & Paise Zero Only
179	Polarisation coupons (100 mmx 100mm) with Magnetic reed switch as per NACE SP 104 with permanent ref cell.	D00319	2.00	NOS	10,500.00	21000.00	INR Twenty One Thousand & Paise Zero Only
180	SECTION-C(PIPING & MECHANICAL WORKS)						
181	PLANT PIPING & SV STATION (ABOVE & UNDER GROUND)						
182	Transportation including loading, unloading & handling of all piping items from Owner's and/ or Contractor's storage point to work site/ workshop as applicable, complete work of fabrication, erection, painting, testing of pipes, flanges and fittings and making ready for further Commissioning / Start-up of carbon steel piping of all sizes and ratings including supply of all consumables, equipment, manpower and other resources and execution of, but not limited to, the following works in accordance with relevant specifications & scope of work, drawings, specification and instructions of Engineer-in-charge and as per all provisions of the CONTRACT DOCUMENT.						
183	Fabrication including cutting, edge preparation, inclusive of grinding the edges of pipes, fittings, flanges etc. to match with the matching edges of uneven/different thickness wherever required, welding, attachment of all pipe fittings like elbows, tees, reducers. Supply of nipples, couplings,caps, plugs, gasket, stud bolts, nuts, U Clamps etc. as required for completion of job						
184	Fixing/ Installation of weldolets, sockolets, flanges, vent and drain point connection etc., including providing stub- in connections, fabricated fittings and reinforcement pads etc., as required.						
185	Erection including prior cleaning, lifting, placing on pipe sleepers, sv stations, and supports, overhead on racks, skids and at all elevations including installation and carrying out connected activities for all types of valves including supply and fixing of gaskets, studs/ bolts, nuts wherever required for all sizes, levelling, aligning, joining of flanges, blind flanges, connecting with equipment, nozzles, strainers, tie-in with existing piping/facilities, etc. tapping for inline instruments like pressure gauges, thermowells, sample connection, etc.						
186	Preparation of final bill of material based on piping GADs.						
187	Preparation of isometric and fabrication drawings.						
188	Carrying out 100 % Non-destructive testing						
189	Surface preparation before application of primer by means of sand blasting including supply of approved quality of sand, manpower, machineries, tools & tackles to achieve required roughness as per specification and as per instruction of Engineer-in-charge.						
190	Painting of entire system (including aboveground all pipes fittings, flanges and accessories) as per specification BR/TS/039 suitable for corrosive area environment including supply of approved paints and primers, application of primer and paints, identification lettering/ numbering, colour coding, etc. as specified including rub down & touch up of shop primer or scrapping of shop primer wherever required by COMPANY and providing scaffolding						
191	Cleaning and flushing by water/ compressed air, testing of the systems including hydrostatic, pneumatic and any other type of testing as specified, draining, drying by compressed air/other methods approved by COMPANY.						
192	Precommissioning & making operational all piping system and equipments and provide all necessary assistance in term of supply of man-power, equipment, tools and tackles required amount of nitrogen for purging of entire terminal piping system including equipments etc. to the company during commissioning activities.						
193	Clean-up and restoration of site, preparation of as built drawings, documents and project records; transportation of surplus free issue material to Owner's designated plac(s); completing all works in all respects as per the AFC drawing, specifications, standards and other provisions of Contract and instruction of Engineer-in-charge.						
194	Completion of all such work in all respects as per scope of work and as per drawings, specifications and instructions of the COMPANY and keeping the system ready in all respects for further commissioning and start up.						

Sl. No.	Item Description	Item Code	Quantity	UOM	Estimated Rate (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees Rs. P	TOTAL AMOUNT (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees	TOTAL AMOUNT In Words
195	Hook-up works including making provision for hooking up and carrying out shutdown activities at terminals if necessary.						
196	Complete Carbon Steel Piping Work with painting including all fittings, flanges and supply of all required gaskets, studs bolts & nuts etc. as described under item 2.0 above						
197	ASTM A106, Gr. B (Charpy), Seamless, BE , SIZE-8" NB S40	E00101	12.00	Meter	3,800.00	45600.00	INR Forty Five Thousand Six Hundred & Paise Zero Only
198	ASTM A106, Gr. B (Charpy), Seamless, BE , SIZE-6" NB S40	E00102	12.00	Meter	2,800.00	33600.00	INR Thirty Three Thousand Six Hundred & Paise Zero Only
199	ASTM A106, Gr. B (Charpy), Seamless, BE , SIZE-4" NB S40	E00103	12.00	Meter	2,100.00	25200.00	INR Twenty Five Thousand Two Hundred & Paise Zero Only
200	ASTM A106, Gr. B (Charpy), Seamless, BE , SIZE-2" NB XS	E00104	18.00	Meter	1,500.00	27000.00	INR Twenty Seven Thousand & Paise Zero Only
201	ASTM A106, Gr. B, Seamless, PE , SIZE-1.5" NB XS	E00105	2.00	Meter	1,200.00	2400.00	INR Two Thousand Four Hundred & Paise Zero Only
202	ASTM A106, Gr. B, Seamless, PE, SIZE-1" NB XS	E00106	2.00	Meter	1,000.00	2000.00	INR Two Thousand & Paise Zero Only
203	ASTM A106, Gr. B, Seamless, PE , SIZE-3/4" S160	E00107	2.00	Meter	900.00	1800.00	INR One Thousand Eight Hundred & Paise Zero Only
204	1) Pipe Specification and thickness may vary depending upon availability of pipe. No extra payment shall be made for this. 2) All butt welded fittings end shall generally match with connecting pipe wall thickness. However, in case of misalignment, Contractor shall have to do end preparation without any extra cost. 3) All coupling, nipples etc. as required shall be supplied by contractor but no separate payments shall be made as it is covered under erection rate. 4) NDT of Joints below 2" is to be included in above rate. However, payment of radiography of joints (2" and above) shall be paid separately under SOR item for RADIOGRAPHY mentioned elsewhere in this SOR.						
205	SUPPLY OF ASSORTED PIPE, FITTINGS AND FLANGES						
206	Complete work of supply of pipes, fittings and flanges including all taxes, duties, transportation and inspection charges but not limited to the following items in accordance with relevant specifications indicated in clause of SCC & scope of work indicated in SCC, drawings, specification and instructions of Engineer-in-charge and as per all provisions of the CONTRACT DOCUMENT						
207	Handling including lifting, transportation from Contractor Stores to CONTRACTOR's workshop for fabrication and/ or to work site for field fabrication and erection for all piping items supplied by Contractor.						
208	CARBON STEEL PIPES						
209	ASTM A106, Gr. B (Charpy), Seamless, BE , SIZE-8" NB S40	E00201	8.00	Meter	5,115.00	40920.00	INR Forty Thousand Nine Hundred Twenty & Paise Zero Only
210	ASTM A106, Gr. B (Charpy), Seamless, BE , SIZE-6" NB S40	E00202	12.00	Meter	4,455.00	53460.00	INR Fifty Three Thousand Four Hundred Sixty & Paise Zero Only
211	ASTM A106, Gr. B (Charpy), Seamless, BE , SIZE-4" NB S40	E00203	8.00	Meter	3,861.00	30888.00	INR Thirty Thousand Eight Hundred Eighty Eight & Paise Zero Only
212	ASTM A106, Gr. B (Charpy), Seamless, BE , SIZE-2" NB XS	E00204	15.00	Meter	2,598.00	38970.00	INR Thirty Eight Thousand Nine Hundred Seventy & Paise Zero Only
213	ASTM A106, Gr. B, Seamless, PE , SIZE-1.5" NB XS	E00205	3.00	Meter	1,814.00	5442.00	INR Five Thousand Four Hundred Forty Two & Paise Zero Only
214	ASTM A106, Gr. B, Seamless, PE, SIZE-1" NB XS	E00206	3.00	Meter	1,153.00	3459.00	INR Three Thousand Four Hundred Fifty Nine & Paise Zero Only
215	ASTM A106, Gr. B, Seamless, PE , SIZE-3/4" S160	E00207	3.00	Meter	1,009.00	3027.00	INR Three Thousand Twenty Seven & Paise Zero Only
216	FLANGES						
217	Weld Neck (B-16.5, A105(Charpy), 125 AARH, RF) (End Thickness to match pipe thickness)						
218	6" 300#	E00301	3.00	Nos	5,284.00	15852.00	INR Fifteen Thousand Eight Hundred Fifty Two & Paise Zero Only
219	4" 300#	E00302	3.00	Nos	3,076.00	9228.00	INR Nine Thousand Two Hundred Twenty Eight & Paise Zero Only
220	2" 300#	E00303	4.00	Nos	940.00	3760.00	INR Three Thousand Seven Hundred Sixty & Paise Zero Only
221	Socket Welded (B-16.5, A105, 125 AARH, SW end to B16.5) 1.5" 300#	E00304	3.00	Nos	744.00	2232.00	INR Two Thousand Two Hundred Thirty Two & Paise Zero Only
222	Socket Welded (B-16.5, A105, 125 AARH, SW end to B16.5) 3/4" 300#	E00305	3.00	Nos	386.00	1158.00	INR One Thousand One Hundred Fifty Eight & Paise Zero Only
223	Blind Flanges (B-16.5, A105 (Charpy), 125 AARH, RF)						
224	8" 300#	E00306	2.00	Nos	8,474.00	16948.00	INR Sixteen Thousand Nine Hundred Forty Eight & Paise Zero Only

Sl. No.	Item Description	Item Code	Quantity	UOM	Estimated Rate (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees Rs. P	TOTAL AMOUNT (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees	TOTAL AMOUNT In Words
225	6" 300#	E00307	3.00	Nos	4,725.00	14175.00	INR Fourteen Thousand One Hundred Seventy Five & Paise Zero Only
226	4" 300#	E00308	3.00	Nos	2,892.00	8676.00	INR Eight Thousand Six Hundred Seventy Six & Paise Zero Only
227	2" 300#	E00309	8.00	Nos	903.00	7224.00	INR Seven Thousand Two Hundred Twenty Four & Paise Zero Only
228	3/4" 300#	E00310	2.00	Nos	464.00	928.00	INR Nine Hundred Twenty Eight & Paise Zero Only
229	ELBOW, 90° Elbow (A234, Gr. WPB (Charpy), B-16.9, 1.5D), BW / (As per Standard Specification and Data Sheets encloaed)						
230	8" S80	E00401	2.00	Nos	9,881.00	19762.00	INR Nineteen Thousand Seven Hundred Sixty Two & Paise Zero Only
231	6" S40	E00402	2.00	Nos	3,129.00	6258.00	INR Six Thousand Two Hundred Fifty Eight & Paise Zero Only
232	4" S40	E00403	3.00	Nos	1,305.00	3915.00	INR Three Thousand Nine Hundred Fifteen & Paise Zero Only
233	2" XS	E00404	9.00	Nos	455.00	4095.00	INR Four Thousand Ninety Five & Paise Zero Only
234	TEE, Equal Tee (A234, Gr. WPB (Charpy), B-16.9, 1.5D), BW						
235	8" S80	E00501	2.00	Nos	5,815.00	11630.00	INR Eleven Thousand Six Hundred Thirty & Paise Zero Only
236	6" S40	E00502	2.00	Nos	4,322.00	8644.00	INR Eight Thousand Six Hundred Forty Four & Paise Zero Only
237	4" S40	E00503	2.00	Nos	2,113.00	4226.00	INR Four Thousand Two Hundred Twenty Six & Paise Zero Only
238	2" XS	E00504	6.00	Nos	881.00	5286.00	INR Five Thousand Two Hundred Eighty Six & Paise Zero Only
239	SOCKOLET (A105, SW)/ (As per Standard Specification)						
240	8" x ¾"	E00601	2.00	Nos	1,872.00	3744.00	INR Three Thousand Seven Hundred Forty Four & Paise Zero Only
241	6" x ¾"	E00602	2.00	Nos	710.00	1420.00	INR One Thousand Four Hundred Twenty & Paise Zero Only
242	4" x ¾"	E00603	4.00	Nos	685.00	2740.00	INR Two Thousand Seven Hundred Forty & Paise Zero Only
243	WELDOLET (As per Standard Specification)						
244	8" x 2"	E00701	2.00	Nos	2,069.00	4138.00	INR Four Thousand One Hundred Thirty Eight & Paise Zero Only
245	6" x 2"	E00702	2.00	Nos	1,694.00	3388.00	INR Three Thousand Three Hundred Eighty Eight & Paise Zero Only
246	4"X2"	E00703	5.00	Nos	1,569.00	7845.00	INR Seven Thousand Eight Hundred Forty Five & Paise Zero Only
247	BARRED TEE (As per Standard Specification)						
248	8" x 4"	E00801	2.00	Nos	24,188.00	48376.00	INR Forty Eight Thousand Three Hundred Seventy Six & Paise Zero Only
249	6" x 6"	E00802	2.00	Nos	20,232.00	40464.00	INR Forty Thousand Four Hundred Sixty Four & Paise Zero Only
250	6" x 4"	E00803	2.00	Nos	18,757.00	37514.00	INR Thirty Seven Thousand Five Hundred Fourteen & Paise Zero Only
251	4" x 4"	E00804	5.00	Nos	15,793.00	78965.00	INR Seventy Eight Thousand Nine Hundred Sixty Five & Paise Zero Only
252	4" x 2"	E00805	10.00	Nos	18,000.00	180000.00	INR One Lakh Eighty Thousand & Paise Zero Only
253	INSULATING JOINTS (As per Standard Specification)						
254	4"	E00901	2.00	Nos	65,000.00	130000.00	INR One Lakh Thirty Thousand & Paise Zero Only
255	2"	E00902	2.00	Nos	45,000.00	90000.00	INR Ninety Thousand & Paise Zero Only
256	Reducer (As per Standard Specification)						
257	8"x6"	E001001	2.00	Nos	2,500.00	5000.00	INR Five Thousand & Paise Zero Only
258	8"x4"	E001002	2.00	Nos	2,400.00	4800.00	INR Four Thousand Eight Hundred & Paise Zero Only

Sl. No.	Item Description	Item Code	Quantity	UOM	Estimated Rate (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees Rs. P	TOTAL AMOUNT (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees	TOTAL AMOUNT In Words
259	6"x4"	E001003	2.00	Nos	2,050.00	4100.00	INR Four Thousand One Hundred & Paise Zero Only
260	4"x3"	E001004	2.00	Nos	1,950.00	3900.00	INR Three Thousand Nine Hundred & Paise Zero Only
261	4"x2"	E001005	3.00	Nos	1,450.00	4350.00	INR Four Thousand Three Hundred Fifty & Paise Zero Only
262	End Caps (As per Standard Specification)						
263	8"	E001101	2.00	Nos	2,800.00	5600.00	INR Five Thousand Six Hundred & Paise Zero Only
264	6"	E001102	2.00	Nos	1,900.00	3800.00	INR Three Thousand Eight Hundred & Paise Zero Only
265	4"	E001103	2.00	Nos	1,400.00	2800.00	INR Two Thousand Eight Hundred & Paise Zero Only
266	2"	E001104	2.00	Nos	800.00	1600.00	INR One Thousand Six Hundred & Paise Zero Only
267	Note:a) All butt welded fittings end shall generally match with connecting pipe wall thickness however in case of misalignment Contractor shall have to do end preparation without any extra cost.						
268	B) All coupling, nipples etc. as required shall be supplied by contractor but no separate payments shall be made as it is covered under erection rate.						
269	Supply of Valves						
270	Complete work of supply of valves including all taxes,duties,transportation and inspection charges but not limited to, the following items in accordance with relevant Specifications & relevant Data Sheets indicated in scope of work indicated in SCC, drawings, specification and instructions of EIC and as per provisions of the CONTRACT DOCUMENT						
271	Plug Valves						
272	BW 2" 300#	E001201	4.00	Nos	19,000.00	76000.00	INR Seventy Six Thousand & Paise Zero Only
273	Ball Valves						
274	BW, FB 8" 300#	E001202	2.00	Nos	1,70,000.00	340000.00	INR Three Lakh Forty Thousand & Paise Zero Only
275	BW, FB 6" 300#	E001203	2.00	Nos	1,45,000.00	290000.00	INR Two Lakh Ninety Thousand & Paise Zero Only
276	FE, FB 4" 300#	E001204	2.00	Nos	62,000.00	124000.00	INR One Lakh Twenty Four Thousand & Paise Zero Only
277	BW, FB 4" 300#	E001205	6.00	Nos	60,000.00	360000.00	INR Three Lakh Sixty Thousand & Paise Zero Only
278	BW, FB 2" 300#	E001206	4.00	Nos	20,000.00	80000.00	INR Eighty Thousand & Paise Zero Only
279	SW, FB 1" 800#	E001207	2.00	Nos	4,500.00	9000.00	INR Nine Thousand & Paise Zero Only
280	SW, FB ¾" 800#	E001208	2.00	Nos	4,000.00	8000.00	INR Eight Thousand & Paise Zero Only
281	Globe Valves						
282	FE 2" 300#	E001209	2.00	Nos	26,600.00	53200.00	INR Fifty Three Thousand Two Hundred & Paise Zero Only
283	ERECTION OF VALVES (As per P & ID) (Above Ground)						
284	Handling including lifting and transportation from COMPANY's warehouse to CONTRACTOR'S Stores and/or work site and installation of all types of valves including assembly of valve accessories, (if any) by bolting, threading or welding, supply and insertion of gaskets, nuts & bolts, nipples, etc. at all elevations of pipe sleepers, supports or overhead on racks, equipments nozzle, skid & painting etc. supply of all consumables, manpower, equipment, etc. for completion of all works as per scope of work and as per drawings, specifications and instructions of Engineer- in-charge including servicing/ cleaning of valve wherever required.						
285	Welded Valves (Full Bore/ Reduced Bore)						
286	8" 300#	E001301	2.00	Nos	10,500.00	21000.00	INR Twenty One Thousand & Paise Zero Only
287	6" 300#	E001302	2.00	Nos	8,500.00	17000.00	INR Seventeen Thousand & Paise Zero Only
288	4" 300#	E001303	6.00	Nos	6,500.00	39000.00	INR Thirty Nine Thousand & Paise Zero Only
289	2" 300#	E001304	14.00	Nos	4,500.00	63000.00	INR Sixty Three Thousand & Paise Zero Only
290	Flanged Valves (Full Bore/ Reduced Bore)						
291	8" 300#	E001305	2.00	Nos	8,500.00	17000.00	INR Seventeen Thousand & Paise Zero Only

Sl. No.	Item Description	Item Code	Quantity	UOM	Estimated Rate (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees Rs. P	TOTAL AMOUNT (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees	TOTAL AMOUNT In Words
292	6" 300#	E001306	3.00	Nos	6,500.00	19500.00	INR Nineteen Thousand Five Hundred & Paise Zero Only
293	4" 300#	E001307	2.00	Nos	4,500.00	9000.00	INR Nine Thousand & Paise Zero Only
294	2" 300#	E001308	6.00	Nos	3,250.00	19500.00	INR Nineteen Thousand Five Hundred & Paise Zero Only
295	Sockolet Welded Valve (Ball / Plug / Valves)						
296	1"	E001309	2.00	Nos	1,800.00	3600.00	INR Three Thousand Six Hundred & Paise Zero Only
297	¾"	E001310	4.00	Nos	1,800.00	7200.00	INR Seven Thousand Two Hundred & Paise Zero Only
298	Note : Erection of underground valves already covered in Mainline SOR Item code A00100						
299	RADIOGRAPHY						
300	Performance of radiographic inspection by gamma radiation as per scope of work and as per specifications in piping of all types and thickness including providing/hiring of all necessary equipments, supply of all consumables, and whatever else even though not expressly mentioned but required to perform the work as per specifications and instructions of Engineer-in-Charge (full circle re-radiography of the repaired joint and additional radiography necessitated due to poor performance of contractor's welder shall be carried out by the Contractor at his own cost and shall not be paid extra by Company). Radiographs shall be submitted to the Engineer-in-Charge for acceptance, whose decision shall be final and binding.						
301	8" NB	E001401	6.00	Nos	2,400.00	14400.00	INR Fourteen Thousand Four Hundred & Paise Zero Only
302	6"NB	E001402	16.00	Nos	2,000.00	32000.00	INR Thirty Two Thousand & Paise Zero Only
303	4"NB	E001403	24.00	Nos	1,400.00	33600.00	INR Thirty Three Thousand Six Hundred & Paise Zero Only
304	2"NB	E001404	44.00	Nos	700.00	30800.00	INR Thirty Thousand Eight Hundred & Paise Zero Only
305	FIELD INSTRUMENTS						
306	Supply of Pressure Gauges inclusive of supply of erection accessories as per data sheet.	E001501	5.00	Nos	7,500.00	37500.00	INR Thirty Seven Thousand Five Hundred & Paise Zero Only
307	Supply of Digital Pressure Gauges inclusive of supply of erection accessories.	E001502	5.00	Nos	3,500.00	17500.00	INR Seventeen Thousand Five Hundred & Paise Zero Only
308	Installation, Calibration, Testing & Commissioning of Pressure Gauges inclusive of supply of necessary piping materials/tubings alongwith all necessary valves & fittings, fabrication and installation of impulse lines/manifolds & hydraulic testing as per specification.	E001503	5.00	Nos	5,000.00	25000.00	INR Twenty Five Thousand & Paise Zero Only
309	SECTION-D(CIVIL WORKS)						
310	EARTH WORK IN EXCAVATION/ SITE GRADING AND BACKFILLING						
311	Earth work in excavation /site grading in all kinds of soil including soft rock in any plan dimension up to required depth including backfilling of excavated earth at any location in layers of 300mm and compacted up to 95% to its MDD at all heights and depths. Surplus and unserviceable earth shall be disposed up to any lead in all conditions. Soil to be levelled and neatly dressed complete in all respect as per scope of work, detailed construction drawings, technical specifications and direction of the Engineer-in-Charge.	F00101	48.00	CUM	450.00	21600.00	INR Twenty One Thousand Six Hundred & Paise Zero Only
312	Note:-						
313	1. This Rate shall be applicable only for excavation which are not included as a part of respective SOR Item.						
314	2.The Contractor shall take into account in his quoted rate the provision for excess excavation required for necessary working space, cutting in slopes etc., which may be required for excavation and other allied works and refilling the side slopes and working space in layers as per requirement.						
315	3.Rate to include cost of all labour, tools, tackles, equipment, hire charges, shoring, bailing and pumping out water as required etc. with all bye works and sundry works complete in all respects.						
316	4.NET CUM of excavated quantity in CUM shall be measured for payment.						
317	5. To be read in conjunction with Particular Job Specification.						
318	VALVE PIT						
319	Construction and handing over of RCC Valve Pit of approx. 1.8m x 1.8 m in size (internal dimension) as per technical specification and direction of engineer-in-charge complete in all respect. Scope of work shall be as per Sketch attached with the tender.	F00701	2.00	Nos	1,65,000.00	330000.00	INR Three Lakh Thirty Thousand & Paise Zero Only
320	Construction and handing over of RCC Valve Pit of approx. 2.0m x 2.0 m in size (internal dimension) as per technical specification and direction of engineer-in-charge complete in all respect. Scope of work shall be as per Sketch attached with the tender.	F00702	3.00	Nos	2,05,000.00	615000.00	INR Six Lakh Fifteen Thousand & Paise Zero Only
321	Construction and handing over of RCC Valve Pit of approx. 2.5m x 2.5 m in size (internal dimension) as per technical specification and direction of engineer-in-charge complete in all respect. Scope of work shall be as per Sketch attached with the tender.	F00703	2.00	Nos	2,50,000.00	500000.00	INR Five Lakh & Paise Zero Only
322	STEEL STRUCTURAL WORKS						
323	Steel structure Fabrication						

Sl. No.	Item Description	Item Code	Quantity	UOM	Estimated Rate (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees Rs. P	TOTAL AMOUNT (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees	TOTAL AMOUNT In Words
324	Supplying, Fabricating & Erecting in position steel structures fabricated out of MS Girders, channels, Tees, angle, flats, plate, square hollow sections pipes etc. conforming to IS:2062 and/or from pipes conforming to IS:1161 for structural purpose for cascade supporting structure, loading/unloading platform, Gratings for platform, catladder,handrails, hoardings for sinages, Lcv stand, etc. of any size/dia for required design including cutting, welding, bolting, hoisting, fixing in position, including application of one coat of primer at shop and second coat of primer at site after erection and two coats of finishing paint at site .The work is to be completed in all respect as per specification ,scope of work, detailed construction drawings and directions of the Engineer-in-charge.	F00801	220.00	KG	125.00	27500.00	INR Twenty Seven Thousand Five Hundred & Paise Zero Only
325	[Rate to include cost of all labour, nut, bolts, tools, tackles, hire charges royalties, levies, transportation, scrap value, gas cutting, welding, other consumables, paints, compressed air, water, electric power etc. all complete.]						
326	Providing and fixing Fencing Structure						
327	Supplying, fabricating & fixing steel structural fencing fabricated from pipes conforming to IS:1161 and plates conforming to IS:2062 & fixing of GI weldmesh made from 3mm GI wire @ 75 mm bothways to structural steel frame by means of welding/bolting, including applying two coats of approved quality of synthetic enamel paint over a priming coat of in approved shade including supply of all raw materials, bolts, electrodes, transportation, including making pokets & pouring with PCC (1:2:4) in of block 500x500x500 for fixing of posts etc complete as per enclosed drawing, technical specifications,scope of works and directions of the Engineer-In-Charge.						
328	Fencing height 2.1m	F00901	36.00	RM	3,500.00	126000.00	INR One Lakh Twenty Six Thousand & Paise Zero Only
329	Notes:						
330	The quantities indicated are estimated values and hence are approximate. Final payment will be made based on actual quantities to be certified by the Purchaser.						
331	The cost of MS bolts (permanent and service), washers, electrodes, putty, gases, cost of straightening the raw materials, cutting of flats from plates and providing splices, paints, tools, plants, etc., as required for the work shall be deemed to be included in the quoted rates.						
332	All handling and transport charges of raw materials and fabricated structures including double handling, as required, for completion of work in accordance with						
333	Time schedule, are deemed be included in the quoted rates						
334	All accessories like MS tower bolts, MS Pivot, MS Wheels, MS Tee section, locking arrangement etc. shall be measured by weight only.						
335	Contractor shall ensure proper alignment and smooth operation of Gate						
336	GROUND PENETRATING RADAR						
337	Carrying out subsurface utility survey along the proposed pipeline route and/ or as specified by Engineer-In- Charge for 10 m corridor using Ground Penetrating Radar (GPR) for depth upto 8 m below the existing ground level to locate and identify all existing underground utilities/buried objects including but not limited to pipelines, sewers, conduits, cables, drains, manholes, appurtenances etc in the proposed corridor along with location, DGPS coordinates, depth, shape and dimensional details of utilities. Four (4) Copies of Report and Drawings incorporating all collected datas shall be submitted as per scope of work and direction of the Engineer-in-charge. Scale of Drawing shall be Planimetry (X Axis 1:1000, Y Axis 1:100), Longitudinal Section (Z Axis 1:100) and Transverse Section at critical location.	F001001	10000.00	Meter	75.00	750000.00	INR Seven Lakh Fifty Thousand & Paise Zero Only
338	Hiring of Trailer/Truck (25-30 MT capacity) for transporting of any materials within the city as per instruction of EIC	H00100	20.00	HOURL	1,000.00	20000.00	INR Twenty Thousand & Paise Zero Only
339	Hiring of Hydra/Crane (12 MT-16 MT capacity)including fuel,required manpower ,lifting tools etc. for Loading & unloading of any materials within the city as per instruction of EIC	H00101	20.00	HOURL	1,200.00	24000.00	INR Twenty Four Thousand & Paise Zero Only
340	The contractor shall provide hard barricading as per standard specifications, including necessary painting and stenciling, for the entire duration of the awarded job. Note: Payment for the provision of barricading materials shall be made as a one-time payment upon confirmation of material availability at the project site. The contractor must ensure the availability of the barricading materials throughout the entire project duration. Reconciliation of material availability shall be carried out as per the instructions of the Engineer-in-Charge (EIC). In the event of any shortage of materials without proper documentation, the corresponding value shall be deducted from the Running Account (RA) bill. The number of shifts, transportation, and placement of hard barricading including all required manpower and machinery shall be deemed included in the laying rate of the above pipeline work.	I00100	100.00	RM	1,500.00	150000.00	INR One Lakh Fifty Thousand & Paise Zero Only
341	Note :-						
342	1.Survey Agency for execution of GPR Survey Work to be engaged by the Contractor shall be submitted for approval of GAIL/B&R prior to start of work.						
343	2. GPR Work shall be carried in presence of Contractor's Representative.						
Total in Figures						79668507.00	INR Seven Crore Ninety Six Lakh Sixty Eight Thousand Five Hundred Seven & Paise Zero Only
Quoted Rate in Figures				Select		0.00	INR Zero Only

Sl. No.	Item Description	Item Code	Quantity	UOM	Estimated Rate (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees Rs. P	TOTAL AMOUNT (inclusive of all applicable taxes & duties & other levies [if any] payable by the Contractor under the Contract, or for any other cause except final GST) in Rupees	TOTAL AMOUNT In Words
Quoted Rate in Words		INR Zero Only					



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



GAIL (India) Limited
(A Government of India Undertaking)
A Maharatna Company
GAIL Jubilee Tower, B-35 & 36, Sector-1,
Noida- 201301, State: Uttar Pradesh, India

TENDER REF.- GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

TENDER ID: 2026_GAIL_278290_1



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED
WORKS OF STEEL PIPELINE UNDER JAMSHEDPUR GA
(CITY AREA) FOR CITY GAS DISTRIBUTION NETWORK
(1 YEAR ARC)**

OPEN DOMESTIC COMPETITIVE BIDDING

VOLUME – II OF III



PREPARED AND ISSUED BY
BRIDGE AND ROOF COMPANY (INDIA) LIMITED
(A Govt. of India Enterprise)
KANKARIA CENTER (5TH FLOOR), 2/1 RUSSEL STREET,
KOLKATA – 700071, WEST BENGAL (INDIA)
PHONE: +91(33)2217-2108/2274.

 GAIL (india) LIMITED	OIL & GAS	STEEL LINE CONNECTIVITY TO CNG STATIONS AND OTHER CUSTOMERS/DRS ETC BY LAYING, HDD AND ASSOCIATED WORKS UNDER GA FOR CITY GAS DISTRIBUTION NETWORK FOR M/s GAIL (INDIA) LIMITED	 बी एण्ड आर B AND R <i>Building Nation Since 1920</i>
		BID DOCUMENT NO.	
TITLE	Volume II		Page 1 of 3 REVISION - 0



C O N T E N T S

LIST OF SPECIFICATIONS / STANDARDS



VOLUME-II OF III

I. TECHNICAL SPECIFICATION FOR MECHANICAL WORKS

1.	Specification for Preliminary Activities	BR/TS/021
2.	Specification for Excavation of Trench	BR/TS/022
3.	Specification for Taking Over, Handling, Handling, Stacking and Stringing Steel Pipes	BR/TS/023
4.	Specification for Preparation of Steel Pipes	BR/TS/024
5.	Specification for Lowering in	BR/TS/025
6.	Specification for Backfilling the Trench	BR/TS/026
7.	Specification for Obstacles Crossing and Special Passages	BR/TS/027
8.	Specification for Marking Out	BR/TS/028
9.	Specification for Testing	BR/TS/029
10.	Specification for Purging and Commissioning the Network	BR/TS/030
11.	Specification for Technical Records	BR/TS/031
12.	Specification for Construction of Valve Assembly	BR/TS/032
13.	Specification for Mainline Construction (Onshore)	BR/TS/033
14.	Specification for Welding of Onshore Gas Pipelines + Welding Specification Chart	BR/TS/034
15.	Specification for Hydrostatic Testing of Onshore Pipeline	BR/TS/035

 GAIL (india) LIMITED	OIL & GAS	STEEL LINE CONNECTIVITY TO CNG STATIONS AND OTHER CUSTOMERS/DRS ETC BY LAYING, HDD AND ASSOCIATED WORKS UNDER GA FOR CITY GAS DISTRIBUTION NETWORK FOR M/s GAIL (INDIA) LIMITED	 बी एण्ड आर B AND R <i>Building Nation Since 1920</i>
		BID DOCUMENT NO.	
TITLE	Volume II		Page 2 of 3 REVISION - 0

16.	Specification for major water Crossings	BR/TS/036
17.	Specification for Pipeline Crossing Roads, Railroads, Minor Water and Other Crossings	BR/TS/037
18.	Specification for Piping Fabrication and Erection	BR/TS/038
19.	Specification for Shop and Field Painting	BR/TS/039
20.	Specification for Repair of Pipeline Corrosion Coating	BR/TS/040
21.	Specification for Pipeline Markers	BR/TS/041
22.	Specification for Flushing and Testing of Piping Systems	BR/TS/042
23.	Specification for Casing Insulators and End Seals	BR/TS/043
24.	Specification for Field Joint Coating (Onshore Pipelines)	BR/TS/044
25.	Specification for Vents, Drains and Wells	BR/TS/045
26.	Specification for Gaskets, Bolts and Nuts	BR/TS/046
27.	Specification for Piping Material Specification	BR/TS/047
28.	Technical Specification for Pre-Commissioning and Commissioning	BR/TS/048
29.	Specification for Health, Safety and Environment Management (HSE)	BR/TS/049
30.	Specification for Quality Assurance System Requirements	BR/TS/050
31.	Specification for Documentation for Pipeline Construction	BR/TS/051
32.	Specification for Field Joint Coatings of Pipeline for HDD Crossing	BR/TS/052
33.	Specification for Pipeline Crossings	BR/TS/053

 GAIL (india) LIMITED	OIL & GAS	STEEL LINE CONNECTIVITY TO CNG STATIONS AND OTHER CUSTOMERS/DRS ETC BY LAYING, HDD AND ASSOCIATED WORKS UNDER GA FOR CITY GAS DISTRIBUTION NETWORK FOR M/s GAIL (INDIA) LIMITED	 बी एण्ड आर B AND R <i>Building Nation Since 1980</i>
		BID DOCUMENT NO.	
TITLE	Volume II		Page 3 of 3 REVISION - 0

	Using HDD Method	
34.	Specification for Warning Mats	BR/TS/054
35.	Specification for Seamless Fittings and Flanges [Size up to DN 400mm (16") NB]	BR/TS/055
36.	Specification for Assorted Pipes	BR/TS/056
37.	Specification for Ball Valves	BR/TS/057
38.	Specification for Plug Valves	BR/TS/058
39.	Specification for Insulating joint	BR/TS/059
40.	Specification for LR Bend	BR/TS/060

II. TECHNICAL SPECIFICATION FOR CIVIL STRUCTURAL WORKS

1.	Specification For Civil Engineering Works	BR/TS/061
2.	Specification for Anti-buoyancy measure (concrete weight coating and saddle weight)	BR/TS/062
3.	Technical Specification For Fabrication, Erection And Painting Of Steel Structures, Gates And Miscellaneous Works	BR/TS/063

III. TECHNICAL SPECIFICATION FOR CATHODIC PROTECTION WORKS

1.	Temporary Cathodic Protection System	BR/TS/064
2.	Corrosion Survey	BR/TS/065

IV. TECHNICAL SPECIFICATION FOR TELECOM

1.	Specification / Procedure for optical cable testing	BR/TS/066
----	---	-----------

PROCESS & PIPING DESIGN SECTION
BRIDGE AND ROOF CO. (INDIA) LTD.



SPECIFICATION
FOR
PRELIMINARY ACTIVITIES

SPECIFICATION NO.: BR/TS/021

C O N T E N T S

- 1.0 OBJECT
- 2.0 EQUIPMENT
- 3.0 DRAWINGS
 - 3.1 Surveys
 - 3.2 Construction Drawings
- 4.0 PERMITS
 - 4.1 Installation Permits
 - 4.2 Circulation Permit
 - 4.3 Digging Permit
 - 4.4 Trial-Hole Permit
- 5.0 STAKING OUT

1.0 **OBJECT**

This specification refers to the preliminary activities to be taken prior to digging the trenches.

2.0 **EQUIPMENT**

The Contractor shall supply all equipment necessary for the execution of the Works, from topographical survey until tests and commissioning operation, including all safety devices necessary to meet worker as well as public safety standards.

3.0 **DRAWINGS**

The contractual documents indicate the streets where pipe lines are to be laid. In order to set up the pipelines routes, the Contractor shall draw-up the following documents.

3.1. **Survey**

The contractor shall carry out a complete topographical survey of each street, in accordance with the general specification "Drawings" showing in particular.

- the limits of public and private lands
- the limits of carriage-ways and side walks
- the above-grounds obstacles.

3.2 **Construction Drawings**

Onto the above mentioned survey drawings, the Contractor shall draw-up:

a) **The underground obstacles**


The Contractor shall carry out a subsurface inspection in order to locate the underground obstacles and the utilities in the total width of the streets, carriage-ways and sidewalks.

The Contractor shall get all available information and drawing from the authorities in charge of underground utilities such as water, electricity, communications, etc.

The Contractor shall carry out the subsurface inspection using a pipe locator and by digging trial-holes.

b) **The proposed pipelines routes****Public land**

The pipeline shall normally be laid in public land, as follows:

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR PRELIMINARY ACTIVITIES	
SPECIFICATION NO. : BR/TS/021		REV-0	Page 3 of 4

- basic grid

The basic grid pipelines shall be under the carriage-ways, except where they can be laid under the sidewalks, as are the distribution networks pipelines.

- distribution network

The distribution network pipelines shall be under the sidewalks, not closer to the building line than one meter and to the other utilities than 0.40 meter. If not possible, as proved by trail-holes, they shall then be laid under the carriage-ways as close as possible to the sidewalks but not under the gutters.

Private land

In case a pipeline section would have to be laid in private land, the Contractor shall obtain from the owner the necessary written authorization on behalf and in liaison with the company, while the construction drawing is being drawn-up.

c) Pipeline equipment locations

The pipeline equipment such as valve chambers, buried valves, connecting box chambers, etc. shall be installed in public land. The pipeline equipment locations shall be shown on the construction drawings.

Whenever possible, the sight holes shall be situated at sidewalk surface level.

The drawing shall be submitted to the Engineer for approval of the survey and of the construction drawings.

The drawings shall be submitted, in the number stipulated by the special specifications at least one month before starting excavation of the streets concerned.

Approval of the drawings shall be needed for obtaining the digging permit.

Such an approval will not prevent the Engineer from ordering a change of route if unexpected above ground or underground obstacles, or any other difficulties are encountered later on.

4.0


PERMITS

4.1

Installation Permits

The Contractor shall obtain form the concerned Authorities such as the Municipality, Administrations, etc the installation permits for installing:

- stores ad workshops
- material stock yards
- backfill material yards

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR PRELIMINARY ACTIVITIES	
SPECIFICATION NO. : BR/TS/021		REV-0	Page 4 of 4
	<ul style="list-style-type: none"> - earth spoil dumps - etc. 		
4.2	<p>Circulation Permit</p> <p>The Contractor shall obtain from the concerned Authorities the circulation permit for the heavy equipment (cranes, lorries, trucks, etc.) that he may wish to use during the construction of the Works.</p> <p>Any damage resulting from the use of heavy equipment shall be charged to the Contractor.</p>		
4.3	<p>Digging Permit</p> <p>Before any occupation of public land, the Contractor shall request in writing the digging permit from the appropriate authorities, in the way and time stipulated by the special conditions and/or specifications.</p>		
4.4	<p>Trial-Hole Permit</p> <p>The Contractor shall request in writing the necessary trial-hole permits from the appropriate authorities in the way and time stipulated by the special conditions and/or specifications.</p> <p>Moreover the Contractor shall appoint a representative who shall settle any problem raised by the occupation of public land and private land if any. In particular, he shall be in charge of making all necessary arrangements with the traffic police prior to the starting of the work and of dealing with all conflicts arising from the work process. He shall also be in charge of dealing with all problems raised by the different utilities, authorities and private persons.</p>		
5.0	<p><u>STAKING OUT</u></p> <p>The Contractor shall give notice to the Engineer, before staking out the pipelines routes.</p> <p>The pipelines routes shown on the construction drawings shall be confirmed by digging trial-holes.</p> <p>The final pipeline route set-up, taking consideration of the spotted underground obstacles, shall be marked on the street surface with due agreement of Engineer-in-charge.</p> <p>The staked out pipeline route shall not be altered without the prior authorization of the Engineer.</p>		

PROCESS & PIPING DESIGN SECTION
BRIDGE AND ROOF CO. (INDIA) LTD.



SPECIFICATION
FOR
EXCAVATION OF THE TRENCH

SPECIFICATION NO.: BR/TS/022

C O N T E N T S

1.0	OBJECT
2.0	MATERIALS AND EQUIPMENT
3.0	ROUTE
4.0	SIZE OF THE TRENCH
5.0	CLEARING
6.0	REMOVAL OF ROAD SURFACINGS
7.0	DIGGING OF THE TRENCH
8.0	SHEETING AND BRACING OR PROPPING
9.0	DEWATERNNNG
10.0	JOINT HOLES
11.0	EXCAVATED MATERIAL
12.0	SIGNALING, FENCING AND LIGHTING
13.0	ENCLOSURE

1.0 **OBJECT**

This specification refers to the excavation, clearing and finishing of the trenches in which the pipelines are to be laid.

2.0 **MATERIALS AND EQUIPMENT**

The Contractor shall supply all materials and equipment necessary for the excavation, clearing and finishing works of the trench, for the transport of excavated earth and backfill material, for the draining of the trenches and for any equipment such as bracing, props, casings, channels and pipes required for the proper execution of the works. The Contractor shall obtain from the relevant authorities all the necessary authorization for using these materials and equipment.

3.0 **ROUTE**

The route of the trench shall be marked on the ground according to the final route determined with the Engineer.

Where the excavation is carried out by hand, the two edges of the trench shall be marked on the ground. Where a machine is used one edge only shall be marked, since the width of the trench depends on the size of the trenching equipment.

The route of the trench shall be such that the axis of the pipeline shall be not less than one meter from the building line, unless otherwise requested by Engineer for specific reasons.

Should obstacles be encountered, the Contractor shall dig trial holes around these obstacles until a route is accepted by the Engineer.


In all cases, it shall be the responsibility of the Contractor to check for the existence of any and all underground utilities along the route of the trench. Omission on the construction drawings shall not be considered as the non existence of underground utilities or obstacles. The Contractor shall in particular make provision for any new facilities having been laid after the Construction drawings were drawn-up.

4.0 **SIZE OF THE TRENCH**

The width of the trench shall be the outside diameter of the pipe plus 0.20 meter.

The minimum depth of the trench shall be such as to provide a cover over the crown of the pipe as specified in the Specifications/ SCC.

When necessary, in case of obstacle crossings, tie-ins, etc. It shall be the responsibility of the Contractor to make the trench wider and deeper than specified above in order to have sufficient working space.

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR EXCAVATION OF THE TRENCH	
SPECIFICATION NO. : BR/TS/022		REV-0	Page 3 of 6

At obstacles crossings or underground utilities or works, the trench shall be excavated to a depth giving the minimum clearance specified in the specification “Obstacle crossings and special passages.”

5.0 **CLEARING**

5.1 **Removal of Obstacles**

The Contractor shall clear the work-site of any obstacles such as stocks of road building materials, sight holes, temporary barracks, et c. in agreement with the appropriate authorities.

The Contractor shall settle the matter with the appropriate authorities even if new obstacles appears after construction drawing have been drawn-up.

5.2 **Circulation**

The Contractor shall carry out all clearing work necessary for the free and safe circulation of pedestrians and road users.

The Contractor shall ensure the free and safe trench crossing for pedestrians and vehicles.

Wherever the trench is excavated along or across streets, roads and sidewalks the Contractor shall install temporary bridges for pedestrians and vehicles as specified in the Specifications/ SCC. Steel plates shall be installed on the whole length of road crossings, so that the roads crossed by the trench are not narrowed.


5.3 **Modifications of Traffic**


Wherever, due to the dimension of the streets or the traffic condition, it will be necessary to modify, limit, divert or even stop temporarily the traffic, the Contractor shall deal with the Municipality and Police authorities and inform the Engineer-in-charge of the arrangements agreed upon.


6.0 **REMOVAL OF ROAD SURFACINGS**

Road surfacing shall be removed by appropriate cutters, in the case of asphalt, bitumen or cement surfacing. Cobbles, slabs, bricks or ceramic paving-stones shall be removed with care for possible reuse. Materials unsuitable for reuse shall immediately be removed from the site as digging proceeds. Materials suitable for reuse shall tidily be piled-up as directed by the Engineer.

7.0 **DIGGING OF THE TRENCH**

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR EXCAVATION OF THE TRENCH	
SPECIFICATION NO. : BR/TS/022		REV-0	Page 4 of 6
<p>The Contractor shall trench to the specified depth and width. In large and busy streets the maximum total length and duration of open trench shall be given in the special specifications or as decided by Engineer-in-charge.</p> <p>The maximum length of open trench may be extended subject to the approval of the Engineer.</p> <p>The sides of the trench shall be cleared of any roughness which could damage the coating of the pipes during lowering-in.</p> <p>The bottom of the trench shall be uniformly graded and free from stones, rocks, pebbles, gravel or other objects which could damage the coating.</p> <p>Underground facilities, such as water pipes, electric cables, telephone cables, located within the limit of the trench shall be carefully exposed by hand excavation.</p> <p>The Contractor shall be liable for all damages and injuries caused to encountered utilities and shall deal with the matter with the appropriate authorities.</p>			
8.0	<u>SHEETING AND BRACING OR PROPPING</u>		
8.1	<p>Trench</p> <p>The Contractor shall carry out the sheeting or bracing wherever required by the nature of the ground and/or the depth of the trench, and whenever the Engineer so requires.</p> <p>Sheeting or bracing shall not be removed until the backfilling progress allows their removal without any risk of injury to the personal or damage to the coating.</p> <p>The Contractor shall be responsible for the application of the safety regulations in force and for the consequences of inadequate or insufficient safety measures.</p>		
8.2	<p>Existing Structures</p> <p>Any structure which may be damaged during the excavation work shall be protected.</p> <p>Trenches, located near electricity poles, lamp-posts or foundations shall be propped; the propping shall be kept until the end of the backfilling and left if necessary.</p> <p>Wherever underground lines or utilities interfere with construction work, the Contractor shall take the necessary measures to preserve the continuous use of the utilities during and after the gaslines construction work in accordance with the concerned authorities requests.</p> <p>The Contractor shall be responsible for the consequences of inadequate or insufficient safety measures.</p>		

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR EXCAVATION OF THE TRENCH	
SPECIFICATION NO. : BR/TS/022		REV-0	Page 5 of 6
9.0	<u>DEWATERING</u>		
9.1	In The Trench		
	<p>The Contractor shall keep the trench free from water.</p> <p>The Contractor shall provide pumps, shoring equipment and all equipment and material required to maintain the trench in good condition until the pipe is laid and the trench backfilled.</p>		
9.2	Outside of The Trench		
	<p>The excavated materials shall not interfere with the flow of water when the trench passes alongside a road; this flow shall be maintained by a drain or if necessary by deviating the opposite gutter.</p> <p>The excavated of the trench shall not interrupt the flow of water. At each street crossing, a gutter shall be tunnelled and underpinned by means of planks. If the gutter cannot be kept in use it shall be replaced by a duct.</p>		
10.0	<u>JOINT HOLES</u>		
	<p>Where tie-ins are to be made in the bottom of the trench, the Contractor shall dig joint holes in order to allow unrestricted welding coating and wrapping as well as the relevant inspections.</p>		
11.0	<u>EXCAVATED MATERIAL</u>		
	<p>The excavated material shall be placed in such a way as to avoid any inconveniences to property owner, or interference to the circulation of pedestrians or vehicles as well as to the operation of near-by installations. The excavated material shall be piled up in such a way that they enable the watering of the trees. No excavated material shall be piled up in the road crossings.</p> <p>To prevent the excavated stone and earth from falling into the trench, a strip 20 cm wide shall be left clear between the edge of the trench and the bottom of the pile of excavated earth. This width may be increased according to the nature of the ground and the atmospheric conditions.</p> <p>Wherever necessary, the Engineer may require the excavated material to be removed from the site and to be kept at a dump yard until the trench is to be back filled and to be brought back to the site for backfilling.</p> <p>When the excavated material is judged by the Engineer to be unsuitable for re-use, the Contractor shall remove it from the site as the digging of the trench proceeds and shall supply in its place suitable material approved by the Engineer.</p>		


BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR EXCAVATION OF THE TRENCH	
SPECIFICATION NO. : BR/TS/022		REV-0	Page 6 of 6
12.0	<u>SIGNALING, FENCING AND LIGHTING</u>		
12.1	Signalling		
12.1.1	<u>Site Identification</u>		
	Each site shall be provided with an identification board mentioning the reason for the work and the names of the Company, the Contractor and the Consulting Engineer, as stipulated in the Specifications and SCC.		
12.1.2	<u>Traffic Signals</u>		
	At both ends of the trench the Contractor shall install 2 traffic signs one immediately close to the trench and the other ahead, as required by the Engineer.		
12.2	Fencing		
	The Contractor shall fence all working areas. He shall also fence both sides of temporary bridges, when required by the Engineer.		
12.3	Lighting		
	The Contractor shall install lights around all working areas in accordance with the Specifications/ SCC. The voltage shall conform to the safety regulations in force.		
	The Contractor shall install signaling, fencing and lighting of all trial-holes, trench section and other excavations.		
	The Contractor shall provide watchmen wherever deemed necessary for the safety of the public and of the workers, in particular as regards working sites, on site material stockage, temporary dumping yards, etc.		
13.0	<u>ENCLOSURE – (2 NOS. SKETCHES)</u>		

PROCESS & PIPING DESIGN SECTION
BRIDGE AND ROOF CO. (INDIA) LTD.




SPECIFICATION
FOR
TAKING OVER, HANDLING, HAULING,
STOCKING AND STRINGING STEEL PIPES


SPECIFICATION NO.: BR/TS/023

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR TAKING OVER, HANDLING, HAULING, STOCKING AND STRINGING STEEL PIPES	
SPECIFICATION NO. : BR/TS/023		REV-0	Page 1 of 5

C O N T E N T S

1.0	OBJECT
2.0	EQUIPMENT
3.0	TALKING OVER PIPE AND PIPELINE ACCESSORIES
4.0	HANDLING AND STOCKING PIPES AND PIPELINE ACCESSORIES
4.1	Bare Pipes
4.2	Coated Pipes
4.3	Pipeline Accessories
5.0	STRINGING PIPES AND PIPELINE ACCESSORIES
6.0	USING CROP-ENDS
7.0	INVENTORY
8.0	RECOVERY AND STORAGE

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR TAKING OVER, HANDLING, HAULING, STOCKING AND STRINGING STEEL PIPES	
SPECIFICATION NO. : BR/TS/023		REV-0	Page 2 of 5
1.0	<u>OBJECT</u> <p>This specification refers to the taking over, handling, hauling, stocking and stringing of the pipes and equipment to be used in the construction of the distribution networks</p>		
2.0	<u>EQUIPMENT</u> <p>The Contractor shall supply the equipment which is required for the loading, hauling, unloading, stocking and protecting the pipes and pipeline equipment.</p> <p>The equipment used by the Contractor shall be adapted to the condition of the roads and tracks, the relief of the land, the characteristics of the pipes and the construction schedule.</p>		
3.0	<u>TAKING OVER PIPES AND PIPELINE ACCESSORIES</u> <p>The Contractor shall check the packing lists and bill of loading and send them to the Engineer, with acceptance or reservation for shortage or damage.</p> <p>Should no reservation be mentioned in these document, the Engineer may consider that the Contractor has received and accepted all pipes and pipeline accessories listed in these documents. Any missing or damaged pipe of pipeline accessory shall be replaced or repaired by the Contractor.</p> <p>All demurrage charge incurred be cause of a delay in unloading/ loading the pipes or pipeline accessories shall be borne by the Contractor.</p>		
4.0	<u>HANDLING AND STOCKING PIPES AND PIPELINE ACCESSORIES</u> <p>The Contractor shall take all the necessary steps and precaution to ensure that the bare or coated pipes are not damaged during loading, hauling, unloading and stocking.</p>		
4.1	<u>Bare Pipes</u> <p>The pipe shall be handled with care, in order to prevent damage. The use of steel cable, of chains wound round the pipes, of steel hooks is strictly prohibited. Nevertheless, lifting hooks equipped with a bent brass copper plate, placed within each pipe end, may be used, when approved by the Engineer.</p> <p>During haulage the pipes shall be wedged and protected in such a way as to prevent any distortion, flattening or damage to pipe ends and as to have no contact with the adjacent pipe.</p> <p>The maximum number of layers of bare pipes, both on the vehicles used for hauling and in the ground stock yard shall be determined in order to prevent distortion and flattening.</p>		

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR TAKING OVER, HANDLING, HAULING, STOCKING AND STRINGING STEEL PIPES	
SPECIFICATION NO. : BR/TS/023		REV-0	Page 3 of 5

The pipe layers shall be wedged to avoid any accidental rolling.

If not flat, the stock yard shall be levelled by the Contractor. The pipes shall be supported clear from the ground by skids.

4.2 Coated Pipes

In addition to the precautions here above mentioned for the bare pipes the Contractor shall handle and stock the coated pipes under the following conditions.

4.2.1 Handling

The use of claws, pliers, chains, slings and ropes for crane lifting is prohibited.

The recommended devices are: twisted hemp, plastic or leather straps, at least 100 mm wide, and a swing-bar for limiting the flexion of the pipes. The wood planks used for handling shall be perfectly smooth or coated with plastic strips on both faces.

When the water is hot the Contractor shall handle the coated pipes during the cool hours of the day. The Contractor shall avoid handling the coated pipes when the ambient temperature is 0°C and below.

4.2.2 Stocking

The Contractor shall not stock on the same pile :

- coated pipes of different diameters,
- crossed layers of coated pipes.


The pipe shall be supported clear from the ground by skids and wedges, either coated with neoprene strips, 25 to 30cm wide, having a padding approved by the Engineer.


In the stock yard the maximum number of layers of coated pipes for a pile is as follows:

<u>Nominal pipe diameter</u>	<u>Number of layers</u>
25 mm	10
32 mm	8
50 mm	6
80 mm and more	2

Between the pipe layers, the Contractor shall place neoprene strips, matting or any other flexible material approved by the Engineer.

4.3 Pipeline Accessories

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR TAKING OVER, HANDLING, HAULING, STOCKING AND STRINGING STEEL PIPES	
SPECIFICATION NO. : BR/TS/023		REV-0	Page 4 of 5
<p>The pipeline accessories, such as valves, insulating flanges, flanges, etc. shall be stocked under temporary shelters such as tarpaulins, nylon sheets and kept clear from the ground by wood planks or any approved isolating devices. Both ends of valves and insulating flanges shall be temporarily sealed by wooden plugs or plastic caps to prevent dust, dirt and moisture from entering.</p>			
5.0	<p><u>STRINGING PIPES AND PIPELINE ACCESSORIES</u></p> <p>The pipes shall be strung along the edge of the trench in such a way that:</p> <ul style="list-style-type: none"> - they cause no inconvenience to the road and street traffic and no damage to roads, streets and alleys, - they are neither in danger of being damaged by Contractor's machines nor by road users vehicles. <p>The Contractor shall be responsible for stringing the pipes and pipeline accessories at the proper location in according with the construction drawings.</p> <p>The strung coated pipes shall be kept clear from the ground by padded skids.</p> <p>The valves, insulating flanges, cathodic protection and regulator equipment shall be brought from the stock yard to the site at the time of their installation.</p> <p>The pipes and pipeline accessories that are to be installed in flooded areas or areas likely to be flooded shall not be supplied until the moment of assembly.</p>		
6.0	<p><u>USING CROP-ENDS</u></p> <p>The Contractor shall ensure the transport of any usable crop-ends to the locations where they can be used, taking care that there are no more than three (3) welds over a ten (10) meter straight length of pipeline.</p> <p>The length of a crop-end pipe considered as usable shall be at least:</p> <ul style="list-style-type: none"> - 0.50 m for pipes having a nominal diameter of 200 mm and less: - two diameters for pipes having a nominal diameter of 250 mm and over. <p>The maximal total length of unusable crop-ends (pipes rejected for reasons attributed to the Contractor and pipes used for welding process approval test and welder qualification tests) shall be fixed at three per thousandths of the total length per category of pipe supplied by the Company. The surplus of unusable lengths shall be chargeable to the contractor.</p>		
7.0	<p><u>INVENTORY</u></p>		

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR TAKING OVER, HANDLING, HAULING, STOCKING AND STRINGING STEEL PIPES	
SPECIFICATION NO. : BR/TS/023		REV-0	Page 5 of 5

The Contractor shall for each category of pipe, keep a permanent inventory of the pipes and pipeline accessories he has received.

After the execution of the works, and for the pipes supplied by the Company, the Contractor shall draw-up a list of unused pipes and usable crop-ends. This document shall be part of the technical records to be given to the Engineer.

8.0 **RECOVERY AND STORAGE**

When the pipes have been supplied by the Company, the pipes remaining after the construction of the pipe lines as well the usable crop-ends shall be marked by the Contractor, hauled and stored in a place determined by the Engineer.

The parts stored shall be classified by category according to their characteristics (diameter, thickness, grade of steel)


These operations must be finished by the date of "Completion of the Work".

PROCESS & PIPING DESIGN SECTION
BRIDGE AND ROOF CO. (INDIA) LTD.



SPECIFICATION
FOR
PREPARATION OF THE STEEL PIPES

SPECIFICATION NO.: BR/TS/024

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR PREPARATION OF THE STEEL PIPES	
SPECIFICATION NO. : BR/TS/024		REV-0	Page 1 of 5

CONTENTS

1.0	OBJECT
2.0	MATERIALS AND EQUIPMENT
3.0	CHECKING THE PIPES
4.0	INTERNAL CLEANING
5.0	CLEANING THE ENDS
6.0	CUTS AND BEVELS
6.1	Straight Pipes
6.2	Mitered Pipes
7.0	DIRECTION DIVERSION
7.1	Flexion
7.2	Field Cold Bending
7.3	Factory Elbows
7.4	Mitered Bends
8.0	TEES
9.0	CHECKING OF INSIDE SECTION
10.0	REJECTED PIPES

1.0 OBJECT

This specification refers to the checking, cleaning, cutting and bending of steels pipes before welding.

2.0 MATERIALS AND EQUIPMENT

The Contractor shall supply the materials, equipment, machines and accessories necessary for the preparation of the pipes.

The bending machines shall be fitted with the proper equipment and in particular internal mandrels, if required by the pipe diameter and wall thickness. The wearing parts shall be in good condition and renewed as soon as required.

Any machine producing defective bends shall be immediately replaced.

The electric tools such as brushes and grinders shall be fitted with the regulation safety devices.

3.0 CHECKING THE PIPES

The Contractor shall examine each pipe before its preparation.

Any pipe showing defects, such as distortion, flattened ends, bumps, notches, grooves, scratches, corrosion pits, shall be put aside for examination by the Engineer who may order the rejection, repair or cutting of the pipe in order to eliminate the defect.

4.0 INTERNAL CLEANING


Before assembling the pipes shall be cleaned internally by running a pipe brush.


All operations shall be conducted in such a way as to prevent any foreign matters from entering into the pipelines.

5.0 CLEANING THE ENDS

Before proceeding to the pipes and immediately before executing the root bead, each pipe-end shall be cleaned down to the metal by a rotary wire brush file or grinder, if necessary.

This cleaning shall be carried out on the bevel and land as well as on the inside and outside walls of the pipe and over a distance of at least five (5) centimeters.

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR PREPARATION OF THE STEEL PIPES	
SPECIFICATION NO. : BR/TS/024		REV-0	Page 3 of 5
6.0	<u>CUTS AND BEVELS</u> <p>The cuts and bevels shall be made, either with cutting torch and bevelling machine or with any other machine approved by the Engineer.</p>		
6.1	Straight Pipes <p>Hand cutting by torch is forbidden.</p> <p>The plane of the cut shall be perpendicular to the axis of the pipe.</p> <p>The rough-cut pipe ends shall be ground so that bevels and lands meet the bevelled pipes specifications.</p>		
6.2	Mitered Pipes <p>For the mitered pipes the plane of the cut is not perpendicular to the axis of the pipe : hand cutting by torch is allowed.</p> <p>The pipe shall be bevelled by grinding.</p>		
7.0	<u>DIRECTION – DIVERSION</u>		
7.1	Flexion <p>There is no flexion permitted during laying of basic grid steel pipes.</p> <p>In all other cases the diversion of the pipes in the field shall be carried out by cold bending or by using factory elbows and miter bends.</p>		
7.2	Field Cold Bending <p>The bending of coated pipes in the field shall only be carried out with the approval of the Engineer, all coating repair being the responsibility of the Contractor.</p> <p>The bending shall be so done as to avoid any flattening or buckling.</p> <p>Any flattened or buckled pipe shall be rejected.</p> <p>On longitudinally welded pipe, bending shall be so done that the seam is 15 (fifteen) degrees from the neutral axis of the bend.</p> <p>When several welded pipes are to be bent together, no bending shall be done on the tie-in-weld.</p> <p>Out-of-roundness measured across the maximum and minimum cross section at the center of the bend shall not exceed 2.5% of the pipe O.D.</p>		

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR PREPARATION OF THE STEEL PIPES	
SPECIFICATION NO. : BR/TS/024		REV-0	Page 4 of 5
7.3	Factory Elbows <p>The Contractor may use factory elbows or segments cut there from, provided that the arc length measured along the crotch is at least 25.4 mm on pipes 50 mm in diameter and larger.</p>		
7.4	Mitered Bends <p>Mitered bends are not permitted on pipelines intended to operate at 30 percent or more of the specified minimum yield limit elastic strength. Deflection caused by misalignment up to 3 degrees are not considered as miters.</p> <p>Mitered bends are permitted for pipelines intended to operate at less than 30 percent of the specified minimum yield strength. However, it shall be used only after due approval from Engineer-in-charge.</p> <p>In that case, the Contractor may use miter bends for deflections angles equal to or less than 12.5°.</p> <p>The minimum distance between miters, measured at the crotch shall not be less than one pipe diameter.</p>		
8.0	<u>TEES</u> <p>Whenever the pipelines are to be internally cleaned by scrapers or spheres the Contractor shall weld flush with the branch of the tees the necessary number of guiding bar in order to avoid any blockage.</p>		
9.0	<u>CHECKING OF INSIDE SECTION</u> <p>A pipeline to be cleaned by scrapers after the internal cleaning of foreign materials the inside section of each straight and bent pipe shall be checked by running a gauge made of two steel plates and approved by the Engineer.</p> <p>The distance between the plates shall be equal to twice the nominal diameter of the pipe to be checked. The diameter of the plates will be 95% of ID or as given in the specifications/ SCC or as directed by Engineer-in-charge.</p> <p>Any pipe whether bent or not which does not allow the free run of the gauge shall be rejected.</p>		

10.0

REJECTED PIPES

The rejected pipes shall be marked “REJECTED” in red paint.

These pipes shall be immediately removed from the work site by the Contractor hauled and stocked at a depot approved by the Engineer.

PROCESS & PIPING DESIGN SECTION
BRIDGE AND ROOF CO. (INDIA) LTD.



SPECIFICATION
FOR
LOWERING IN

SPECIFICATION NO.: BR/TS/025

BRIDGE AND ROOF
CO. (I) LTD.

PROCESS & PIPING
DESIGN SECTION

SPECIFICATION
FOR
LOWERING IN




SPECIFICATION NO. : BR/TS/025

REV-0

Page 1 of 3

CONTENTS

- 1.0 OBJECT
- 2.0 EQUIPMENT
- 3.0 CAPPING PIPELINE SECTIONS
- 4.0 LOWERING-IN
- 5.0 FLOODED TRENCH
- 6.0 AIR PRESSURIZING PIPELINE SECTIONS

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR LOWERING IN	
SPECIFICATION NO. : BR/TS/025		REV-0	Page 2 of 3
1.0	<p><u>OBJECT</u></p> <p>This specification refers to the lowering-in of the pipelines.</p>		
2.0	<p><u>EQUIPMENT</u></p> <p>The Contractor shall supply the equipment necessary for lifting, handling a lowering-in the pipelines and for protecting their coating; the list and the characteristics of the equipment shall be approved by the Engineer.</p> <p>The lifting equipment shall be provided in sufficient quantity and having a strength adapted to the characteristics of the pipeline and to the lowering-in methods in order that the pipelines suffer no unusually heavy stresses during the lowering operations.</p> <p>The lifting equipment accessories such as roller cradles, slings, wedges shall such that no damages is caused to the coating.</p> <p>The dimension and type shall be approved by the Engineer.</p>		
3.0	<p><u>CAPPING PIPELINE SECTIONS</u></p> <p>Before lowering-in a pipeline section, both ends shall be capped in such a way as to prevent stones and earth from entering the pipeline section during the lowering in operations. The caps shall be of a type approved by the Engineer and shall removed just before welding.</p>		
4.0	<p><u>LOWERING-IN</u></p> <p>The Contractor shall carry out the lowering-in immediately after the Engineer has checked :</p> <ul style="list-style-type: none"> • The quality and the quantity of lifting and handling machines and devices; width non-abrasive slings or bents shall be used for lowering-in the pipelines. All lowering-in devices and padded skids shall be subject to close inspection to ensure that the coating is not damaged before the pipe reaches the bottom of the trench. • The good condition of the coating and its quality of insulation; when the pipeline is constructed with previously coated pipes, not lowered-in directly but placed on skids above or beside the trench the quality of the coating shall be systematically checked, and any necessary repairs shall be carried out in conformity with the specification. • The good condition of the trench; when the coated pipeline is to be lowered-in the bottom shall be free of brushes, skids, pipes, crops, rocks, hard lumps of earth or clay, sticks, so that the protective coating shall not be punctured nor abraded. 		

Before lowering-in the pipelines the trench shall be padded with a minimum 10 cm compacted padding such as sand or a soft material agreed by the Engineer.

Immediately after lowering-in the pipelines, the Contractor shall place 20 cm of soft material over them.

When a flexion laying of the pipeline is authorized the pipes shall be maintained in the middle of the trench by means of sand bags.

5.0 **FLOODED TRENCH**

When the trench contains water or mud the trench shall be dried and cleaned before lowering-in any of the pipeline sections.

However for certain locations of a limited length the Contractor may propose for the approval of the Engineer a procedure which, without drying out the trench enables the pipeline sections to be normally laid in the bottom of the trench.

6.0 **AIR PRESSURIZING PIPELINE SECTIONS**

As soon as possible after lowering-in the pipeline sections shall be air-pressurized at 1 kg/cm^2 and the constructed portions of network shall be maintained so pressurized until tightness tests.

PROCESS & PIPING DESIGN SECTION
BRIDGE AND ROOF CO. (INDIA) LTD.





SPECIFICATION
FOR
BACKFILLING THE TRENCH

SPECIFICATION NO.: BR/TS/026

C O N T E N T S

1.0	OBJECT
2.0	MATERIALS AND EQUIPMENT
3.0	BACKFILLING
3.1	Soft Layer
3.2	Above The Soft Layer
3.3	Temporary Reconditioning
4.0	PROTECTION OF BACKFILL
5.0	CLEANING
6.0	FINAL RESURFACING
7.0	OBSTACLES
8.0	SETTLEMENT OF DAMAGES
9.0	ENCLOSURE

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR BACKFILLING THE TRENCH	
SPECIFICATION NO. : BR/TS/026		REV-0	Page 2 of 4
1.0	<u>OBJECT</u> <p>This specification refers to the backfilling of the trench after the lowering-in of the gas pipelines and to the reconditioning of the surface after the completion of the works.</p>		
2.0	<u>MATERIALS AND EQUIPMENT</u> <p>The Contractor shall supply the materials and equipment necessary for backfilling the trench and reconditioning the surface in particular:</p> <ul style="list-style-type: none"> - the soft materials necessary for protecting the pipe line when they are not present in the backfill - new backfill material to replace that which is considered unsuitable by the Engineer - the materials necessary for reconditioning the surface - the equipment required for hauling, backfilling, compacting and reconditioning <p>The materials and equipment, as well as their conditions of use shall be approved by the Engineer.</p>		
3.0	<u>BACKFILLING</u> <p>The backfilling of the trench shall follow the lowering-in of the pipe so that the coating is not exposed to excessive temperature : variations and the Contractor shall carry out the backfilling operations as soon as the Engineer has checked in particular:</p> <ul style="list-style-type: none"> - the good condition of the coating and any coating's mechanical protection - the on site availability materials necessary for the restoration of drains where a crossing over drained areas is involved as well as the on site availability of warning devices to be installed. - the quality of the backfill material which has been brought in 		
3.1	Soft Layer <p>The pipelines shall be surrounded with sand or approved soft material under on the sides of and above.</p> <p>Soft layer of stone free earth, coming from the excavated material may also be used for above purpose if suitable. Sifting the earth on the work site shall be forbidden.</p> <p>The used of salty sands or sands composed of grains with sharp edges shall be forbidden.</p> <p>In all cases, backfilling shall be carried out to the satisfaction of the Engineer and so that no damage can be caused to the pipe coating.</p>		
3.2	Above The Soft Layer		

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR BACKFILLING THE TRENCH	
SPECIFICATION NO. : BR/TS/026		REV-0	Page 3 of 4

After the soft layer a warning device as specified in the material specifications/ SCC shall be placed 0.20 m above the upper tangent of the pipeline. When two pipelines are to be laid in the same trench the Contractor shall place two two warning devices.

Then the backfilling shall be completed with the excavated material by 0.15 m thick layers, each layer being compacted by machines following a procedure approved by the Engineer.

3.3 Temporary Reconditioning

3.3.1 Normal

Unless otherwise mentioned in the special conditions and/or special specifications the Contractor shall provide a temporary reconditioning , which must be carried out immediately after backfilling and compacting by reusing d igging materials ; after compacting, the top the backfill shall be 5 cm above the ground level.

3.3.2 Reinforced

Wherever a reinforced temporary reconditioning is required as specified in the special conditions and/or special specifications or as required by the Engineer, the Contractor shall carry out the reconditioning by using of the following means :


- a mixture of earth and cement at 50 kg. Of cement per cubic meter of earth for the last thirty centimeters of the backfill and a 5 cm thick tarmac layer at the surface
- backfilling the trench with sand and then for the last 20 cm at 15 cm thick lean concrete layer and 5 cm thick tarmac layer.

In all cases the Contractor shall remove any excess excavated material occasioned by the earthworks and shall haul it to the agreed dump area.

Any nearby area which have been damaged or weakened by the execution of the trench shall be restored.

The temporary reconditioning shall be performed in such a way that the level does not exceed that of the surrounding ground by more than five centimeters.

The surfaces of backfilled trenches shall be kept constantly fit for traffic until the time of final resurfacing.


BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR BACKFILLING THE TRENCH	
SPECIFICATION NO. : BR/TS/026		REV-0	Page 4 of 4
4.0	<u>PROTECTION OF BACKFILL</u> <p>One steep slopes where flowing water is likely to run through the trench, thus wasting out the backfill the Contractor shall install the necessary protection as directed by the Engineer.</p>		
5.0	<u>CLEANING</u> <p>The Contractor shall clean the work site as the backfilling proceeds. Cleaning shall be carried out by means of light equipment so as to minimize public inconvenience.</p>		
6.0	<u>FINAL RESURFACING</u> <p>Unless otherwise mentioned in the special condition and/or special specification and as soon as possible after the backfilling of the trench, the Contractor shall proceed to resurface the land occupied for the execution of the works, the same as the original, in accordance with the relevant authorities requirements.</p> <p>He shall clear the ground of equipment, pipe crops and debris of all kinds.</p> <p>He shall restore to an identical condition, the accesses, fencing, ditches, banks, supporting walls and generally all structures destroyed, damaged or moved for the execution of the works.</p>		
7.0	<u>OBSTACLES</u> <p>The conditions for executing the backfilling and the reconditioning of the surface where an obstacle is involved are defined in the specification "Obstacle crossings and special passages".</p>		
8.0	<u>SETTLEMENT OF DAMAGES</u> <p>The Contractor shall be responsible for any damage caused to various public or private structures, arresting from the works or access to the site, the occupation of land for installing Contractor's stockyard, offices and workshops.</p> <p>The Contractor shall make settlement with the owner or relevant authorities and get from them a letter of discharge as formal acknowledgment that the reconditioning and repairs have been properly carried out; a copy of this letter of discharge shall be given to the Engineer-in-charge.</p> <p>This document does not release the Contractor from this responsibilities concerning work which may prove to be necessary up until the final acceptance of the installations.</p>		
9.0	<u>ENCLOSURE (4 NOS. SKETCHES)</u>		

PROCESS & PIPING DESIGN SECTION
BRIDGE AND ROOF CO. (INDIA) LTD.



SPECIFICATION
FOR
OBSTACLES CROSSING AND SPECIAL
PASSAGES

SPECIFICATION NO.: BR/TS/027

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR OBSTACLES CROSSING AND SPECIAL PASSAGES	
SPECIFICATION NO. : BR/TS/027		REV-0	Page 1 of 8

C O N T E N T S

1.0	OBJECT
2.0	MATERIALS AND EQUIPMENT
3.0	WORK SCHEDULE
4.0	NOTIFICATION OF THE RELEVANT AUTHORITIES OR OWNERS
5.0	CROSSING OF ABOVE GROUND OBSTACLES
6.0	CROSSING OF UNDERGROUND OBSTACLES
7.0	PARALLEL ROUTES
8.0	SPECIAL PASSAGES
9.0	ENCLOSURES

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR OBSTACLES CROSSING AND SPECIAL PASSAGES	
SPECIFICATION NO. : BR/TS/027		REV-0	Page 2 of 8

1.0 **OBJECT**

This specification refers to the crossing of obstacles encountered during the pipeline's construction.

2.0 **MATERIALS AND EQUIPMENT**

The Contractor shall supply the materials and equipment necessary for the execution of the works for the crossing of obstacles encountered by the pipelines, and in particular those required for :

- earthwork, boring, etc.
- construction, checking, testing and positioning the pipelines and of their accessories
- protecting and insulating the pipelines
- protection and reinforcing the obstacles crossed and the surrounding area
- backfilling
- reconditioning the ground surface.

3.0 **WORK SCHEDULE**

In order to reduce as far as possible the duration of the works and to cause the least disturbance to users, the Contractors shall indicate in his general work schedule the most convenient time for crossing the obstacles according to their nature.

The Contractor shall follow the requirements of the relevant authorities or owners of the roads, above ground structures and buried utilities, which may direct traffic the procedure of crossing the resurfacing of the grounds, the safety measures, etc.

The Contractor shall be responsible for any damage and accidents which may arise from disturbances brought to the traffic and to the safety of the roads to the flow of water to the various utilities or be caused by the non observance of the above mentioned requirements.

4.0 **NOTIFICATION OF THE RELEVANT AUTHORITIES OR OWNERS**

Before beginning the works the Contractor shall notify in writing the relevant authorities or owners a copy of this correspondence shall be sent to the Engineer.

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR OBSTACLES CROSSING AND SPECIAL PASSAGES	
SPECIFICATION NO. : BR/TS/027		REV-0	Page 3 of 8

5.0 **CROSSING OR ABOVE GROUND OBSTACLES**

5.1 **Crossing of Railways or Highways**

The crossing shall be carried out :

- either by horizontal boring using steel casings
- or in a trench with or without casing as required

The above crossing shall be done as per method, approved by concerned authority.

5.1.1 **Boring and crossing with steel casing**

The Contractor shall study each crossing to be executed by boring in order to take adequate measures adapted to actual conditions of crossing.

The length of boring shall be limited to the accuracy of the boring equipment and the possibility of the Contractor to install the coated pipe inside the crossing without damaging the coating.

The Contractor shall carry out the necessary excavation work for the installation and operation of the boring equipment.

The Contractor shall be responsible for the good hold of the structure over the boring and shall carry out all the necessary reinforcing work such as planning, sheeting-piles bracing and propping.


The depth of the boring shall be such that in all cases a minimum distance as stipulated in SCC is kept between the crown of the casing and the level of the railway or highway surface.


The steel casing shall have an outside diameter of at least fifteen (15) cm. Larger than the outside pipe diameter; it must be perfectly water-tight rectilinear and welded without internal burring.

Should the casing not be supplied by the Company, its wall thickness and grade of steel shall be approved by the Engineer as per specification.

The casing shall be extended up to the limit of the right-of-way of the railway or the highway.

A double coating with outer wrap if required shall be applied along the whole length of the pipeline contained within the casing and shall be extended beyond the casing by one meter on both sides.

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR OBSTACLES CROSSING AND SPECIAL PASSAGES	
SPECIFICATION NO. : BR/TS/027		REV-0	Page 4 of 8
<p>Insulators shall be fit on the coated pipe so that :</p> <ul style="list-style-type: none"> - the distance between insulators takes into account the weight of the pipe filled with water and the load permissible per insulator. - An insulator is placed as near as possible to the ends of the casing and is doubled by a second insulator at the most fifty (50) cm away. - The portion of the anchor bolts extending beyond the insulator after being tightened shall be cut off in order to prevent any contact with the casing. <p>During the sliding into the casing, the advance of the pipe section must be progressive and controlled so that the coating is not damaged.</p> <p>Immediately after sliding the pipeline into the casing, end seals shall be fitted at both ends of the casing and fixed by solid stainless steel straps.</p> <p>Both ends of the casing shall be equipped with vent pipes in accordance with typical attached drawing.</p> <p>Immediately after completion of the crossing, the contractor shall proceed to apply an electrical insulation test and any insulation defect discovered shall be sought out and repaired to the satisfaction of the Engineer.</p>			
5.1.2	<p><u>Crossing in open trench with steel casing</u></p> <p>The crossing of highway in open trench shall be carried out in two sections or more to allow the continuity of traffic, as requested by the relevant authorities.</p> <p>The specifications for digging, backfilling and reconditioning shall be applied and the contractor shall make provisions in excavating the trench to keep the minimum distance of one meter or as per SCC whichever is higher between the crown of the casing and the road surface.</p>		
5.1.3	<p><u>Crossing in open trench without steel casing</u></p> <p>The specifications for digging, lowering-in, backfilling and reconditioning the road surface shall be applied.</p> <p>A double coating with outer wrap shall be applied on the pipe if required.</p> <p>The Contractor shall provide temporary bridges, traffic and warning signs, flashing lights, fencing, etc. including provisions for watchmen as required by the relevant authorities.</p>		

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR OBSTACLES CROSSING AND SPECIAL PASSAGES	
SPECIFICATION NO. : BR/TS/027		REV-0	Page 5 of 8

5.2 **Crossing of Canals**

Canals shall be crossed in open trenches dug in the streambed, in such way that the distance between the upper tangent of the coated pipe and the cleaned out bottom to its normal depth is at least equal to 0.80 m according to the depth of the ditch or canal.

This distance may be reduced to 0.50 m with the agreement of the Engineer.

The flow of water shall be diverted by means of temporary ducts or canals.

The specifications for digging shall be applied.

A reinforced concrete slab at least 0.10 m thick shall be laid over the soft earth or sand layer of backfill above the pipe.

The dimensions of the slab shall be :

- width : pipe OD plus 0.40 cm.
- Length : ditch or canal width plus 0.40

The structure of the ditch or canal shall be reconditioned.

The reconditioning of the drainage and irrigation canals includes the works and supply of materials and equipment required to return these canals to their water-tight condition (concrete or clay structures, sheeting piles, etc).

Should the Contractor for his own convenience request the concerned authorities to move or put out of service an electric or telephone line, he shall bear all the corresponding expenses.

6.0 **CROSSING OF UNDERGROUND OBSTACLES**


6.1 **Cables, Pipelines and Other Utilities**


The Contractor shall be responsible to verify the existence and location of underground obstacles and utilities along the route of the trench.

The use of mechanical excavation shall be restricted in sections of the route where such ditches or utilities are located.

The Contractor shall make all provisions to increase the size of the trench according to the size of the encountered obstacle in order to allow sufficient working space and maintain the specified clearance between the pipe and the crossed underground obstacles and utilities.

The minimum clearance is shown on attached typical drawings.

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR OBSTACLES CROSSING AND SPECIAL PASSAGES	
SPECIFICATION NO. : BR/TS/027		REV-0	Page 6 of 8
<p>The minimum clearance be reduced for any reason, the Contractor shall install adequate mechanical protection agreed by the Engineer.</p>			
6.2	<p>Masonry Work</p> <p>As far as possible, any masonry work encountered shall be crossed in such a manner that a minimum clearance of 20 cm be left.</p> <p>If a pipeline passes through a masonry work a plastic sleeve, with the agreement of the concerned authority or owner, shall be placed in the masonry.</p> <p>The specifications for lowering-in, backfilling and reconditioning of the surface shall be applied.</p> <p>The Contractor shall inform the Engineer, and the relevant authorities personal wherever the above obstacles and utilities are encountered. All damages or injuries to these works shall be immediately repaired to the satisfaction of all the concerned parties.</p> <p>The Contractor shall provide all the necessary traffic and warning signs fencing, safeguards to prevent damages and injuries to the roads and street users.</p>		
7.0	<p><u>PARALLEL ROUTES</u></p> <p>In case of parallel routes for a gas pipeline and other utility, a minimum distance of 0.40 m shall be left between the lines on the horizontal plane of the gas distribution pipeline ; the minimum distance between two gas pipelines shall be 0.30 m.</p> <p>If necessary, this minimum distance can be less than specified here above, upon the approval of the concerned authorities and of the Engineer.</p>		
8.0	<p><u>SPECIAL PASSAGES</u></p> <p>When a gas pipeline is to be placed at the side of a structure such as a bridge, building, wall etc. the pipeline can be placed :</p> <ul style="list-style-type: none"> - on supports, with or without casing - suspended directly or in a gutter - fixed to the wall by collars and mechanically protected. <p>The construction drawings derived from all justificatory calculations shall be drawn up by the Contractor and submitted to the Engineer for approval in accordance with the provision of the specification "Documents drawn up by the Contractor"</p> <p>The number, dimension, shapes and distribution of the supports, shall be studied and designed, account being taken of the nature and shape of the supporting structures</p>		

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR OBSTACLES CROSSING AND SPECIAL PASSAGES	
SPECIFICATION NO. : BR/TS/027		REV-0	Page 7 of 8
<p>the value of climatic stresses (wind, ice, snow) of vibration phenomena (excess dynamic pressure, traffic etc.)</p>			
8.1	<p>Supported Pipeline</p> <p>Metallic supports shall be fixed onto the structure</p> <p>The supports shall have:</p> <ul style="list-style-type: none"> - a sliding surface to enable movement in any direction in the plane of the pipeline - side stops to prevent the pipeline from falling. <p>A plastic material shall be placed between the pipeline and the sliding surface of the support, allowing :</p> <ul style="list-style-type: none"> - the lengthwise movement of the pipeline, in order to prevent it from leaving its sliding plane. - the sideways movement of the pipeline without it being able to rock against nor touch the support stops - the electrical insulation of the pipeline <p>The plastic material can be either fitted on the supports or wound around the pipeline</p>		
8.2	<p>Suspended Pipeline</p> <p>In this case, metal cradles shall be sealed within the masonry.</p> <p>A plastic wrap shall be wound around the pipeline, at each cradle, allowing :</p> <ul style="list-style-type: none"> - the lengthwise movement of the pipeline - the electrical insulation of the pipeline from the cradle <p>The diameter of the cradles shall be adapted to the pipeline diameter in order to maximize the contact surface between the pipeline and each cradle.</p> <p>When the pipeline is placed in a suspended duct, the pipeline shall be electrically insulated from the duct.</p>		
8.3	<p>Pipeline Fixed by Collars</p> <p>When a pipeline is fixed onto a wall by means of metal collars, the pipeline shall be electrically insulated from the collars by a plastic adhesive tape wound around the pipe or by any other insulating device approved by the Engineer.</p>		

If required by the Engineer the pipeline shall be mechanically protected against possible damage. The protecting device shall be metallic and electrically insulated from the pipeline.

8.4 Galleries

In case a gas pipeline is to be placed in gallery, it shall be fixed onto the wall by means of supports, cradles or collars or any other device approved by the Engineer.

The pipeline location within the gallery shall be determined by the Contractor in accordance with this specification and in agreement with the concerned authorized requirements.


The gallery shall be visitable and ventilated ; the Contractor shall provide the necessary mechanical protection of the pipeline at the gallery crossings and passage intersections.

PROCESS & PIPING DESIGN SECTION
BRIDGE AND ROOF CO. (INDIA) LTD.




SPECIFICATION
FOR
MARKING OUT

SPECIFICATION NO.: BR/TS/028

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR MARKING OUT	
SPECIFICATION NO. : BR/TS/028		REV-0	Page 1 of 2

C O N T E N T S

- 1.0 OBJECT
- 2.0 MATERIALS AND EQUIPMENT
- 3.0 LOCATION OF THE INDICATOR – PLATES
- 4.0 PAINTING
- 5.0 ENCLOSURE


BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR MARKING OUT	
SPECIFICATION NO. : BR/TS/028		REV-0	Page 2 of 2
1.0	<u>OBJECT</u> This specification refers to the marking out of basic grid pipelines, valves, current taps, etc.		
2.0	<u>MATERIALS AND EQUIPMENT</u> The Contractor shall supply the materials and equipment necessary for placing the markers and for the indicator-plates. The markers and indicator-plates shall conform to the attached typical drawings.		
3.0	<u>LOCATION OF THE INDICATOR-PLATES</u>		
3.1	Pipelines If required by the engineer, indicator-plates shall be installed along the basic grid pipeline route on both side of highways, railways, canals and other main obstacle crossings. The indicator-plates shall only show the distance between the indicator- plate and the pipeline.		
3.2	Valves Current Taps, etc. All the valves current taps, etc. of the basic grid and distribution network shall be marked out. The indicator-plates shall only show the location of the sight holes on the ground The indicator-plates shall be fixed onto natural markers such as buildings, fences etc. or onto markers, as shown on attached drawing. The Contractor shall place the markers, if any, in such a way they cause no inconvenience to the flow of traffic and public and that they cannot be moved. The volume and shape of the foundation shall be suited to the nature of the ground in which it is implanted. The location of each indicator-plate shall be recorded on the as built drawings.		
4.0	<u>PAINTING</u> The markers shall be painted as stipulated in the special condition of contract.		
5.0	<u>ENCLOSURES (4 NOS. SKETCHES)</u>		

PROCESS & PIPING DESIGN SECTION
BRIDGE AND ROOF CO. (INDIA) LTD.



SPECIFICATION
FOR
TESTING


SPECIFICATION NO.: BR/TS/029


BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR TESTING	
SPECIFICATION NO. : BR/TS/029		REV-0	Page 1 of 23

C O N T E N T S

- 1.0 OBJECT
- 2.0 NATURE OF THE TESTS
- 3.0 MATERIALS AND EQUIPMENT
- 4.0 TEST SCHEDULE
- 5.0 PRESENCE OF THE ENGINEER
- 6.0 ORGANISATION OF THE TESTS AND CHECKS
- 7.0 RESISTANCE TEST
- 8.0 TIGHTNESS TEST
- 9.0 VALVE ASSEMBLIES
- 10.0 INSPECTION OF UNTESTED JOINTS
- 11.0 REPAIRS
- 12.0 REPORTS AND STATEMENTS
- 13.0 DRAINING
- 14.0 TEST REPORT
- 15.0 ANNEXURES

Procedure for Hydrostatic Tightness Test
 Procedure for Pneumatic Tightness Test
 Coating Resistance Test

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR TESTING	
SPECIFICATION NO. : BR/TS/029		REV-0	Page 2 of 23
1.0	<p><u>OBJECT</u></p> <p>This specification refers to the tests to be carried out on gas pipelines before their start-up.</p> <p>The special conditions indicate the regulation texts to which the tests are subjected.</p>		
2.0	<p><u>NATURE OF THE TESTS</u></p> <p>The tests consist of :</p> <ul style="list-style-type: none"> • The test to check the resistance of the pipeline after final positioning; this test shall be hydrostatic if the maximum operating pressure is greater than 5 bar gauge and pneumatic if it is lower than or equal to 5 bar gauge. • The test to check the tightness of the pipeline, after the previous test has been carried out with satisfactory results; this test shall be hydrostatic if the maximum operating pressure is greater than 5 bar gauge, pneumatic if it is lower than or equal to 5 bar gauge. • The inspection to check the assembly and connections. 		
3.0	<p><u>MATERIALS AND EQUIPMENT</u></p> <p>The Contractor shall supply all the materials, products, equipment, apparatus and tools necessary for the execution of the tests, in particular:</p> <ul style="list-style-type: none"> • Temporary connection, branching and service-line installation. • The test and filling compressor and pumps, valves, tanks and foam pigs. • Measuring and inspection apparatus. • Water, air, electricity, etc. • Inhibitor, drying products, means for injection • Means of transport and telecommunication between places where tests and checks are being performed. • The equipment and means for rapid intervention of an emergency repair team. <p>All materials, products, equipment and apparatus used in the execution of the tests shall be submitted to the Engineer for approval.</p>		
4.0	<p><u>TEST SCHEDULE</u></p>		

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR TESTING	
SPECIFICATION NO. : BR/TS/029		REV-0	Page 3 of 23

The Contractor shall draw up and submit to the Engineer for approval the detailed schedule for the execution of the tests, in accordance with the specification "Documents drawn-up by the Contractor".

In addition to the schedule, the Contractor shall supply :-

- The longitudinal section and relative altitudes of the pipelines to be hydrostatically tested.
- The location and arrangement of the launching traps.
- The location of thermometer and pressure gauges.
- The characteristics of the pipes and accessories laid at each part of the longitudinal section.
- The factory test pressure of the pipes and accessories which could limit the test pressure on site.
- The maximum operating pressure envisaged.
- The nature and density of the filling product(s) used for the tests.
- The nature of the proposed inhibitor.
- The safety measures forecast.

5.0 **PRESENCE OF THE ENGINEER**

The tests must be performed in the presence of the Engineer who shall be notified at least forty-eight (48) hours in advance.

In addition, the representatives of the Company must be notified within the same time limit, in order that they may be present at the tests if so wished.

6.0 **ORGANISATION OF THE TESTS AND CHECKS**

The Contractor must, at the time of the tests, make any necessary arrangements to safeguard the public safety. The steps taken must be made known.

The Contractor shall be responsible for any damage or any accident caused either directly or indirectly by the execution of the tests.

7.0 **RESISTANCE TEST**

7.1 **Maximum Operating Pressure Greater Than 5 bar gauge**

The fluid used shall be water. In order to prevent the formation of air pockets, the line section to be tested shall be filled slowly, from the lowest point of the section as far as practical, the water pushing slowly an adequate number of foam pigs.

If purging devices are to be installed at the highest points so as to prevent air pockets, the pipeline shall be cut on both sides of each purging device after the testing operations. To replace the removed section, a new pipe section shall be welded and the welds radiographed.

Before launching the first foam pig, the Contractor shall introduce in the line section a volume of water corresponding to the volume of ten(1) meters of pipeline.

The test pressure shall be at least equal to 1.5 times the maximum operating pressure and at the most equal, for each pipe part, fitting and accessory apparatus, to its factory test pressure.

The resistance test shall last two hours and may be performed during the stabilising time prior to the tightness test.

If the properties of the water necessitate it, the latter shall be decanted, filtered and an inhibitor product added.

That test consists, for the Contractor, to check that the pressure in the pipeline does not undergo any considerable drop.

7.2

Maximum Operating Pressure Lower and or Equal to 5 bar gauge

The fluid used shall be air.

The test pressure shall be at least equal to 1.5 times the maximum operating pressure.

The resistance test may not take place if, in the sections laid in the ditches, the trench is not backfilled to a height of at least 0.40m above the upper tangent of the pipe line, and if, in the sections placed on supports, the pipeline is not finally fixed on to the supports and into the anchorage blocks.

The test shall last four hours and may be performed during the stabilizing time prior to the tightness test.

That test consists, for the Contractor, to check that the pressure in the pipeline does not undergo any considerable drop.

8.0


TIGHTNESS TEST


8.1


Maximum Operating Pressure Greater Than 5 bar gauge

If the resistance test has been successfully withstood by the pipeline and accessory equipment, the Contractor shall carry out a hydrostatic tightness test at a pressure :-

- At least equal to the maximum operating pressure foreseen, measured at the highest points of the section subjected to the test.
- At the most equal to the resistance test pressure measured at the lowest points.

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR TESTING	
SPECIFICATION NO. : BR/TS/029		REV-0	Page 5 of 23
	<p>Before performing this test the Contractor or shall ensure that the quantity of air contained in the pipelines or accessory equipment is low enough not to cause any doubt in the results of the tightness test; if need be he shall place air vent device at the most suitable points.</p> <p>The test procedure is described in the Annexure-1.</p>		
8.2	<p>Maximum Operating Pressure Lower Than or Equal to 5 bar gauge</p> <p>If the resistance test is successfully withstood by the pipeline and accessory equipment, the Contractor shall perform a pneumatic tightness test at a pressure of 1 bar gauge ($\pm 10\%$).</p> <p>The duration of the test shall be 192 hours.</p> <p>The test procedure is described in the Annexure-2.</p>		
9.0	<p><u>VALVE ASSEMBLIES</u></p> <p>All the valves, fittings, pipes, flanges and apparatus which constitute the valve assemblies, may be tested all together at the workshop, if prefabricated.</p> <p>The test shall be performed with all the valves open.</p>		
10.0	<p><u>INSPECTION OF UNTESTED JOINTS</u></p> <p>After the connection of sections which have satisfied the test, the tie-in welds shall be 100% inspected by radiography and marked.</p>		
11.0	<p><u>REPAIRS</u></p> <p>If a test is not deemed satisfactory by the Engineer, the Contractor shall take any steps necessary for detecting defects or leaks and repairing them. After repair, the tests shall be performed again until a result considered satisfactory by the Engineer has been obtained.</p>		
12.0	<p><u>REPORTS AND STATEMENTS</u></p> <p>The Contractor shall draw up all the reports concerning the performance of the tests and shall carry out all the justifying calculations of pressure variations observed. These documents which shall form part of the technical records shall be progressively handed over to the Engineer as they are drawn up.</p>		
13.0	<p><u>DRAINING</u></p> <p>As soon as the hydrostatic tests have been deemed satisfactory, the Contractor shall proceed to empty the water contained in the pipeline and accessory apparatus he shall use foam-pigs of a suitable type.</p>		

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR TESTING	
SPECIFICATION NO. : BR/TS/029		REV-0	Page 6 of 23
<p>The draining shall be considered satisfactory when the spheres arrive at the end of the pipeline section without pushing any water.</p> <p>If the pipeline is not purged from air to gas just after the tests, the pipe shall be air pressurised at one (1) bar gauge.</p>			
14.0	<p><u>TEST REPORT</u></p> <p>At the end of the testing operations on a pipeline section, when the measurement results are acceptable the Contractor shall :</p> <ul style="list-style-type: none"> - draw up the test report - make the necessary calculations - submit the test report to the Engineer for approval. <p>The test report shall be handed over the Engineer before the starting-up operations.</p>		
15.0	<p><u>ANNEXURES</u></p> <ol style="list-style-type: none"> 1. Procedure for Hydrostatic Tightness Tests 2. Procedure for Pneumatic Tightness Test 3. Coating Resistance Test 		

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR TESTING	
SPECIFICATION NO. : BR/TS/029		REV-0	Page 7 of 23

ANNEXURE-1

PROCEDURE FOR HYDROSTATIC TIGHTNESS TEST

1.0 GENERAL CONDITIONS OF TIGHTNESS TEST

1.1 Duration of test

1.2 Stabilizing time

1.3 Test pressure

1.4 Measuring instruments

1.5 Possible time extensions

2.0 TIGHTNESS TEST ACCURACY

2.1 General

2.2 Revelation of a minimum leakage

2.3 Minimum leakage hypotheses


3.0 PRACTICAL PROCEDURE FOR TESTS


3.1 Checking for presence of air

3.2 One hour tightness test

3.3 24 hours tightness test

3.4 Annexes

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR TESTING	
SPECIFICATION NO. : BR/TS/029		REV-0	Page 8 of 23
1.0	<u>GENERAL CONDITIONS OF TIGHTNESS TEST</u>		
1.1	Duration of Test This duration shall be in terms of the volume of the section being tested. If $V \leq 20\text{m}^3$, duration 1 hour If $V > 20\text{m}^3$, duration 24 hours		
1.2	Stablizing Time The tightness test may only begin after a certain stabilizing time has elapsed after the filling-up of the pipe with water and expanding it at a pressure at least equal to that of the test. The resistance test may take place during the stabilizing time period. The stabilizing time shall depend on the diameter and is given below :- <div style="margin-left: 40px;"> $\phi \leq 400\text{mm}$: 1 days 40 mm $\phi \leq 750\text{mm}$: 2 days $\phi \geq 800\text{mm}$: 3 days </div>		
1.3	Test Pressure The value must be at least equal to the maximum operating pressure foreseen and at the most equal to the resistance test pressure.		
1.4	Measuring Instruments		
1.4.1	<u>Temperature</u> The thermometers to be used must be permit the temperature to be measured with an accuracy of 0.1°C . The number of thermometers to be placed shall be left to the d iscretion of the Engineer. There must, however, be at least 4 for a se ction up to 500m, long at least 6 for a section more than 500m long, and at least one every two kilometers the reading of all thermometers must be carried out in less than one hour.		
1.4.2	<u>Pressure</u> The pressure readings shall be carried out by means of a dead weight tester the sensitive of which, in the conditions of the test, shall be about 10 g/cm^2 . The pressure variations shall be recorded ; the accuracy of the corresponding apparatus shall be at least equal to 0.5 bar. Any manifest irregularity of the recorded curve shall lead to the rejection of the test.		

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR TESTING	
SPECIFICATION NO. : BR/TS/029		REV-0	Page 9 of 23

1.5 Possible Time Extensions

The tightness test consists of at the most 3 pressure readings. If these 3 readings do not lead to a favourable conclusion, the test must be performed again after a delay of at least 3 days (except where there are abnormally fast temperature variations in which case a return to more normal conditions is required), during which time the pipeline shall be kept under pressure with a recording of the pressure. During this delay of 3 days, the Engineer may, at his discretion, carry out a certain number of additional temperature and pressure measurements to be used as estimation factors.

2.0 TIGHTNESS TEST ACCURACY

2.1 General

It is not generally possible to expect that a tightness test will detect any leak. The visual inspection may be able to accomplish this, but, as soon as the test is based on the verification of a formula, there are two sources of uncertainty; on the one hand, the formula used is never anything more than an approximation of the real fact, on the other hand the measuring apparatus give only approximations of the real values.

For a tightness test, it is therefore only possible to guarantee the retention of the mass of water contained in the pipeline up to a certain volume, and only possible to guarantee the tightness of the pipe up to a certain point.

It is therefore necessary to choose a prior this certain point for undetected leaks; experiments have enabled a choice to be made which is not entirely arbitrary.

2.2 Revelation of a Minimum Leakage

The coating of the steel pipe adheres to the pipeline, and a stress applied at a certain point cannot cause this to become unstuck unless it exceeds a certain value. It follows that, for the coating to become unstuck and cracked during testing, a hole must have a certain diameter. This minimum value defines a threshold, and the corresponding flow is about 5 litres an hour under a pressure of 70 bar.

2.3 Minimum Leakage Hypotheses

Minimum leakage shall be defined by a certain flow of water under a given pressure P.

This flow equals :

$$q = \frac{1}{15} (P + 5) \text{ for } P \leq 100$$

$$q = 7 \text{ for } P > 100$$

q being expressed in litres/ hour, and P in kg/cm²

3.0 PRACTICAL PROCEDURE FOR TESTS

3.1 Checking for Presence of Air

3.1.1 Measurements to be taken

Let V be the volume of the pipeline to be tested.

A checked volume m shall be drained off : the result is a pressure drop ΔP_1 - measured on a dead weight tester.

3.1.2 Interpretation

The theoretical pressure drop ΔP_0 corresponding to m is :


$$\Delta P_0 = \frac{m}{V \left(\chi + \frac{D}{Ee} \right)} \quad (m \text{ and } V \text{ being expressed with the same unit})$$

with :

χ : compressibility factor of water
D, e : nominal outside diameter and wall thickness of the pipe
E : young's module of steel

Should the section tested include pipe of different wall thicknesses and grades, the value of D / Ee to be taken into account shall be equal to the weighted average of the different value of D / Ee relating to homogeneous sections, the weight factors being the corresponding volumes.

ΔP_1
The ratio ----- is formed.

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR TESTING	
SPECIFICATION NO. : BR/TS/029		REV-0	Page 11 of 23
<p style="text-align: center;">ΔP_2</p> <p>If the ratio is less than :</p> <ul style="list-style-type: none"> - 0.90 where the pipe diameter less than 400mm. - 0.95 where the pipe diameter is more than or equal to 400mm, there is an excessive quantity of air and there is reason to refuse the test. <p>3.2 One Hour Tightness Test</p> <p>Two pressure readings P1 and P2 shall be made at one hour interval, in such conditions that the temperature does not change during the test, at times t1 and t2.</p> <p>3.2.1 Interpretation</p> <p>Algebraically : (P1 - P2) < 0.5 kg/cm² : test acceptable (P1 - P2) = 0.5 kg/cm² : short extension (P1 - P2) > 0.5 kg/cm² : test refused</p> <p>3.2.2 Short Extension</p> <p>A third reading P3 shall be taken at time t3 after an interval of time t equal to ½ hour after t2.</p> <p>Let $\Delta P'_0$ be the pressure drop which would have been caused by the minimum leakage during (t3 - t2). $\Delta P'_0$ is calculated from the formula of 3.1.2 in which m is replaced by the volume equal to the product of the flow of the minimum leakage by (t3 - t2).</p> <p>Algebraically : (P1 - P2) < 0.5 $\Delta P'_0$: test acceptable (P1 - P2) > 0.5 $\Delta P'_0$: test refused</p> <p>3.3 24 Hours Tightness Test</p> <p>3.3.1 Measurement to be taken</p> <ul style="list-style-type: none"> i) 2 tests pressure reading P1 and P2 at times t1 and t2 with an interval of 24 hours. ii) Temperature readings along the tested pipeline, at time t1 and t2 in order to get T1 and T2, which are the average values of the ground temperatures. iii) The air temperature Ta1 and Ta2 and the atmospheric pressure b1 and B2 at times t1 and t2. <p>3.3.2 Interpretation</p>			

i) Notation

- f : factor of which the average value depends only on the diameter of the pipe and is given in the attached graph.
- $\partial f / f$: dispersion factor of f, given in the same graph.
- μ : expansion factory of water
- γ : cubic expansion factor of steel
- χ : compressibility factory of water
- D, e : outside diameter and thickness
- E : young's module of steel
- H : maximum permissible pressure variation
- $\Delta P'0$: pressure drop cau sed by minimum leakage throughout the duration of test extension
- P : difference of pressure after temperature correction.

ii) Calculations to be made

$$H = \frac{\partial f}{f} / \Delta P + 0.2 f.K$$

$$\Delta P = f.K (T1 - T2) \text{ with } K = \frac{\mu - \gamma}{\chi + D/ Ee}$$


$$p = P1 - \Delta P - P2$$

iii) Conclusions

The test is satisfactory if $p < H$

If otherwise, an extension of about one hour is made by taking, at time t3 at an interval of about one hour after t2, a pressure reading P3.

Let $\Delta P'0$ be the pressure drop which would have been caused by minimum leakage throughout the duration of the extension ($\Delta P'0$ is calculated as in the one hour tests).

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR TESTING	
SPECIFICATION NO. : BR/TS/029		REV-0	Page 13 of 23

The test is satisfactory, if $P_2 - P_3$ is less than $0.5 \Delta P_0$. If the test is not satisfactory, it shall be redone.

3.4 **Annexes**

Curves giving f and $\partial f / f$ in terms of the pipeline diameter.

Variations of the compressibility factor of water χ in terms of its temperature.

Variation of $\mu - \gamma$ in terms of the temperature of the water.

BRIDGE AND ROOF
CO. (I) LTD.

PROCESS & PIPING
DESIGN SECTION

SPECIFICATION
FOR
TESTING



SPECIFICATION NO. : BR/TS/029

REV-0

Page 14 of 23

HYDROSTATIC TEST

$\frac{\partial f}{f}$
Curves Giving f and ----- In terms of diameter ϕ
 f

BRIDGE AND ROOF
CO. (I) LTD.

PROCESS & PIPING
DESIGN SECTION

SPECIFICATION
FOR
TESTING



SPECIFICATION NO. : BR/TS/029

REV-0

Page 15 of 23

HYDROSTATIC TEST

BRIDGE AND ROOF
CO. (I) LTD.

PROCESS & PIPING
DESIGN SECTION

SPECIFICATION
FOR
TESTING



SPECIFICATION NO. : BR/TS/029

REV-0

Page 16 of 23

HYDROSTATIC TEST

ANNEXURE-2**PROCEDURE FOR PNEUMATIC TIGHTNESS TEST**

1.0 GENERAL CONDITIONS

1.1 Stablizing time

1.2 Test Duration

1.3 Test Pressure

1.4 Measuring instruments

2.0 PRACTICAL PROCEDURE FOR TESTS

2.1 Measurements to be taken

2.2 Corrections for 0°C

2.3 Interpretation

- Relative pressure in the pipeline : P in mm of mercury

- Temperature of the ground : T in °C
against the pipeline

2.2 **Corrections for 0°C**

2.2.1 Atmospheric Pressure

The formula to be used shall be :

$$br = b(1 - 18.1 \times 10^{-5} Ta)$$

br = rectified atmospheric pressure (height at 0°C of the column of mercury)

b = Read atmospheric pressure

Ta = air temperature at the barometer location

2.2.2 Relative pressure in the pipeline

The formula to be used shall be :

$$Po = \frac{P}{1 + T / 273}$$


Po = rectified relative pressure at 0°C

P = read relative pressure in the pipeline

T = average temperature of the ground

2.2.3 Absolute pressure for 0°C

$$Pa = Po + br$$

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR TESTING	
SPECIFICATION NO. : BR/TS/029		REV-0	Page 20 of 23

2.3

Interpretation

The test shall be satisfactory if the difference in the absolute pressure Pa in the pipeline, corrected for 0°C, between two consecutive days and between first day and each day of test, is less than the maximum error due to defects in the accuracy of the measuring instruments, estimated at 10mm of mercury.

ANNEXURE-3**COATING RESISTANCE TEST**

- 1.0 GENERAL PROCEDURE FOR THE TEST
- 2.0 INTERPRETATION
- 3.0 ACCEPTANCE
- 4.0 OTHER CHECKS

1.0 GENERAL PROCEDURE FOR THE TEST

- i) Make sure that all insulating flanges are shunted.
- ii) Measure (by means of a copper/ copper sulphate electrode) and record the pipeline potentials U_0 at every cathodic test point, with no applied cathodic protection yet (static potentials). Such a measurement is not compulsory for test purposes but may give useful indications in case anomalies are detected later on.
- iii) Switch on the cathodic protection. Wait a few days for stabilisation. Set the potential output of the station at 2.1 Volts Measure and record the current input (I) in the network.
- iv) Measure and record the pipeline potential U_1 at every cathodic test point with cathodic protection ON (U_2) and OFF (U_1) by interrupting the cathodic protection input in the network on a timed cycle of 20 seconds ON, 10 seconds OFF.

2.0 INTERPRETATION

The exact value of the coating resistance of network, R , cannot be known, but it can be assumed that it is over the calculated value at the most underprivileged point, i.e. where $U_2 - U_1$ is minimum.

Therefore :

$$R > \frac{S (U_2 - U_1) \text{ min.}}{I}$$

Where :

R = Coating resistance of network in Ωm^2

S = Total external surface of the pipeline

U_1 = potential with cathodic protection OFF, in V

U_2 = potential with cathodic protection ON, in V

I = current input in the work, in A

3.0 ACCEPTANCE

For a network without service lines :

$$R > 4\,000 \, \Omega.m^2$$

For a network with service lines (steel) :

$$R > 2\,000 \, \Omega.m^2$$

4.0

OTHER CHECKS

The foregoing only concerns the coating resistance measurement.

As far as the working order of the cathodic protection system is concerned one shall take the opportunity of the coating resistance test performance to also check the followings :-

- i) At the most underprivileged point, $|U_2|$ is greater than 1 000mV.
- ii) $I / S < 50 \mu.A/m^2$ (micro amps per square meter).
- iii) At no test point with other buried metallic structure, the potential variation of the structure with cathodic protection ON and OFF exceed 20mV.

PROCESS & PIPING DESIGN SECTION
BRIDGE AND ROOF CO. (INDIA) LTD.




SPECIFICATION
FOR
PURGING AND COMMISSIONING THE
NETWORK

SPECIFICATION NO.: BR/TS/030

C O N T E N T S

1.0	Object
2.0	Materials and Equipment
3.0	Work Schedule
4.0	Safety Precautions
5.0	Purging
5.1	General
5.2	Pipelines
5.3	Accessories
6.0	Repairs
7.0	Performance Defects
8.0	Certificate of Completion

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR PURGING AND COMMISSIONING THE NETWORK	
SPECIFICATION NO. : BR/TS/030		REV-0	Page 2 of 5

1.0

OBJECT

This specification refers to the preparatory and execution operations for purging and commissioning a gas distribution network.

2.0

MATERIALS AND EQUIPMENT

The Contractor shall supply all materials and equipment necessary for:

- Purging the pipelines from air to gas.
- Supervising the purging operations.
- Checking that the performance of the accessories conform to the contract.
- Adjusting the accessories.
- Commissioning the works.

The contractor shall also supply and have ready on site:

- The replacement materials such as valve operation indicators, plastic caps for casing, etc. which may be damaged during the startup operations. If such materials are taken from the spare to be supplied by the contractor they shall be immediately replaced
- Safety equipment such as fire extinguishers, gas masks, gas analyzers etc., to ensure labour and public safety.

The company will supply the gas free of charge, at the required pressure and flow.

3.0

WORK SCHEDULE

The contractor shall draw-up and submit a purging schedule to the Engineer's approval, in the conditions specified in the specification "Documents drawn-up by the contractor".

This schedule shall specify:

- The portion of network to be purged.
- The characteristics of the works to be purged.
- The operation sequence and the description of the equipment intended to be used.
- The staff intended to be mobilized including the necessary specialist and technicians of the manufacturers of the materials if necessary.

4.0 **SAFETY PRECAUTIONS**

The contractor may not proceed to the purging until safeguards have been placed around the installations and works, where they are needed in application of the safety regulations.

The contractor shall be required to satisfy any public regulations. He shall, where necessary, obtain permission from the concerned Authorities before beginning any operations, and he shall take all the necessary precautions to ensure safety of persons and properties during the purging operations, these precautions must be made known to all persons concerned and if necessary shall be publicized.

5.0 **PURGING**

5.1 **General**

The purging operations include:

- Purging the pipelines from air to gas.
- Checking the performance of the accessories.
- Adjusting the accessories.


All these operations shall be performed under the supervision of the Engineer and in the presence of representatives of the company. The contractor shall give a 3(three) day's notice. They shall not start unless the network is thoroughly completed and all test certificates regarding the concerned works have been signed and the purging schedule is approved by the Engineer.


5.2 **Pipeline**

The purging operations for pipelines include:

- Making accessible the purging devices of the portion of network to be started up.
- Installing the vent pipes and/or torches on to the purging devices.
- Purging from air to gas the network in such a way that the eventual ring mains be purged before the branch lines.
- Removing the vent pipes and/or torches, when the network is filled with gas.
- Beckfilling the eventual excavations at purging device locations.

5.3 **Accessories**

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR PURGING AND COMMISSIONING THE NETWORK	
SPECIFICATION NO. : BR/TS/030		REV-0	Page 4 of 5
<p>The contractor shall check the performance of the accessories in accordance with the manufacturer's instruction.</p> <p>These checks shall include in particular:</p> <ul style="list-style-type: none"> ➤ The manual opening and closing of all valves. ➤ The electrical check that all insulating flanges are in good working conditions. ➤ The inspection of good working condition and adjustment of checking and safety devices. 			
6.0	<p><u>REPAIRS</u></p> <p>The contractor shall replace as quickly as possible any parts and devices supplied by himself and proving to be defective.</p>		
7.0	<p><u>PERFORMANCE DEFECTS</u></p> <p>If the performances of the accessories do not meet the contract requirements, the contractor shall take any necessary steps to remedy the situations as soon as possible, even by installing any additional device which might prove necessary.</p>		
8.0	<p><u>CERTIFICATE OF COMPLETION</u></p> <p>When the following are completed in accordance with the contractor provisions:</p> <ul style="list-style-type: none"> ➤ The network is completely constructed and all accessory installations are installed and tested including telecommunication cables if any. ➤ The network is purged from air to gas. ➤ It prove to be tight. ➤ The accessory performances prove to conform to be contract. ➤ The accessories are adjusted to the operation conditions. ➤ All connections are made, all marker plates and signs are installed. ➤ The site test certificate regarding the works have been signed by the Engineer. ➤ The factory test certificate regarding the materials have been handed over to the Engineer by the Contractor. ➤ The spare parts and tools have been handed over to the company by the contractor. 		

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR PURGING AND COMMISSIONING THE NETWORK	
SPECIFICATION NO. : BR/TS/030		REV-0	Page 5 of 5

➤ The technical records have been handed over to the Engineer by the Contractor.

The Engineer shall deliver the certificate of completion regarding the network or concerned portion of network to the contractor.

PROCESS & PIPING DESIGN SECTION
BRIDGE AND ROOF CO. (INDIA) LTD.




SPECIFICATION
FOR
TECHNICAL RECORDS

SPECIFICATION NO.: BR/TS/031

C O N T E N T S

- 1.0 Object
- 2.0 Composition of Technical Records
- 3.0 Technical Documents
- 4.0 As-Built Document
- 5.0 Drawing up of Technical Records
- 6.0 Handing over of Technical Records.

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR TECHNICAL RECORDS	
SPECIFICATION NO. : BR/TS/031		REV-0	Page 2 of 3

1.0

OBJECT

These specification relate to the preparation drawing-up presentation by the Contractor, his sub-contractor, suppliers and handing over to the Engineer if the document which constitute the technical records of the pipelines, stations and accessory works constructed by the Contractor.

2.0

COMPOSITION OF TECHNICAL RECORDS

The technical records shall be composed of:

- The technical documents which shall be drawn-up progressively by the contractor as the execution of the works precedes, kept continually up to date, transmitted to the engineer at his request and returned to the contractor for correction or complement if any.
- The as-built documents which shall be in conformity with the construction of all the works and handed over to the Engineer at the date of issue of the certificate of completion.

3.0

TECHNICAL DOCUMENT

These document shall include:

- Construction drawings.
- The welder qualification certificates
- The reports on the weld inspections.
- The welding reports
- The sectioning of the pipeline for the testing.

The reports on tests carried out on site, in application of the regulation texts, on pipeline, stations and accessory works, as well as, if need be the report drawn-up the representation of the Authority in charge of the inspection of the these tests.

4.0

AS-BUILT DOCUMENT

These documents include in particular:

- The map of the final route of the pipelines.
- The as-built drawings at the scale mentioned in the special specification and recording or as per standard engineering practice followed as per Engineer-in-charge.

- The depth of the pipeline.
- The characteristics of the pipes and the limits for changes in characteristics.
- The position and size of pipeline equipment such as valves, casing, insulating joints, current taps, vents, telecommunication cables, etc.
- The position of the markers.
- The plans which are conform to the construction of the stations and accessory works and other equipment, bearing the exact list of plants and diagram of the cathodic protection installations.
- The starting-up reports of the works (pipelines, stations accessory works cathodic protection) the measurements and operation tests.
- The final discharge obtained by the contractor from owner, operators, municipal authorities after the restoration of the ground surface.
- Inventory of equipment supplied by the company to the contractor for the construction of the works.
- The welding records.
- The radiographic exposures of welds.

5.0

DRAWING-UP OF TECHNICAL RECORDS.

The drawings-up of the documents of technical records with regard to the preparation, presentation, form and size, procedure for transmission and approval shall be submitted to the rules defined in the specification "Document drawn-up by the contractor".

6.0

HANDING OVER OF TECHNICAL RECORDS

The technical records (one reproducible and 10 copies) shall be handed over to the engineer at the date of the certificate of completion.

PROCESS & PIPING DESIGN SECTION
BRIDGE AND ROOF CO. (INDIA) LTD.



SPECIFICATION
FOR
CONSTRUCTION OF VALVE ASSEMBLY

SPECIFICATION NO.: BR/TS/032

BRIDGE AND ROOF
CO. (I) LTD.

PROCESS & PIPING
DESIGN SECTION

SPECIFICATION
FOR
CONSTRUCTION OF VALVE
ASSEMBLY




SPECIFICATION NO. : BR/TS/032


REV-0


Page 1 of 4

CONTENTS

- 1.0 General Dimensions
- 2.0 Civil Works
- 3.0 Protection against stray currents and Electrostatic loads.
- 4.0 Cathodic Protection

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR CONSTRUCTION OF VALVE ASSEMBLY	
SPECIFICATION NO. : BR/TS/032		REV-0	Page 2 of 4
<p>Valve assemblies location and construction will be as per contractor's construction drawing and technical instructions that must be submitted for Engineer's approval.</p> <p>In all events these assemblies must comply with the general requirements given below and will be constructed in conformance with typical drawings enclosed with the tender.</p>			
1.0	<u>GENERAL DIMENSION</u>		
	<ul style="list-style-type: none"> ➤ Minimum clearance between any element of valve assembly and valve chamber floor-20 cm. ➤ Distance between upper generatrix of main pipeline and road pavement surface must be at least equal to the contract defined cover. 		
2.0	<u>CIVIL WORKS</u>		
2.1	Inside Dimension		
	<p>The inside dimensions must allow:</p> <ul style="list-style-type: none"> ➤ The installation and/or operation of the various valve assembly components (pipes, valves, fittings, valve motorizations). ➤ The movement of maintenance and operation staff. 		
2.2	Concrete:		
	<p>As per applicable standards.</p>		
2.3	General Water Tightness		
	<ul style="list-style-type: none"> ➤ The valve chamber has to be water proof the side walls and bottom have to withstand an outside hydrostatic pressure of at least 1 bar. ➤ The pipe and casing penetration sealing devices must: <ul style="list-style-type: none"> - Accept angular deflections of 5°. - Ensure electric insulation between metallic components and civil works. 		
2.4	Access		
	<i>Camber Covering</i>		
	<ul style="list-style-type: none"> ➤ Must generally speaking, comply with distribution granting Authorities specifications and/ or recommendations. ➤ Must be water tight. 		

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR CONSTRUCTION OF VALVE ASSEMBLY	
SPECIFICATION NO. : BR/TS/032		REV-0	Page 3 of 4
<ul style="list-style-type: none"> ➤ It includes an access cover, less than 60kg. to enable access, by a man-through a standing ladder into chamber. ➤ Must be able to support a maximum load of 25 tons, its design has to be such as to allow top side to be filled with the same material as the surface, roadway of pavement (concrete, asphalt, slabs etc.). ➤ Must be lockable and withstand external efforts. ➤ Must bear the mark "GAS". 			
2.5	Aeration <ul style="list-style-type: none"> ➤ The valve chambers shall be fitted with an upper aeration duct opening, at most 20 cm. from chamber access cover and a lower aeration duct opening grid at most 20 cm. from chamber floor. ➤ Air ducts shall be of steel of fibrous cement each with a minimum cross-section of 200 cm². ➤ Water horizontal portions of these ducts have a 2% slope, the low point shall be on valve chamber side to evacuate the water that may penetrate these ducts. ➤ Water tightness of ducts and their connection to valve chamber shall be as per paragraph 2.2. ➤ A yellow warning strip shall be placed over all horizontal portions of these ducts. ➤ Aeration duct will exist ground and extend for the lower duct 2m above ground level and for upper duct 2.50 m above ground level and this in an area where they do not hinder vehicular nor pedestrian traffic. ➤ Duct surface outlets shall be protected against the ingress of water and other objects likely to clog them. 		
3.0	<u>PROTECTION AGAINST STRAY CURRENTS AND ELECTROSTATIC LOADS.</u> <p>In order to avoid having stray currents pass through the valve assembly (cathodic protection currents, stray currents, electrostatic loads), the different metallic devices shall be electrically bonded to an earthing plate.</p> <p>The earth resistance shall be less than 20 ohms.</p> <p>The valve assembly shall be electrically isolated from the upstream and downstream pipes by insulating joints placed outside the valve chamber and at a maximum distance of 2 meters.</p>		

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	SPECIFICATION FOR CONSTRUCTION OF VALVE ASSEMBLY	
SPECIFICATION NO. : BR/TS/032		REV-0	Page 4 of 4

4.0

CATHODIC PROTECTION

The pipeline port ions electrically isolated from valve chambers shall be interconnected by means of a removable link.


SPECIFICATION FOR MAINLINE CONSTRUCTION (ONSHORE)

SPECIFICATION NO.: BR/TS/033



(OIL & GAS)


BRIDGE AND ROOF CO. (INDIA) LTD.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 1 of 1
			REVISION : 0
			EDITION : 1

CONTENTS


<u>SL.NO.</u>	<u>DESCRIPTION</u>
1.0	SCOPE
2.0	REFERENCE CODES, STANDARDS AND SPECIFICATIONS
3.0	REQUIREMENTS OF R.O.U. AND ACCESS THERETO
4.0	RIGHT-OF-WAY
5.0	HANDLING, HAULING, STRINGING AND STORING OF MATERIALS
6.0	TRENCHING
7.0	BENDING
8.0	LINING UP
9.0	LAYING OF PIPE
10.0	BACK-FILLING
11.0	TIEING-IN
12.0	SPECIAL INSTALLATIONS ON THE PIPELINE
13.0	WORKING SPREAD LIMITATIONS
14.0	CLEAN-UP AND RESTORATION OF RIGHT-OF-WAY
15.0	MAINTENANCE DURING DEFECTS LIABILITY PERIOD

PREPARED BY:	CHECKED BY:	APPROVED BY:	ISSUE DATE :

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 1 of 41
			REVISION : 0
			EDITION : 1

1.0 SCOPE

- 1.1 This specification covers the minimum requirements for the various activities to be carried out by CONTRACTOR for or about the construction of cross-country pipelines.
- 1.2 The various activities covered in this specification include the following works of pipeline construction :
- Clearing, grubbing and grading of Right-of-way
 - Construction of all temporary facilities required in connection with the WORKS
 - Staking of the pipeline route
 - Handling, hauling, stringing and storing of all materials
 - Trenching
 - Field-bending of line pipe
 - Lining-up
 - Pipeline laying
 - Backfilling
 - Tieing-in
 - Installation of auxiliary facilities and appurtenances forming a part of pipeline installation
 - Clean-up and restoration of Right-of-way;
 - Maintenance during defects liability period.
- 1.3 This specification shall be read in conjunction with the conditions of all specifications and documents included in the CONTRACT between COMPANY and CONTRACTOR.
- 1.4 CONTRACTOR shall, with due care and vigilance, execute the work in compliance with all laws, by- laws, ordinances, regulations etc. and provide all services and labour, inclusive of supervision thereof, all materials, excluding the materials indicated as "COMPANY Supplied materials" in the CONTRACT, equipment, appliances or other things of whatsoever nature required in or about the execution of the work, whether of a temporary or permanent nature.
- 1.5 CONTRACTOR shall take full responsibility for the stability and safety of all operations and methods involved in the WORK.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 2 of 41
			REVISION : 0
			EDITION : 1

1.6 CONTRACTOR shall be deemed to have inspected and examined the work area(s) and its surroundings and to have satisfied himself so far as practicable as to the form and nature thereof, including sub-surface conditions, hydrological and climatic conditions, the extent and nature of the WORK and materials necessary for the completion of the WORK, and the means of access to the work area(s).

1.7 CONTRACTOR shall be deemed to have obtained all necessary information subject as above mentioned as to risks, contingencies and all other circumstances, which may influence the WORK.

1.8 CONTRACTOR shall, in connection with the WORK, provide and maintain at his own costs, all lights, guards, fencing, watching etc., when and where necessary or required by COMPANY or by any duly constituted authority and/ or by the authorities having jurisdiction thereof for the protection of the WORK and properties or for the safety and the convenience of public and/ or others.

2.0 REFERENCE CODES, STANDARDS AND SPECIFICATIONS


2.1 Reference has been made in this specification to the latest edition of the following codes, standards and specifications :

- | | | | |
|----|-----------------------|---|---|
| a) | ANSI B 31.8 | - | Gas Transmission and Distribution Piping Systems |
| b) | ANSI B 31.4 | - | Liquid Petroleum Transportation Piping Systems |
| c) | API 1104 | - | Standard for Welding Pipelines and Related Facilities |
| d) | API 1105 | - | Bulletin on Construction Practices for Oil and Products Pipelines |
| e) | Part 1992
Title 49 | - | Transportation of Natural and Other Gas by Pipeline (US Department of Transportation - Pipeline Safety Standards) |
| f) | Part 195 | - | Transportation of Liquids by Pipeline (US Department of Transportation - Pipeline Safety Standards). |

In case of differences between the requirements of this specification and that of the above referred codes, standards and specifications, the requirements of this specification shall govern.

2.2 For the purpose of this specification the following definitions shall hold:

- the words "Shall" and "Must" are mandatory.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 3 of 41
			REVISION : 0
			EDITION : 1

- the works "Should, "May" and "Will" are non-mandatory, advisory or recommended.

3.0 **REQUIREMENTS OF R.O.U. AND ACCESS THERETO**

CONTRACTOR shall, before starting any clearing operations, familiarise himself with all the requirements of the Authorities having jurisdiction over the Right of Way for work along the pipeline route or in connection with the use of other lands or roads for construction purpose.

CONTRACTOR shall notify COMPANY well in advance during work progress, the method of construction for crossing road, pipeline, cable, railway, river and other existing obstacles.

CONTRACTOR shall not commence work on such crossings before having obtained approval from the authorities and land owners concerned to the satisfaction of COMPANY. The crossings shall be installed to meet at all times the requirements and conditions of the permit issued by the authorities concerned. In the absence of any specific requirements by authorities, CONTRACTOR shall comply with COMPANY'S instructions.

The right of ingress and egress to the ROW shall be limited to points where such ROW intersects public roads, Arrangements for other access required by the CONTRACTOR shall be made by him at his own cost and responsibility, and for such access, the conditions of this specifications shall also apply.

Where the ROW comes within 30 metres of an existing line or facility, CONTRACTOR shall propose and provide methods to safe-guard the existing line or facility (e.g. a demarcation fence). No work is allowed in such area without COMPANY's prior approval.


3.1 **Safety measures during construction of pipelines inside the area influenced by high voltage lines**

3.1.1 **General**

Pipelines which are constructed inside the area of high voltage lines may be electrically influenced by the high voltage lines. The voltage caused by the influence may at times be high enough to pose danger to personnel working on the pipeline. It is imperative therefore, that the instructions given below should be strictly observed.

3.1.1.1 It is a necessity that all personnel working on the pipeline which is being laid in the area influenced by the high voltage systems, be given clear instructions on measures to be taken.

3.1.1.2 Vehicles and equipment must be earth-connected. This may be effected by attaching an uninsulated cable or chain (which touches the ground) of adequate length to the underside of the vehicle.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 4 of 41
			REVISION : 0
			EDITION : 1

3.1.1.3 If its not impossible for plant and/ or materials to come within 50m of the centre of the high voltage systems, special measures must be taken to prevent any approach beyond that distance, unless article 3.1.2 is complied with.

3.1.1.4 DURING THUNDERSTORMS OR WHEN DISCHARGES ARE OBSERVED ON INSULATORS ALL PERSONNEL MUST LEAVE THE AREA OF THE HIGH VOLTAGE LINE AND PIPELINE.

3.1.1.5 To prevent electrical voltage in a no n-buried section of the pipeline from rising to dangerous levels, the length of the pipeline section which has been welded together before burial must not exceed the length at which the max. admissible voltage may be induced. This length may be calculated using an approved calculation method.

3.1.1.6 Before a pipeline section is lowered into the trench the structure's earth electrodes indicated in the drawings or determined with calculation method must have been installed and connected both to the pipeline section already buried and to the section which is about to be buried. The electrical connections which serve the purpose of preventing dangerous voltages must have a min. area of 35mm².

Said connections must not be interrupted until after the permanent safety earth connections have been installed and connected to the entire uninterrupted pipeline.

3.1.1.7 The welded connection between the pipeline section and the section already buried must be installed at a distance of at least 50m from the nearest point of a pylon base.

3.1.1.8 Personnel doing work inside the area of influence of the high voltage system must wear electrically insulating foot-wear (e.g. rubber kneeboots) and wear insulating rubber or plastic gloves.


3.1.2 **Additional measures for work at less than 50m from the centre of the high voltage system.**

If work is done at less than 50m from the centre of the high voltage system, the regulations below must be complied with in addition to the rules specified in clause 3.1.1.

3.1.2.1 The work must not be started until agreement has been reached with the authorities which controls the high voltage system, about the implementation of the safety measures specified in this section.

3.1.2.2 Measures must be taken to prevent excavating and hoisting equipments from approaching high voltage lines to within any of the following distances.

This distance depends on the voltage carried. For individual connections the distance must be :

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 5 of 41
			REVISION : 0
			EDITION : 1

	0	-	50 KV	3m
	40	-	200 KV	5m
200		-	380 KV	8m

The measures taken may be as follows :

1. Special selection of equipment, or limiting or blocking certain directions of movement, or limiting the operational area, thereby making it impossible for any work to be done at a distance from the high voltage line of less than the accepted minimum.
2. In case the measures recommended in 1. above are not feasible, installation of clearly visible markers of sufficient height or laying out a "no passage beyond this point" line of drums painted bright red and white must prevent any work being done inside the danger area. Further, an inspector must be present all the time.

3.1.2.3 In the event that a vehicle, crane etc. should accidentally come into contact with a live cable of a high voltage system or flash-over of electrical charge occurs, the driver must not leave his vehicle because this will pose a serious threat to his life.

The vehicle or crane must break the contact WITHOUT ANY HELP FROM OUTSIDE.

The driver must not leave his vehicle until he has managed to leave "the dangerous area, or alternatively, when the Electricity Authorities have given notice that the cable(s) have been put out of circuit. In case a serious fire starts in the vehicle, he is permitted to jump from the vehicle, clearing it as far as possible, while the jump should be to a dry spot.

4.0 **RIGHT-OF-WAY**


The CONTRACTOR is required to perform his construction activities within the width of Right-of-way set aside for construction of pipeline, unless he has made other arrangements with the land owner and/ or tenant for using extra land. Variation in this width caused by local conditions or installation of associated pipeline facilities or existing pipelines will be identified in the field or instructed to the CONTRACTOR by COMPANY.

The ROW boundary lines shall be staked by the CONTRACTOR, so as to prepare the strip for laying the pipeline. CONTRACTOR shall also establish all required lines and grades necessary to complete the work and shall be responsible for the accuracy of such lines and grades.

4.1 **Staking**

Prior to clearing operations CONTRACTOR shall :

- 1) Install Bench Marks, Intersection Points and other required survey movements.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 6 of 41
			REVISION : 0
			EDITION : 1

- 2) Stake markers in the centreline of the pipeline at distance of maximum 100 metres for straight line sections and maximum 10 metres for horizontal bends. Wherever ROW centreline has been staked on ground, CONTRACTOR shall exercise care in accurately staking the pipeline centreline, in consultation with COMPANY.
- 3) Stake two ROW markers at least at every 100 metres.
- 4) Set out a reference line with respect in pipeline centreline at a convenient location. Markers on reference line shall be at a distance of maximum 100m for straight line sections and maximum 10m for horizontal bends.
- 5) Install distance markers locating and indicating special points, such as but not limited to :
 - Contract limits, obstacle crossings, change of wall thickness, including corresponding chainage, etc.

ROW markers shall be staked out at the boundary limits of Right-of-way wherever possible. ROW markers shall be painted red with numbers painted in white. Number shall be identical to centreline marker number with letters A (left side) and B (right side) added, (looking, in flow direction). Reference markers shall also carry the same information as its corresponding centreline markers.

Markers shall be of suitable material so as to serve their purpose and shall be coloured distinctly for easy identification. CONTRACTOR shall be responsible for the maintenance and replacement of the reference line markers until the permanent pipeline markers are placed and the as-built drawings are submitted and approved.


Any deviation from the approved alignment shall be executed by CONTRACTOR after seeking COMPANY approval in writing prior to clearing operations.

4.2 **Monuments**

All shrines, monument, border stones, stone walls and the like shall be protected and shall be subjected to no harm during construction. Any violation of the above by the CONTRACTOR shall be brought to the notice of the COMPANY and other concerned authorities. Restoration of the above shall wholly be the responsibility of the CONTRACTOR.

4.3 **Fencing**

Prior to clearing or grading of the Right-of-way or stringing of pipe, CONTRACTOR shall open fences on or crossing the construction Right-of-way and install temporary gate of sound construction made of similar materials and suitable quality to serve purpose of original fence. Adjacent post shall be adequately braced to prevent slackening of the remainder of the fence. Before such fences are cut and opened, CONTRACTOR shall

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 7 of 41
			REVISION : 0
			EDITION : 1

notify the land owner or tenant, and where practicable, the opening of the fences shall be in accordance with the wishes of said owner and tenant. In all cases where CONTRACTOR removes fences to obtain work route, CONTRACTOR shall provide and install temporary fencing, and on completion of construction shall restore such fencing to its original condition.

CONTRACTOR shall install temporary fencing on either side of ROW where in COMPANY's opinion, it is considered essential to ensure safety and non-interference, especially in areas like grazing lands, villages etc.

Fencing shall be removable type wherever necessary, to permit crossing of traffic. The type of fencing must be suitable for the situation in accordance with user. The pole distance shall not be greater than 6m. The minimum height of the fencing shall be 1.2m above grade. Fencing can consist of one or more rows of smooth wire and/ or of barbed wire.

Fencing shall be continuously maintained and the thorough-ways inspected to be shut during the execution of the work.


4.4 **Row Clearing and Grading**

4.4.1 All stumps shall be grubbed for a continuous strip, with a width equal to trench top width plus two metres on either side centred on the pipeline centreline. Further, all stumps will be grubbed from areas of the construction Right-of-way, where Right-of-way grading will be required. Outside of these areas to be graded and the mentioned trench strip, at the option of CONTRACTOR, the stumps may either be grubbed or cut off to ground level. Any stump cut off must be left in a condition suitable for rubber-tired pipeline equipment traffic.

4.4.2 All grubbed stumps, timber, bush undergrowth and root cut or removed from the Right-of-way shall be disposed of in a manner and method satisfactory to COMPANY, land-owner and/ or tenant, and Government Authorities having jurisdiction and as soon as practical after the initial removal. In no case, it shall be left to interfere with the grading and laying operations. Whenever stumps are grubbed and a hole is left in the ground, CONTRACTOR shall back-fill the hole and compact it to prevent water from gathering in it and creating a big hole.

4.4.3 CONTRACTOR shall grade the pipeline Right-of-way as required for proper installation of the pipeline, for providing access to the pipeline during construction, and for ensuring that the pipeline is constructed in accordance with the good engineering and construction practices.

4.4.4 CONTRACTOR shall grade sharp points or low points, without prejudice to section 6.0 of this specification, to allow the pipe to be bent and laid within the limits set forth in these specifications and drawings as regards the minimum elastic curvature permitted, and shall drill, blast or excavate any rock or other material which cannot be graded off with ordinary grading equipment in order to make an adequate working space along the pipeline.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 8 of 41
			REVISION : 0
			EDITION : 1


- 4.4.5 No temporary or permanent deposit of any kind of material resulting from clearing and grading shall be permitted in the approach to roads, railways, streams, ditches, drainage ditches and any other position which may hinder the passage and/or the natural water drainage.
- 4.4.6 The Right-of-Way clearing and grading operations shall in no case involve embankment structures of any type and class without prior approval of the authorities having jurisdiction over the same.
- 4.4.7 In the case of natural or artificial deposits of loose soil, sand, heaps of earth, or other fill materials, these shall be removed till stable natural ground level is reached so as to ensure the construction of the pipeline ditch is in stable ground.
- 4.4.8 In the case of Right-of-Way clearing and grading on hill side or in steep slope areas, proper barriers or other structures shall be provided to prevent the removed materials from rolling downhill. The Right-of-Way crossfall shall not exceed 10%.
- 4.4.9 Wherever the pipeline Right-of-Way runs across plantations, alongside farmyards, built up areas, groups of trees, horticultural spreads, gardens, grass-fields, ditches, roads, paths, railways or any other area with restrictions of some kind, CONTRACTOR shall grade only the minimum area required for digging and constructing the pipeline. In the said places, CONTRACTOR shall carry out the works in such a way that damage done from the pipeline construction is kept to a minimum.

4.5 **Provision of Detours**

CONTRACTOR shall do all necessary grading and bridging at road, water and other crossings and at other locations where needed, to permit the passage of its men and equipment. It is understood that the CONTRACTOR has recognised such restrictive features of the Right-of-Way and shall provide the necessary detours and execute the works without any extra cost to COMPANY. Public travel shall not be inconvenienced nor shall be wholly obstructed at any point.

CONTRACTOR at his own cost shall furnish and maintain watchman detours, lanterns, traffic lights, barricades, signs, wherever necessary to fully protect the public.

CONTRACTOR shall be responsible for moving its equipment and men across or around watercourses. This may require the construction of temporary bridges or culverts. Temporary bridging or access to fording required for Right-of-Way crossing water courses shall be constructed. CONTRACTOR shall ensure that such temporary works shall not interfere with normal water flow, avoid overflows, keep the existing morphology unchanged and shall not unduly damage the banks or water courses. No public ditches or drains shall be filled or bridged for passage of equipment until CONTRACTOR has secured written approval of the Authorities having jurisdiction over the same. CONTRACTOR shall furnish COMPANY a copy of such approval.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 9 of 41
			REVISION : 0
			EDITION : 1

4.6 **Steep and Rocky Terrain**

Grading operations could normally be carried out along the Right-of-way with mechanical excavators or manually. In certain areas, grading may have to be resorted to exclusively by blasting.

In rough or steep terrain, CONTRACTOR may have to grade access roads and temporary bypass roads for its own use. Where such access roads do not fall on the Right-of-Way, CONTRACTOR shall obtain necessary written permission from land owners and tenants and be responsible for all damages caused by the construction and use of such roads, and at no extra cost to COMPANY. Wherever rocky terrain is encountered, grading shall be carried out in all types of solid rocks which cannot be removed until loosened by blasting, drilling, wedging or by other recognised means of quarrying solid rocks.

Where use of explosives is required in connection with Right-of-Way grading and trenching, CONTRACTOR shall comply fully with requirements of the use of explosives as provided under clause 6.3 of this Specification.

4.7 **Off Right-of-Way Damages**

CONTRACTOR shall confine all its operations within limits of the Right-of-Way. Any damage to property outside ROW shall be restored or settled to the CONTRACTOR's account.


CONTRACTOR shall promptly settle all off Right-of-Way damage claims. Should CONTRACTOR fail to do so, COMPANY shall give written notice to CONTRACTOR that if CONTRACTOR does not settle such claims within seven days after such notice, COMPANY shall have the authority to settle claims from the account of the CONTRACTOR.

5.0 **HANDLING, HAULING, STRINGING AND STORING OF MATERIALS.**

5.1 **General**

The CONTRACTOR shall exercise utmost care in handling in pipe and other materials. CONTRACTOR shall be fully responsible for all materials and their identification until such time that the pipes and other materials are installed in permanent installation. CONTRACTOR shall be fully responsible for materials, however, method of storage shall be approved by COMPANY.

CONTRACTOR shall reimburse the COMPANY for the cost of replacement of all COMPANY supplied materials damaged during the period in which such materials are in the custody of the CONTRACTOR. It shall be CONTRACTOR's responsibility to unpack any packing for the materials supplied by COMPANY.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 10 of 41
			REVISION : 0
			EDITION : 1

5.1.2 "Taking Over" of Line Pipe

The following stipulations shall apply in case CONTRACT provides for supply of line pipe, bare and/or corrosion coated, by COMPANY.


CONTRACTOR shall receive and 'take over' against requisition, line pipe from the COMPANY's designated place(s) of delivery as defined in the CONTRACT. CONTRACTOR shall perform visual inspection of the bare pipes and coating of the corrosion coated pipes, as the case may be, in the presence of COMPANY and all damages shall be recorded. In the case of corrosion coated pipes CONTRACTOR at his option may carry out holiday detection at a prescribed set voltage and record such holidays, in the presence of COMPANY, at the time of 'taking over'. However, if CONTRACTOR proposes to perform only visual inspection of coating, then repair of all holidays found at the time of laying the pipeline shall be carried out by the CONTRACTOR at no extra cost to COMPANY. The CONTRACTOR shall be entitled to extra compensation for repair and rectification of defects recorded at the time of taking over as per the rate set forth in the "CONTRACT". Repair of all damages after taking over the delivery of the materials shall be to the CONTRACTOR'S cost. In case of delay in handing over of COMPANY supplied material, CONTRACTOR shall be fully responsible for stopping and rearranging means of transportation at no extra cost to the COMPANY.

5.2 Handling and Hauling of Line Pipe

5.2.1 Bare Pipe

CONTRACTOR shall unload, load, stockpile and transport the bare pipes using suitable means and in a manner to avoid denting, flattening, or other damage to pipes. Pipe shall not be allowed to drop or strike objects which will damage the pipe but shall be lifted or lowered from one level to another by suitable equipment. Lifting hooks when used, shall be equipped with a plate curved to fit the curvature of the pipe. In loading pipe on trucks each length shall be lowered to position without dropping and each succeeding length shall rest on special supports on the truck and shall be separated from the adjacent pipes. After loading, suitable chains and padding shall be used to tie the load securely to each bolster. Pipes, when stock piled, shall be placed on suitable skids to keep them clear of the ground and flood water. The CONTRACTOR shall provide all necessary timber or other materials required for the stock-piling. While stacking, the number of allowable layers of bare pipes shall be calculated as per API RP5L1 and shall be agreed with COMPANY. The stacks must be properly secured against sliding and shall consist of pipes of the same diameter and wall thickness. Adjacent stacks of pipes having different dimensional characteristics shall be clearly separated.

Pipes which are damaged at the time of delivery or "taking-over" (when line pipe is supplied by COMPANY), particularly those which are dented, buckled, or otherwise permanently deformed, must be stacked separately and may be transported to the sites only when these defects have been repaired or eliminated.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 11 of 41
			REVISION : 0
			EDITION : 1

5.2.2 Corrosion Coated Pipes

The CONTRACTOR shall load, unload, transport and stockpile the coated pipes using approved suitable means and in a manner to avoid damage to the pipe and coating. CONTRACTOR shall submit to the COMPANY, a complete procedure indicating the manner and arrangement used for handling and stacking of coated pipes for COMPANY approval prior to commencement of handling operations.

Use of vacuum lifting equipments are preferred. Hooks may also be used for handling the pipes provided they have sufficient width and depth to fit the inside of the pipe and covered with soft material like rubber, teflon or equivalent, so as not to cause damages to bevel or pipe ends. During hoisting, cables/wire ropes shall have sufficient inclination compared to pipe axis so that they do not come into contact with external coating.


Coated pipes may be handled by means of slings and belts of proper width (minimum 60mm) made of non-metallic/non - abrasive materials. In this case, pipes to be stacked shall be separated row by row to avoid damage by rubbing the coated surface in the process of taking off the slings. Use of round sectional slings are prohibited.

During handling, suitable handling equipment with proper length of booms shall be used. Fork lifts may be used provided that the arms of the fork lift are covered by suitable pads preferably rubber. Before lifting operations it is essential to ensure that the pipe surface is free from foreign material with sharp edges. Belts/slides when used shall be cleaned to remove hard materials such as stone, gravel etc. Coated pipes shall not be bumped against any other pipe or any other objects. Rolling, skidding or dragging shall be strictly forbidden.

Coated pipes at all times shall be stacked completely clear from the ground so that the bottom row of pipes remain free from any surface water. The pipes shall stacked at a slope so that driving rain does not collect inside the pipe.

The coated pipes at all times shall be stacked by placing them on ridges of sand free from stones and covered with a plastic film or on wooden supports provided with suitable cover. This cover can, for example, consist of dry, germ free straw with a plastic film, otherwise foam rubber may be used. The supports shall be spaced in such a manner so as to avoid permanent bending of the pipes, particularly in case of small diameter pipes with low wall thickness. The pipes shall be stacked so that the uncoated bevelled ends are in line at one end thus making differences in length clearly noticeable.

Stacks shall consist of limited number of layers so that the pressure exercised by the pipe's own weight does not cause damages to the coating. Each pipe section shall be separated by means of spacers suitably spaced for this purpose. Stacks shall be suitably secured against falling down and shall consist of pipe sections having the same diameter and wall thickness. The weld bead of pipes shall be positioned in such a manner so as not to touch the adjacent pipes.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 12 of 41
			REVISION : 0
			EDITION : 1

Coated Pipes stacked in open storage yard s/dump yards shall be suitably covered on top to decrease direct exposure to sunlight.

The ends of the pipes during handling and stacking shall always be protected with bevel protecters.

The lorries/rail wagons shall be equipped with adequate pipe supports having as many round hollow beds as the number of pipes to be placed on the bottom of the lorry bed. Supports shall be provided for at least 10% of the pipe length. These supports shall be lined with a rubber protection and shall be spaced in a manner as to support equal load from the pipes. The rubber protection shall be free from all nails and staples where pipes are in contact. The second layer and all subsequent layers shall be separated from other layers with adequate number of separating layers of protective material such as straw in plastic covers or otherwise to avoid direct touch between the coated pipes.

All stanchions of lorries/rail wagons used for transportation shall be covered by non-abrasive material like rubber belts or equivalent. Care shall be exercised to properly cover the top of the stanchions and convex portions such as reinforcement of the truck/rail wagon only, rivets etc. to prevent damage to the coated surface.

5.3

Stringing of Pipe


Pipes shall be unloaded from the stringing trucks and lowered to the ground by means of boom tractor or swinging crane or other suitable equipment using lifting devices as mentioned earlier. Dragging or sliding of pipe shall not be permitted. Special precaution shall be taken during stringing of corrosion coated pipe as per the special requirements of previous para. Stringing of pipe shall only be carried out in daylight and after clearing and grading operations have been completed. Pipes shall not be strung along the ROW in rocky areas where blasting may be required, until all blasting is completed and the area cleared of all debris.

The stringing of the pipe on the ROW shall be done in such a manner so as to cause the least interference with the normal use of the land crossed and to avoid damage to and interference with the pipes. The sequence of pipes must be interrupted at suitable intervals, spaced to coincide with passages, roads, railways, water crossings as well as at other places if requested by landowner / tenants to permit use of land.

In case line pipe supply is by different manufacturers, CONTRACTOR shall string all line pipes of one manufacturer before commencing the stringing of line pipes of another manufacturer.

When parallel pipelines are being constructed, bumping against and contact with the strung sections of pipe shall be avoided, whether the stringing of the pipes for the individual lines is carried separately or simultaneously.

The pipe lengths shall be properly spaced in order to make easier the handling during the welding phase.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 13 of 41
			REVISION : 0
			EDITION : 1

It shall be the responsibility of the CONTRACTOR to see that pipe is strung as per the approved drawings for the proper placement of pipe by size, thickness, grade and other specifications. Any additional handling of pipes due to failure to comply with the requirements shall be at the CONTRACTOR's expense.

5.4 Repair of Damaged pipes

After the pipes have been strung along the ROW, they shall be inspected by the CONTRACTOR and by the COMPANY. All defective pipe ends shall have to be repaired as per the directions of the COMPANY or as per the requirements of this specification.

5.5 Materials other than linepipe

CONTRACTOR shall receive and take over against requisition all COMPANY supplied materials from COMPANY's designated place(s) of delivery as defined in the CONTRACT. CONTRACTOR shall perform visual inspection and defects, if any noted, shall be recorded separately. The CONTRACTOR shall be entitled to extra compensation for repair and rectification of such defects at the rates set forth in the "CONTRACT".

The CONTRACTOR shall perform the necessary loading, unloading, hauling from points designated by the COMPANY and storing, if necessary, of all materials. The CONTRACTOR shall exercise care in handling, storing and distribution of materials in order to avoid damage and deterioration of these materials and prevent their theft or loss.


Materials excluding line pipe shall be stored in sheltered storages. Such materials shall not be strung on the Right-of-Way but shall be transported in covered conveyances for use only at the time of installation.

CONTRACTOR shall ensure that all valves and whenever applicable, other materials are fitted with suitable end covers of the type approved by COMPANY. Materials with worked surfaces such as flanges, pipe fittings, etc. must be stacked and handled so as to avoid contact with the ground or with substances that could damage them.

The manufacturer's instructions regarding temperature and procedure for storing materials which are subject to alteration of the original properties and characteristics due to unsuitable storage must be strictly complied with and, if required, an adequate heat conditioning shall be provided for these materials.

When supplied in containers and packages they must not be thrown or dropped, not handled using hooks which could damage the container or the materials, either during loading/unloading or during successive handling, until their final use.

Storage of coating materials which are susceptible to deterioration or damages especially due to humidity, exposure to high thermal conditions or other diverse weather conditions, shall be suitably stored and protected. These materials shall be

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 14 of 41
			REVISION : 0
			EDITION : 1

kept permanently in store , supported above the ground in a dry place, protected against the weather and transported for use only at the time and in quantities necessary for immediate application. Deteriorated materials shall not be used and replaced with no extra cost to COMPANY.

5.6 Identification

CONTRACTOR shall provide all pipes, bends, etc. greater than 2" with serial numbers as soon as possible and measure their length and state is on the pipes, etc. Pipes to be bent shall be measured prior to bending. Identification (i.e. letter, number and length) shall be indelible.

All serial numbers shall be recorded in a list, which shall also state appurtenant pipe numbers.

Beside recording the stamped - in pipe numbers, length of pipe and painted-on serial numbers, the stamped-in numbers of T- pieces, bends, valves, etc. and the batch numbers of bends, T-pieces, valves, etc. and the make of valves, shall also be recorded in said list.

Before a pipe length, pipe end, etc. is cut the painted serial number and stamped-in pipe number shall be transferred by CONTRACTOR in the presence of COMPANY to either side of the joint which is to be made by cutting, and the changes shall be recorded in the above mentioned list stating the (new) length. The results shall be such that all pipes, pups, etc. of diameter greater than 2" bear clear marks painted on.

CONTRACTOR shall explicitly instruct his staff that parts which cannot be identified must not be removed, except after permission by COMPANY.

As a general rule parts must be marked as described above before being moved. In no conditions may unmarked parts be incorporated into the WORK.

6.0 TRENCHING


6.1 Location

CONTRACTOR shall, excavate and maintain the pipeline trench on the staked center line of the pipeline taking into account the curves of the pipeline.

6.2 Excavation

6.2.1

CONTRACTOR shall, by any method approved by COMPANY, dig the pipeline trench on the cleared and graded Right-of-Way. In cultivable land and other areas specifically designated by the COMPANY, top 60mm of the arable soil on the pipeline trench top and 500mm on either side shall be excavated and stored separately to be replaced in original position after backfilling and compacting rest of the trench.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 15 of 41
			REVISION : 0
			EDITION : 1

Suitable crossing shall be provided and maintained over the open ROW where necessary, to permit general public, property owners or his tenants to cross or move stock or equipment from one side of the trench to the other.

Care shall be exercised to see that fresh soil recovered from trenching operation, intended to be used for backfilling over the laid pipe in the trench, is not mixed with loose debris or foreign material. The excavated material shall never be deposited over or against the strung pipe.

6.2.2 In steep slope area or on the hillside, before commencing the works, proper barriers or other protection shall be provided to prevent removed materials from rolling downhill.

6.2.3 On slopes where there is danger of landslide, the pipeline trench shall be maintained open only for the time strictly necessary. Forever, the COMPANY may require excavation of trench by hand, local route detours and limiting the period of execution of the works.

6.2.4 In certain slope sections before the trench cuts through the water table, proper drainage shall be ensured both near the ditch and the Right-of-Way in order to guarantee soil stability.

6.2.5 All sewers, drains ditches and other natural waterways involved in the execution of the works shall be maintained open and functional. The same applies to canals, irrigation canals, pipelines and buried facilities crossed by the ditch for which temporary pipeline shall be laid, if required, and proper temporary installations provided.


6.3 **Blasting**

Blasting for trenching and the related removal of scattered rock and debris caused by the blasting from the Right-of-Way and/or adjacent property, shall be performed by CONTRACTOR as part of his work.

Every possible precaution shall be taken to prevent injuries and damages to persons and properties during blasting operations, which shall be performed in accordance with Standard Rules for Blasting.

CONTRACTOR shall obtain necessary permits for storage and use of explosives and comply with the laws, rules and regulations of the respective Governmental agencies having jurisdiction thereof. No blasting will be allowed without prior and due notice given by CONTRACTOR to COMPANY, Government authorities, land-owners, property occupants, adjacent work crew, and other concerned parties.

CONTRACTOR shall employ only such workmen who are experienced in the type of work to be performed, to supervise, handle and use explosives.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 16 of 41
			REVISION : 0
			EDITION : 1

6.3.1 Areas to be blasted are to be categorised as follows:

- a) Where blasting is to be carried out beyond 50 meters away from any existing pipeline or structures (either above or below ground) the CONTRACTOR shall submit his proposed blasting procedure and perform a trial blast for COMPANY's approval.
- b) Where blasting is to be carried out between 50 and 15 meters from any existing pipeline or structure (either above or below ground) the CONTRACTOR shall submit a procedure for controlled blasting e.g. break-holes, slit trench etc. which will also detail out safety precautions to safeguard the existing pipelines. This procedure will be approved by COMPANY prior to commencement and performing of trial blasting.
- c) No blasting is allowed within 15 metres of any existing pipeline or structure (either above or below around).

6.3.2 All necessary precautions shall be taken to prevent stones from falling outside the Right-of-way and in cultivated areas and to avoid any damage to the installation and properties existing nearby.


6.3.3 Blasting and removal of debris shall be carried out prior to stringing the pipes.

6.3.4 Ground vibration due to blasting near the existing structures shall be continuously monitored using certified instruments to be provided by CONTRACTOR and approved by COMPANY and the peak particle velocities shall not exceed 50 mm/ sec.

COMPANY reserves the right to refuse blasting where possible danger exists to property, existing utilities or other structures. In such locations other methods of extracting rock shall be proposed by CONTRACTOR and shall be approved by COMPANY.

6.4 **Normal Cover and Trench Dimensions**

The trench shall be excavated to a minimum so as to provide, on both sides of the installed pipeline, a clearance as indicated in the job standard/ drawings and to a depth sufficient to provide the minimum cover as indicated below. The dimensions in the table below shall govern except as noted herein or as shown on the job standards or detailed construction drawings or as required by authorities having jurisdiction, whichever is greatest. Minimum depth of cover shall be measured from the top of pipe corrosion/ concrete weight coating (as applicable) to the top of undisturbed surface of the soil or top of graded working strip or top of road or top of rail whichever is lower. Fill material in working strip shall not be considered to add to the depth of cover. However, surface of fill material placed to fill hollows may be used to determine the depth of cover subject to prior approval by COMPANY.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 17 of 41
			REVISION : 0
			EDITION : 1


Sl. No.	Location	Minimum	Cover in meters
a)	Industrial, Commercial & Residential Areas		1.0
b)	Rocky Terrain		1.0
c)	Minor water crossings/ canals / drain / nala / stream		1.5
d)	River crossings for which scour depth is fined (below scour)		1.5
e)	River crossings (Bank width < 50 m) below lowest bed level)		1.5
f)	Other crossings (Bank width > 50 m) (below lowest bed level)	1.5	2.5 (for normal soil) (for rocky strata)
g)	Water crossing by HDD (below least bed level)		2.5
h)	Uncased/ Cased Road Crossings/ Station approach	1.2	
i)	Railroad Crossings	1.7	
j)	Drainage, ditches at roads / railway crossings		1.0
k)	Marshy land and creek area		1.5

Notes :

In case pipeline is located within 1.5 m from any dwelling unit, the cover shall be increased by 300 mm over and above that specified.

6.5 Cutting and Removal of Paving

Whenever it is permitted by Authorities and / or COMPANY Y to open cut a paved road crossing, or where the line is routed within the road pavement, CONTRACTOR shall remove the paving in accordance with the restrictions and requirements of the authorities having jurisdiction thereof or as directed by COMPANY Y. The open cut for the road crossing shall be carried out only when the section of pipeline to be laid is complete. After laying the pipeline, backfilling shall be immediately performed and all the area connected with the works shall be temporarily restored.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 18 of 41
			REVISION : 0
			EDITION : 1

Throughout the period of execution of such works, CONTRACTOR shall provide and use warning signs, traffic lights or lanterns, barricades, fencing, water channel, etc. as required by the local authorities having jurisdiction and/ or COMPANY.

For all roads, paths, walkway etc. which are open-cut, CONTRACTOR shall provide temporary diversions properly constructed to allow the passage of normal traffic with the minimum of inconvenience and interruptions.

The paving shall be restored to its original condition after the pipeline is installed.

6.6 **Extra Depth and Clearance**

At points where the contour of the earth may require extra depth to fit the minimum radius of the bend as specified or to eliminate unnecessary bending of the pipe according to customary good pipeline practice, or where a deep trench is required at the approaches to crossings of roadways, railroads, rivers, streams, drainage ditches, and the like, CONTRACTOR shall excavate such additional depth as may be necessary at no extra cost to the COMPANY.

CONTRACTOR shall excavate to additional depth where the pipeline approaches and crosses other pipelines, sewers, drain pipes, water mains, telephone, conduits, and other underground structures, so that the pipeline may be laid with at least 50 centimeters free clearance from the obstacle or as specified in the drawings, or such greater minimum distances as may be required by authorities having jurisdiction.


Where the pipeline crosses areas, whose easements specifically require greater than normal depths of cover, the trench shall be excavated to extra depth in accordance with the Right-of-way Agreements or as required.

CONTRACTOR shall excavate all such additional depths as may be necessary at no extra cost to the COMPANY.

6.7 **Grades, Bends and Finish of Trench**

The trench is to be cut to a grade that will provide a firm, uniform and continuous support for the pipe. Bends shall be made in the pipe at significant changes in grade of the trench. COMPANY reserves the right to set the grade of the trench and locate the bends if so desired, in which case CONTRACTOR shall excavate, at no extra cost, the trench and bend the pipe to such a grade. COMPANY desires to reduce to a minimum the required number of cold field bends to lay the pipe to conform to the general contour of the ground and maintain a normal cover. This can be accomplished by cutting the trench slightly deeper at the crest of ridges and by gradually deepening the trench in approaches to crossings. Such trenching work shall be done by CONTRACTOR at no extra cost to the COMPANY.

COMPANY intends that there will be a minimum of hand grading of the trench bottom. However, to achieve this, CONTRACTOR will have to dig as square a bottom of the trench as possible with his equipment. This in part can be obtained by adjusting and

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 19 of 41
			REVISION : 0
			EDITION : 1

adopting the crumbling shoe and digging teeth of the trenching machines and by use of a drag behind the trenching machines or manually dressing-up the same. CONTRACTOR shall do such hand work in the trench as is necessary to free the bottom of the trench from loose rock and hard clods and to trim protruding roots from the bottom and side walls of the trench.

6.8 **Padding**

In all cases where rock or gravel or hard soil is encountered in the bottom of the trench, COMPANY will decide the exact extent of trench padding, that will be required. The thickness of the compacted padding shall not be less than 150mm. In those areas that are to be padded, the trench shall be at least 150mm deeper than otherwise required, and evenly and sufficiently padded to keep the pipe, when in place, at least 150mm above bottom of excavated trench.

Acceptable padding shall be placed under the pipeline before its installation, and around after installation to establish at both sides and on top of the pipe a permanent layer of padding. The thickness of compacted padding on top of pipe corrosion coating shall be at least 150mm. Padding materials that are approved by COMPANY shall be graded soil/ sand and/ or other materials containing no gravel, rock, or lumps of hard soil. Sand used for padding shall pass through sieve size ASTM-10 or ISO-2.00.

When specified in the CONTRACT, rock shield may be used in place of or in addition to sand padding as indicated above. Such rock shield shall be in accordance with the specification issued for the purpose and shall be subject to COMPANY approval.

6.9 **Protection of Trench**


CONTRACTOR shall keep the trench in good condition until the pipe is laid, and no claim is to be made to the COMPANY by reason of its caving either before or after pipe is laid.

All lumber, sheet-piling jacks or other materials, that may be necessary to shore the trench, in order to prevent caving are to be furnished and removed by CONTRACTOR.

CONTRACTOR shall dewater if necessary, using well point system or other suitable systems, shore, or do what else might be required to excavate the trench, install the pipe in it and backfill the trench in accordance with these specifications at no extra cost to COMPANY.

6.10 **Protection of Underground Utilities and Special Methods**

Details of some underground utilities, as far as acquired by COMPANY, shall be indicated in the Drawings. However, CONTRACTOR shall obtain plans and full details of all existing and planned underground services from the relevant Local Authorities and shall follow these plans closely at all times during the performance of work. CONTRACTOR shall be responsible for location and protection of all underground lines and structures. In special locations the use of trenching machine, backhoe may result

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 20 of 41
			REVISION : 0
			EDITION : 1

in damage to property and subsurface structures likely to be encountered during excavation. At such places, CONTRACTOR shall excavate the trench manually to same specification at no extra cost.

Where the pipeline crosses other underground utilities/ structures, the CONTRACTOR shall first manually excavate to a depth and in such a manner that the utilities/ structures are located.

Temporary underpinning or any other type of supports and other protective devices necessary to keep the interfering structure intact shall be provided by the CONTRACTOR at his own cost and shall be of such design as to ensure against their possible failure.

Despite all precautions, should any damage to any structure/ utility etc., occur, the Owner/ Authority concerned shall be contacted by the CONTRACTOR and repair shall forthwith be carried out by the CONTRACTOR at his expense under the direction and to the satisfaction of COMPANY and the concerned Owner/ Authority. If CONTRACTOR fails to repair in reasonable time, COMPANY reserves the right to have the repair executed at the cost of the CONTRACTOR.

6.11 **Encroachments and Working near other utilities**


In locations, where pipeline has to be laid in the body of a road, canal, dyke or other locations under jurisdiction of Government/ Public Bodies, the CONTRACTOR shall perform such work without extra compensation, according to the requirement of concerned Authorities. When it becomes necessary that CONTRACTOR has to resort to hand digging, well point, erection of sheet piling or any other special construction methods in these areas, no extra compensation shall be paid. CONTRACTOR shall contact the Authorities concerned in order to become familiar with their requirements.

In locations, where the pipeline has to be laid more or less parallel to an existing pipeline, cable and/ or other utilities in the Right-of-way, CONTRACTOR shall perform the work to the satisfaction of the Owner/ Authority of the existing pipeline/ cable/ utility. In such locations CONTRACTOR shall perform work in such a way that even under the worst weather and flooding conditions, the existing pipeline/ utilities remain stable and shall neither become undermined nor have the tendency to slide towards the trench.

CONTRACTOR shall be liable for any damage occurring to, or resulting from damage to other pipelines, underground structure/ utilities, as laid down in clause 6.10 of this specification.

6.12 **Provisions for negative buoyancy to the pipe**

CONTRACTOR shall check if up-floating danger is present in open trench and then shall take appropriate measures to prevent up-floating such as applying soil dams and dewatering of trench or temporary filling of water into the line (in exceptional cases).

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 21 of 41
			REVISION : 0
			EDITION : 1

In the case of water on the ditch bottom when the pipeline is being laid, the ditch shall be drained to the extent and for the time required to make a visual inspection of the ditch bottom. After this inspection, the presence of water will be allowed provided its level does not cause sliding of the ditch sides and pipe floating before backfilling when no concrete weighting is provided.

The water pumped out of the ditch shall be discharged into a natural water course.

Wherever up-floating of the pipeline after backfilling is to be reckoned with, anti-buoyancy measures shall be provided by CONTRACTOR for areas indicated in the drawings or as may be encountered during construction, using one or a combination of the following methods :

- weighting by applying a continuous concrete coating around the pipe;
- weighting by installing saddle weights;
- installing metal anchors screwed into the subsoil in pairs;
- deeper burial of pipeline;
- provision of select backfill material.

The above provisions shall be in accordance with the relevant specifications and/ or job standards/ drawings.

7.0 **BENDING**

CONTRACTOR shall preferably provide for changes of vertical and horizontal alignment by making elastic bends. CONTRACTOR may provide cold field bends, at its option for change of direction and change of slope. COMPANY at its option, may authorise fabricated bends for installation at points where in COMPANY's judgement the use of such bends is unavoidable.


Overbends shall be made in such a manner that the center of the bend clears the high points of the trench bottom. Sag bends shall fit the bottom of the trench and side bends shall conform and leave specified clearance to the outside wall of the trench.

7.1 **Elastic Bends**

The minimum allowable radius for elastic bends in the buried pipeline including that for continuous concrete weight coated pipe shall be in accordance with relevant job standards. The elastic bend shall be continuously supported over its full length. A radius smaller than permitted in elastic bending shall require a cold bend.


7.2 **Cold Field Bends**

7.2.1 The radius of cold field bends shall not be less than 40 times the pipe nominal diameter for pipe diameter 18 inch and above and shall not be less than 30 times the pipe nominal diameter for pipe diameter less than 18 inch.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 22 of 41
			REVISION : 0
			EDITION : 1

- 7.2.2 CONTRACTOR shall use a bending machine and mandrel and employ recognized and accepted methods of bending of coated pipe in accordance with good pipeline construction practice. However, bending machines shall be capable of making bends without wrinkles, buckles, stretching and with minimum damage to the coating.
- 7.2.3 CONTRACTOR shall, before the start of the work, submit and demonstrate to COMPANY a bending procedure which shall conform with the recommendations of the manufacturer of the bending machine. The procedure shall include amongst other steps - lengths, maximum degree per pull and method and accuracy of measurement during pulling of the bend. This procedure and the equipment used shall be subject to COMPANY's approval.
- 7.2.4 Pipes with longitudinal welds shall be bent in such a way that the weld lies in the plane passing through the neutral axis of the bend which shall be installed positioning the longitudinal weld in the upper quadrants. If horizontal deviations are to be achieved by joining more adjacent bends, the bending of the pipe lengths shall be made by positioning the longitudinal welds alternatively 70mm above and below the plane passing through the neutral axis in such a way that the bends are welded with the longitudinal welds displaced by about 150mm and situated in the upper quadrants. In case of vertical bends formed from a number of pipe lengths, the longitudinal welds shall be positioned on the plane passing through the neutral axis of the bend to the right and left alternatively.
- 7.2.5 The pads, dies and rolls of the bending equipment shall have relatively soft surfaces to avoid damage to the pipe coating. Where applicable, fully retaining bending shoes shall be used. Roller type bending machines are preferred.
- 7.2.6 The ends of each bent length shall be straight and not involved anyway in the bending. The length of the straight section shall permit easy joining. In no event shall the end of the bend be closer than 1.5m from the end of a pipe or within one meter of a girth weld.
- 7.2.7 The ovalisation caused on each pipe by bending shall be less than 2.5% of the nominal diameter at any point. Ovalisation is defined as the reduction or increase in the internal diameter of the pipe compared with the nominal internal diameter. A check shall be performed on all bends in the presence of COMPANY by passing a gauge consisting of two discs with a diameter equal to 95% of the nominal internal diameter of the pipe connected rigidly together at a distance equal to 300mm.
- 7.2.8 The wall thickness of finished bends, taking into account wall thinning at the outer radius, should not be less than the design thickness. An indication of wall thinning as a percentage is given by the following empirical formula :

$$\text{Wall Thinning} = \frac{50}{n + 1}$$

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 23 of 41
			REVISION : 0
			EDITION : 1

Where 'n' is the inner bend radius divided by pipe diameter. Pipes with measured wall thickness greater than the nominal wall thickness (i.e. with +ve tolerance) shall normally be used for making cold field bends.

7.2.9 Cold bent pipes on site shall have the corrosion coating carefully checked with the aid of a holiday detector for cracks in the coating down to the pipe wall. It must also be checked whether the coating has disbonded from the pipe wall during bending by beating with a wooden mallet along the outer radius. Any defects or disbonding of the coating caused during bending (also forced ridges in the coating) shall be repaired at the CONTRACTOR's expense in accordance with COMPANY approved procedures.

7.2.10 When pipelines are laid in parallel, the horizontal bends shall be concentric.

7.3 **Miter and Unsatisfactory Bends**

All bends showing buckling, wrinkles, cracks or other visible defects or which are in any way in disagreement, in whole or in part, with this specification shall be rejected.

No miter bends shall be permitted in the construction of the pipe line. CONTRACTOR shall cut out and remove any bend or bends which do not meet the specifications and shall replace the same with satisfactory bends at no additional cost to the COMPANY. In the event the CONTRACT provides for supply of line pipe by COMPANY, the pipes required for replacement will be furnished by COMPANY, but the cost of replacement of such pipes shall be borne by CONTRACTOR.


Cutting of factory made bends and cold field bends for any purpose are not permitted.

8.0 **LINING UP AND WELDING**

Each length of pipe shall be thoroughly examined internally and externally to make sure that it is free from visual defects, damage, severe corrosion (sea water pitting), dirt, animals or any other foreign objects. Each length of the pipe shall be adequately swabbed, either by use of canvas belt disc of proper diameter or by other methods approved by the COMPANY. Damaged/corroded pipes shall be kept separate. Each length of pipe shall be pulled through just before being welded.

All rust and foreign matters shall be removed from the beveled ends by power operated brush. This shall be affected inside & outside and for a minimum distance of 25 mm from edge of bevel. The bevel shall be thoroughly inspected at this stage. Should laminations, spilt ends or manufacturing defects in the pipe observed, the length of the pipe containing such defects shall be removed from the line in accordance with relevant specification.

Contractor shall align and weld together the Joints of pipe so as to construct a continuous pipeline. All welds in the pipeline made by Contractor shall be of strength equal to that of pipe. All welding shall conform to Company's welding specifications enclosed with the Contract.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 24 of 41
			REVISION : 0
			EDITION : 1


8.1 Pipe Defects and Repairs

It is CONTRACTOR's responsibility to repair all internal and/or external defects.

- 8.1.1 Acceptability of defects in the pipe detected during inspection at the work site shall be determined in accordance with latest edition of COMPANY's own material specification or CODE ANSI B31.8/B 31.4 whichever is more stringent.
- 8.1.2 The maximum permissible depth of dents in pipes upto and including 12^{3/4"} OD is 5mm and for pipes over 12^{3/4"} OD is 2% of the nominal pipe diameter.
- 8.1.3 Dents which contain a stress concentrator such as scratch, gauge, arc burn or groove, and dents located at the longitudinal, spiral or circumferential weld shall be removed by cutting out the damaged portion of pipe as a cylinder.
- 8.1.4 Repair on line pipe shall be executed as specified in COMPANY's material specification or Code ANSI B 31.8/B 31.4, whichever is more stringent. A record of all repairs is to be maintained by CONTRACTOR. This record, provided with the pipe identification number is to be submitted to the COMPANY.
- 8.1.5 If due to cutting or repairs, the pipe identification number is removed, it shall be reprinted immediately by CONTRACTOR in the presence of COMPANY. In the event, the CONTRACT provides for supply of line pipe by COMPANY, CONTRACTOR shall be charged for any pipe length due to loss of identification number. No pipe without identification number shall be transported and/or welded into the pipeline.
- 8.1.6 Repair of damaged pipe ends by hammering and/or heating is not allowed. If the dented area is minor and at least 200mm away from the pipe end, and the steel is not stretched, severed, or split in the COMPANY's opinion, the pipe may be straightened with a proper jack.

8.2 Pipe Handling And Skid Spacing

- 8.2.1 When lifting pipe, care must be taken not to kink or overstress it. Proper pipe slings approved by COMPANY shall be used. CONTRACTOR shall submit his method of skidding and skid spacing for COMPANY's approval. A strip of soft material shall be placed in between skid and pipe to protect the external coating of the pipe. The material shall be approved by the COMPANY.
- 8.2.2 The maximum skid spacing is not allowed before the stringer bead and the top and bottom reinforcements are completed, provided that the distance between the incomplete weld and the skid shall not exceed 9 (nine) percent of the skid spacing.
- 8.2.3 Skids shall be at least 1.20 meter long. For pipe with an O.D. of 12-3/4 inch and larger the skids in contact with the pipe shall have a width of at least 200mm. For pipe with an O.D. of less than 12 inch the skids in contact with the pipe shall have a width of at least 150mm. Pipe supports shall be stable, so that pipe movement will not cause the supports to move. Skids shall not be removed under a string before lowering in.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 25 of 41
			REVISION : 0
			EDITION : 1

The welded pipe shall be maintained on skids at the minimum distance of 500mm above ground. Crotches shall be installed at frequent intervals (atleast every 10th support) with a greater number required at bends and undulation grounds.

8.3 Night Caps

At the end of each day's work or every time when joining and welding operations are interrupted, the open ends on the welded strings of pipes shall be capped with a securely closed metal cap or plug as approved by COMPANY so as to prevent the entry of dirt, water, or any foreign matter into the pipeline. These covers shall not be removed until the work is to be resumed. The caps/plugs used shall be mechanical type and shall not be attached to pipe by welding or by any other means which may dent, scratch or scar the pipe.

8.4 Temporary Caps

Whenever the welded strings of pipes are left open at intervals to be tied in later after an appreciable time lag, under roads, railroads, rivers, marshy crossings, etc., temporary caps approved by COMPANY shall be welded to the ends of the pipe.

9.0 LAYING OF PIPE


9.1 Lowering In Trench

9.1.1 Lowering can start after removal from ditch bottom of all obstructions, pipe supports, stones, roots, debris, stakes, rock projections below underside of pipe and any other rigid materials which could lead to perforation or tearing of the coating. Sand padding and / or rock shield shall be provided as required in accordance with clause 6.8 of this specification.


9.1.2 Lowering shall follow as soon as possible, after the completion of the joint coating of the pipeline. In the case of parallel pipelines, laying shall be carried out by means of successive operations, if possible without interruption.

9.1.3 Before lowering in, a complete check by a full circle holiday detector for pipe coating and for field joint coating shall be carried out and all damages repaired at CONTRACTOR's cost. All points on the pipeline where the coating has been in contact with either the skids or with the lifting equipment during laying, shall be carefully repaired. If, after checking, it becomes necessary to place the pipeline again on supports at the bottom of the trench, these must be padded in such a way as to prevent damage to the coating, thus avoiding necessity for further repairs when the pipe is finally raised and laid. Before the last operation, a check must be made of the coating at points of contact with the supports.

9.1.4 Before lowering in, short completed sections of the pipeline shall be cleaned with compressed air in order to remove all dirt, etc. from the inside of pipe sections.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 26 of 41
			REVISION : 0
			EDITION : 1

- 9.1.5 The pipeline shall be lifted and laid using, for all movements necessary, suitable equipment of non-abrasive material having adequate width for the fragility of the coating. Care shall be exercised while removing the slings from around the coated pipe after it has been lowered into the trench. Any damage caused to the coating shall be promptly repaired. Lowering in utilizing standard pipe cradles shall be permitted if CONTRACTOR demonstrates that pipe coating is not damaged. No sling shall be put around field joint coating.
- 9.1.6 Wherever the pipeline is laid under tension, as a result of an assembly error (for example, incorrect positioning of bends, either horizontal or vertical), the trench shall be rectified or in exceptional cases a new assembly shall be carried out, to be approved by COMPANY, so that it fits the excavation and the laying bed.
- 9.1.7 Laying shall be carried out under safe conditions so as to avoid stresses and temporary deformations of the equipments which may cause damage to the pipeline itself and to the coating. In localised points where the right-of-way is restricted to the minimum necessary for the transit of mechanical equipment, the laying shall be carried out using other suitable means. The pipe shall be placed on the floor or the excavation, without jerking, falling, impact or other similar stresses. In particular, care must be taken that the deformation caused during the raising of the pipe work from the supports, does not exceed the values for the minimum allowable radius of elastic curvature, so as to keep the stresses on the steel and on the coating within safe limits. The portion of the pipeline between trench and bank shall be supported by as many side-booms as required and approved by COMPANY for holding the line in gentle S-curve maintaining minimum elastic bend radius as specified in job standard. Lowering in and back-filling shall preferably be carried out at the highest ambient temperature.
- 9.1.8 The pipeline must be laid without interruption for the whole or the length of section available. Where water is present, no laying shall be permitted until the ditch has been drained to the extent and for the time necessary to make visual inspection possible of the bed on which the pipe is to be laid. Following such inspections, the presence of water will be permitted, provided that it is not so high as to cause cave-in of the walls of the trench or floating of the pipeline before backfilling, when weighting is not provided for the pipe.
- 9.1.9 CONTRACTOR shall take precautions immediately after lowering in to prevent the movement of the pipe in trench.
- 9.1.10 In laying parallel pipelines in the same trench, the minimum distances between the pipeline indicated in the approved drawings shall be observed. Once the first pipeline has been positioned, it shall in no way be disturbed by laying of the subsequent pipeline.
- At every seven meters along the trench sand/earth filled bags shall be placed between the parallel pipelines so as to ensure maintenance of the minimum stipulated distance between the parallel lines.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 27 of 41
			REVISION : 0
			EDITION : 1

9.2 Overhead Sections and Sections in Tunnel

9.2.1 The following works shall all be completed before proceeding with the assembly and laying of overhead pipelines :

- Construction of the pipe support structures or of mounts on supports.
- Paints and/or coating of the pipework, as indicated in the engineering specification.

9.2.2 The erection of the supports shall be carried out taking care that the elevation and alignment is in accordance with the drawings.

In the case of metal work supports, pre fabrication and/or assembly shall take into account the maximum allowed free span and the supports shall not interfere with the pipeline welds.

9.2.3 In case roller supports are used, the roller shall be lubricated, then checked for smooth rotation and, in case of seizure, the defect shall be repaired or roller shall be replaced. In the case of overhead section where the pipeline is slanting, the alignment of the end supports shall be made after placing the pipeline in position. Before installation of the pipe section, all the rollers shall be perfectly centered acting on the seat of the support plates.

The above alignment operations shall be carried out before connecting the overhead section with the ends of the buried section.

9.2.4 Lifting, moving and laying of the pipeline shall be carried out in accordance with the provisions of clause 9.1.5.


An insulation sheet shall be installed to isolate the pipe from the support or support from the earth.

The sheet shall be hard polyethylene at least 5mm thick.

9.2.5 It shall extend at least to 1cm outside the saddles or clamps. Moving supports, if any, shall be centered on their support and allow for a movement of at least 300mm in both directions.

9.2.6 A comprehensive report/method statement on the laying operation to be used shall be submitted to the COMPANY well in advance for approval. The report as a minimum shall include, but not limited to the following:

- (a) Method of installation by lifting (as a preferred method).
- (b) Pulling method and related calculations, whenever lifting method cannot be used.
- (c) Pulling device and its characteristics
- (d) Method of anchoring the pulling device
- (e) Characteristics of the pulling rope

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 28 of 41
			REVISION : 0
			EDITION : 1

- (f) Braking device, if any
(g) Pipeline assembly systems.

10.0 BACK-FILLING


10.1 Backfilling shall not be done until the pipe and appurtenances have the proper fit and the pipe is following the ditch profile at the required depth that will provide the required cover and has a bed which is free of extraneous material and which allows the pipe to rest smoothly and evenly. Before any such work is done, it shall be the CONTRACTOR's responsibility to first secure the approval of COMPANY. If any backfilling is done without COMPANY's approval, COMPANY will have the right to require removal of the backfill for examination, and the cost of such uncovering and refilling shall be borne by CONTRACTOR. Backfilling of trench in water courses shall be carried out as per the relevant specifications issued for the purpose.

10.2 Backfilling shall be carried out immediately after the pipeline has been laid in the trench, inspected and approved by the COMPANY, so as to provide a natural anchorage for the pipeline, thus avoiding long exposure of coating to high temperature, damaging actions of adverse weather conditions, sliding down of trench sides and pipe movement in the trench. If immediate backfilling is not possible, a covering of at least 200mm of earth, free of rock and hard lumps shall be placed over and around the pipe and coating.

On no account the top soil from the ROW be used for this purpose. In general, the trench shall be dry during backfilling. Deviations thereof must have prior approval of the COMPANY. The backfill material shall contain no extraneous material and/or hard lumps of soil which could damage the pipe / coating or leave voids in the backfilled trench. After the initial backfill has been placed into the trench to a level slightly above the surrounding ground, CONTRACTOR shall compact the backfill material. The surplus material shall be neatly crowned directly over the trench and the adjacent excavated areas on both sides of the trench as per clause 6.2.1, to such a height which will, in COMPANY's opinion, provide adequately for future settlement of the trench backfill during the maintenance period and thereafter. The crown shall be high enough to prevent the formation of a depression in the soil when backfill has settled into its permanent position. Should depression occur after backfill, CONTRACTOR shall be responsible for remedial work at no extra cost to COMPANY. Surplus material, including rock, left from this operation shall be disposed of to the satisfaction of land owner or authority having jurisdiction at no extra cost to the COMPANY.

For further requirements reference is made to Section of 14.0 "Clean-up and Restoration of Right-of-Way" of this specification.

10.3 Rock, gravel, lumps of hard soil or like materials shall not be backfilled directly onto the pipe unless 'padding' and/or rock shell has been provided as per Section 6.0 of this specification. When "Padding" as described in Section 6.0 of this specification is to be used, the following shall be applicable.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 29 of 41
			REVISION : 0
			EDITION : 1

Where rock, gravel, lumps of hard soil or like materials are encountered at the time of trench excavation, sufficient earth, sand or select backfill materials shall be placed around and over the pipe to form a protective cushion extending at least to a height of 150mm above the top of the pipe. Select backfill materials for padding that are acceptable to COMPANY shall be soil, sand, clay or other material containing no gravel, rock or lumps or hard soil. Whether such padding material would be taken from the adjacent spoil bank or imported from elsewhere shall be directed by COMPANY. All these works shall be carried out by CONTRACTOR at no extra cost to COMPANY. Loose rock may be returned to the trench after the required selected backfill material has been placed, provided the rock placed in the ditch will not interfere with the use of the land by landowner, or tenant.

- 10.4 When the trench has been dug through drive ways or roads, all backfills shall be executed with sand or a suitable material as approved by COMPANY and shall be thoroughly compacted. In certain cases, special compaction methods, such as moistening or ramming of the backfill in layers may be required by COMPANY. COMPANY and any public or private authority having jurisdiction over a road, street or drive way may require that the surface of the backfill be graveled with crushed rock or some other purchased material and the road shall be repaved. In such instances, CONTRACTOR shall comply with said requirements at no extra cost to COMPANY.
- 10.5 Trenches excavated in dykes which are the property of railways or which are part of main roads shall be graded and backfilled in their original profile and condition. If necessary, new and/or special backfill materials shall be supplied and worked-up. The materials required may include gravel, special stabilization materials or stabilized mixtures. However, special processing and/or compacting methods shall require the approval of COMPANY and/or competent authorities.
- 10.6 The trench in irrigated and paddy fields shall be backfilled to within 300mm of the top, then rammed and further backfilled until the trench is completely backfilled. Surplus material remaining after the operation shall be spread over the ROW as specified in Section 14.0 "Clean-up and Restoration of Right-of-Way", of this specification.
- 10.7 At the end of each day's work, backfilling shall not be more than 500 meters behind the head end of lowered-in pipe, which has been padded and approved for backfill. The backfill shall be maintained by CONTRACTOR against washouts etc., until the completion and final acceptance of the work by COMPANY.
- 10.8 CONTRACTOR shall furnish materials and install breakers in the trench in steep areas (slope generally 10% and more) for the purpose of preventing erosion of the backfill. The type of breakers installed shall be as per the approved drawings. Breakers shall be constructed of grout bags filled with a mixture of 4: 1 Sand:Portland cement at COMPANY's direction. CONTRACTOR may propose other methods such as foam dams etc. which shall be subject to approval by COMPANY. Such works shall be at no extra cost to COMPANY. CONTRACTOR shall pay attention to the direction of backfilling in such steep areas.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 30 of 41
			REVISION : 0
			EDITION : 1

10.9 When backfilling the trenches in sloping terrains or steep areas, where in the opinion of the COMPANY, the backfill may be washed out of the trench, sheet piling or other effective water breakers across the trench shall be provided by CONTRACTOR. This is to divert the flow of water away from the trench into normal drainage followed before laying the line. In no case, the water is to be drained via the trench or via channels other than those followed before the line was laid.

10.10 CONTRACTOR shall leave the pipe uncovered at certain locations to allow COMPANY to survey the center line of the pipe and the level of the pipeline in the backfilled trench. Within 48 hours after backfilling, COMPANY shall have carried out such survey and informed CONTRACTOR of any realigning, if required. Thereafter CONTRACTOR shall compact the backfill.

The maximum allowable deviation from the centerline for land sections as staked out by COMPANY and as referenced by CONTRACTOR after backfilling is limited to:

Pipeline dia upto and including 24" : 200mm

P pipeline greater than 24" : 300mm

10.11 Before backfilling of the trench, CONTRACTOR shall comply with the requirements of Clause 6.12 of this specification.

10.12 Stabilization of backfill shall be carried out by the CONTRACTOR in sandy areas and other such places to obtain consolidated cover as directed by the COMPANY. CONTRACTOR shall carry out the stabilization over the pipe line at no extra cost to COMPANY.


The backfill shall be stabilized preferably with 150mm layer of marl, mattresses of gatch other than straw or other stable materials. The width of stabilisation shall be atleast 5.0 meters on either side of the pipeline, plus one meter for every 10 meters height of dune (where the line passes through the dune areas).

10.13 Temporary workers shall be installed during backfilling and the survey as per clauses 10.10 to locate the pipeline axis. These markers shall then be replaced with permanent pipeline markers.

10.14 Backfilling shall be preferably carried out at the highest ambient temperature.

11.0 TIEING-IN

11.1 The unconnected sections of the pipe line at various locations have to be tied in after the sections are coated, lowered and backfilled. The sections to be connected shall have at the ends, sections of over lapping, uncovered pipe of sufficient length to absorb, without inducing excessive stresses in the steel, small displacements necessary for perfect alignment and connection of the ends.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 31 of 41
			REVISION : 0
			EDITION : 1

- 11.2 Tie-in shall preferably be carried out at ambient temperatures corresponding to the average operating temperature in the case of a pipeline conveying fluids at normal temperatures and at the maximum ambient temperature in the case where the pipeline is carrying fluids at high temperature.
- 11.3 CONTRACTOR shall carry out tie-in-welding (including necessary cutting, bevelling, grinding of pipe weld seams and line-up etc.) cleaning, priming, coating and backfilling for the tie-in portion as per relevant specifications. CONTRACTOR shall also excavate the required bell-holes for the connection. Bell-holes made to facilitate welding shall provide adequate clearance to enable the welders to exercise normal welding ability and skill. All tie-in welds shall be radiographically examined.
- 11.4 The tie-in should be done in such a way as to leave a minimum of strain in the pipe. If necessary, with respect to the trench, realigning of the pipe shall be done to eliminate force or strain in the pipe by the CONTRACTOR at no extra cost to COMPANY.
- 11.5 If a pup end cannot be avoided for tie-in, the minimum length that shall be added is 1.0 meters and two or more such pups shall not be welded together. All cut-off lengths greater than 1.0 meters shall be moved ahead in order to be welded into the pipeline at a suitable location. Tie-in with two or more pups may be used provided that they each have minimum length of 1.0 meter and are separated by an entire length of pipe. In no case more than three (3) welds shall be permitted on a 10 meter length of pipeline.
- 11.6 In connecting pipes, special items, fittings and equipment where different wall thickness are to be welded, CONTRACTOR shall follow the procedures indicated in ANSI B31.8/ANSI B31.4, as applicable. The required tapering shall be done by CONTRACTOR at no extra cost to COMPANY.
- 11.7 For tie-in of adjacent sections of pipeline already pressure tested, the pup used for tie-in shall be of single length or off-cuts of pipe which have already been hydrostatically tested. CONTRACTOR shall take care that sufficient number of pretested pipes with different wall thicknesses are readily available.


12.0 SPECIAL INSTALLATIONS ON THE PIPELINE.

12.1 General

- 12.1.1 In addition to constructing the pipeline, CONTRACTOR shall also install certain other auxiliary facilities and appurtenances.

CONTRACTOR shall do all work necessary at each of the installations to provide facilities which are complete in all respects and ready for operation.

Without limiting the generality thereof, the work required to complete the installations shall, where applicable, include all site surveys, site preparation, filling, grading, fencing, foundations, installation of block valves, side valves, pipework, pipe supports, pressure gauges, mechanical facilities, civil work, painting, installation of all electrical

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 32 of 41
			REVISION : 0
			EDITION : 1

equipments, motors, cables, conduits, wiring and fixtures and hooking up of same; installation of all instruments, piping, valves and fittings; mount all instruments and make all piping and electronic connections, etc.

On completion, all elements of each installation shall be checked out and tested for full and correct operation in the presence of and to the satisfaction of COMPANY. All work shall be carried out strictly in accordance with the appropriate codes, the approved drawings, and this and other related specifications.

CONTRACTOR shall fabricate all piping and install valves and fittings as required by the detailed engineering drawings prepared by him and approved by COMPANY.

Stainless steel lines will be "swaged" using permanent fittings installed with a hydraulic device.

Cold bending for the fitting of 1/2" and 1/4" pipes is allowed when special bending tools are used with guides to prevent flattening. The minimum radius allowed shall not be less than $R = 10 D$ where D is the outside diameter of pipe.

The bending tool shall be subject to COMPANY's approval.

CONTRACTOR shall ensure that the piping assemblies are not in a strain prior to the final bolting or welding. CONTRACTOR shall also ensure that all equipment and piping are thoroughly swabbed clean of all dust, residue, welding-spatter, scale, or any potentially detachable matter prior to the tie-in or final bolting.


12.1.2 **Dimensional tolerances.**

These tolerances apply to in line items and corrections for other lines. These tolerances can be executed on items such as vents, drains, dummy supports, field supports, temperature and pressure connections, where the deviation will not affect another spool.

- General dimension such as face to face, face or end to end, face or end to center, and center to center : ± 3 mm.
- Inclination of flange face from true in any direction: 4 mm per meter.
- Displacement of branch connection from indicated location: ± 1.6 mm. When multiple branches are involved, the displacement of the branches shall not exceed 3mm from a common point.
- Rotation of flange bolt holes shall not exceed 1.6 mm.

12.1.3 **Flanged connections.**

CONTRACTOR shall ensure that all flange faces are parallel and centered, according to standard practice, prior to final bolting. CONTRACTOR shall not use bolting forces as a means for attaining alignment. A gasket of proper size and quality shall be installed between the flanges at each joint.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 33 of 41
			REVISION : 0
			EDITION : 1

Bolts shall be tightened in diagonal sequence and shall be centered with equal amounts of thread visible on both sides. Bolts shall be uniformly tightened to produce a leak-proof joint. Bolts that yield during tightening shall be removed and discarded. It is mandatory that a torque wrench is used for bolt tightening.

12.1.4 **Threaded connections.**

Damaged threads shall be cut from the end of a run and the pipe shall be rethreaded.

CONTRACTOR shall properly align all threaded joints. Pipe entering unions shall be true to centreline so the union will not be forced during tightening. The threaded pipe shall not project through fittings to cause interference with valves or other operating mechanisms.

Except for the threaded connections of instruments, which will require periodic testing and maintenance, all threaded connections shall be seal welded. The latter joints shall be made up without pipe joint compound and with a minimum of oil from the threaded cutter. Seal welds should taper into the pipe with as little discontinuity as possible and should cover all threads.

12.1.5 **Welded connections**

Where the Ends of the piping components being welded have an internal surface misalignment exceeding 1.6mm, the wall of the component extending internally shall be trimmed by machining so that the adjoining internal surfaces will be approximately flush. All welding shall be performed in accordance with the specification " Specification for welding of pipelines and related facilities".

Tie - ins between fixed points shall be made at maximum ambient temperature.

12.1.6 **Civil Work**


Civil work shall be provided in accordance with Specifications issued for the purpose.

12.1.7 **Painting**

All exposed surfaces like piping, valves, structures, and miscellaneous appurtenances shall be painted in accordance with the specifications issued for this purpose. The corrosion coating on pipe surface will extend approximately 0.3 meter above the finish grade and it will be necessary for CONTRACTOR to provide a clean interface at the junction of the protective coating and the paint.

12.1.8 **Coating of buried-Installations, etc.**

All buried valves, insulating joints, flowtees, bends, other in-line fittings and appurtenances shall be coated with minimum three coats of approved quality of coal-tar epoxy or any other equivalent suitable COMPANY approved coating at no extra cost to the COMPANY. For buried pipes either heat shrink tapes conforming to COMPANY's specification or coal tar epoxy shall be used. CONTRACTOR shall submit to COMPANY

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 34 of 41
			REVISION : 0
			EDITION : 1

a report used alongwith all the test certificates. Only after obtaining written approval from the COMPANY, CONTRACTOR shall commence the work of coating.

12.1.9 **Clean-up**

After all required tests have been concluded satisfactorily CONTRACTOR shall clean up the site as laid down in the specifications issued for the purpose. The Site finish shall be graded in accordance with the approved drawings.

12.2 **Installation of Valves and Valve Stations**

12.2.1 Block and sectionalising valve stations shall be installed as shown on the approved drawings. It is CONTRACTOR's responsibility to have the units completely assembled, tested and made fully functional including all related instruments etc.

12.2.2 The civil and structural work shall be carried out in accordance with the relevant specifications issued for the purpose and in accordance with the approved drawings as directed by COMPANY. This work as a minimum shall include clearing, grading, fencing, foundations, etc, as required. All above ground structures shall be painted as per the specification and color code given by the COMPANY.

12.2.3 A suitable concrete foundation as directed by COMPANY shall be constructed on which the valve shall be firmly installed, after embedding an insulating sheet of hard polyethylene with a thickness of atleast 5mm or equivalent. Such insulating sheet is also to be installed under pipe clamps, etc.


12.2.4 Valves with flow arrows shall be installed according to the normal flow in the pipeline. During, welding, the valves shall be in fully open position. In addition all manufacturer's instructions shall be followed.

Care shall be taken to avoid entry of sand particles etc. to valve body, seals etc. during transportation, storage, assembly and installation.

12.2.5 For valves and piping installed below ground and/or above ground, the anti-corrosion coating/painting shall be as per the requirements of the relevant specifications issued for the purpose. The anti-corrosion coating below ground shall extend upto 300mm above grade at the lowest point.

12.2.6 Sectionalizing valves shall be installed on sections of the pipeline in the horizontal position only or with an inclination not greater than that allowed by the valve manufacturer. Installation shall be done in such a way that there is no strain in the welded joint while the pipeline at upstream and downstream sides are straight.

12.2.7 All valves shall always be handled using equipment and methods to avoid impact, shaking and other stresses. In particular, the equipment and tools for lifting and handling shall never be done through handwheel, valve stem, joints and other parts which may suffer damage.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 35 of 41
			REVISION : 0
			EDITION : 1

12.2.8 All sectionalizing valve and any other inline assemblies shall be prefabricated and tested hydrostatically ex-situ as per applicable specification. All such assemblies shall be installed at the locations shown in the drawings only after successful completion of the hydrostatic test and dewatering. Thereafter the ends of the assembly shall be closed off. CONTRACTOR shall carry out necessary excavation, cutting, bevelling and welding of the tie-ins required for the installation of such assembly. The tie-in joints shall be radiographically examined over 100% length and also 100% ultrasonically examined prior to backfilling. All works shall be executed in accordance with the relevant specifications issued for the purpose.

12.3 Installation of Scraper Launchers and Receivers

12.3.1 Scraper stations shall be fabricated and installed as per the approved drawings and whenever applicable as per the requirements of clause 12.2 of this specification. It is CONTRACTOR's responsibility to have the units completely assembled, tested and made fully functional including all instruments & related piping.

12.3.2 The civil and structural works for the scraper stations shall be carried out as per the relevant specifications, in accordance with the drawings and as directed by the COMPANY. The work as a minimum shall include site survey, site preparation, clearing, grading, fencing, foundations, etc. as required.

12.3.3 It shall be CONTRACTOR's responsibility to maintain elevations shown on the approved drawings and to carry out any pipework adjustments, necessary for this purpose. Field cuts shall be square and accurate and field welds shall not be performed under stress of pipe ends.

12.3.4 The painting for the scraper stations shall be carried out as per "Specifications for Painting". The underground sections shall be coated as specified for the pipeline upto atleast 300mm above grade.


12.3.5 The hydrostatic testing of the scraper stations shall be executed after installation in accordance with the relevant specification issued for the purpose.

12.4 Installation of Insulation Joints

12.4.1.1 Insulation joints shall be installed at the locations shown in the drawings. CONTRACTOR shall obtain approval from the COMPANY before installation of the insulation joints.

12.4.2 Handling and installation of the insulating joints shall be carried out with all precautions required to avoid damage and excessive stresses and that the original pup length is not reduced.

12.4.2 The insulating joints and the welded joints shall be protected by external coating as per relevant specifications issued for the purpose.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 36 of 41
			REVISION : 0
			EDITION : 1

12.4.4 The in-line inserting shall be made on the buried pipeline; care shall be taken to operate at an external temperature as close as possible to the pipeline operating temperature.

The joints shall be inserted on straight sections and laid on a fine sand bed.

12.4.5 During the execution of the in-line connection welding, the propagation of heat shall be avoided. To achieve this, the joint shall be kept cold by means of nags continuously wetted.

12.4.6 Insulating joints shall be electrically tested before welding into the pipeline. The electrical conductance test shall be carried out using a Megger. Measurement of the insulation resistance across the joints shall be approx. one (1) Mega Ohm. The tests shall be repeated after installation and welding of the joint into the pipeline to verify that the assembly is undamaged.

13.0 WORKING SPREAD LIMITATIONS

CONTRACTOR shall, in general, observe the following maximum distances between the working mainline spread:

Between ROW grading, clearing and backfilling : 30 Kms

Between backfilling and final clean-up : 05 Kms

The above limitations do not apply to point spreads such as continuous rock blasting, river crossing, etc.

Any deviations from the above shall require prior approval of COMPANY. COMPANY reserves the right to stop the work, in case the approved spread limitations are exceeded and CONTRACTOR shall not be paid any compensation for stoppage of work.

14.0 CLEAN-UP AND RESTORATION OF RIGHT OF WAY


14.1 CONTRACTOR shall restore the ROW and all sites used for the construction of pipelines, water crossing and other structures in accordance with COMPANY's instructions, and deliver them to the satisfaction of COMPANY.

14.2 Surplus Materials

The following stipulations shall apply in case CONTRACT provides for supply of line pipe, bare and/or corrosion coated, by COMPANY.

All surplus and defective materials supplied by COMPANY shall be collected by CONTRACTOR and delivered to designated stockpile areas.

All Pipe-ends shorter than 1.0m shall be returned to COMPANY being scrap, all pipes longer than 8.0m shall be reconditioned (bevels, coating, provided with pipe letter,

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 37 of 41
			REVISION : 0
			EDITION : 1

number and length) and be returned to COMPANY's designated stockpile areas together with all undamaged, unused COMPANY supplied materials. All pieces between 1.0 and 8.0m shall be charged to the CONTRACTOR by COMPANY. CONTRACTOR shall record these returned materials in the Material account, to be prepared by him.

14.3 **Disposal**

14.3.1 All surplus and defective materials supplied by CONTRACTOR and all trash, refuse and spoiled materials shall be collected and disposed of by CONTRACTOR.

14.3.2 The ROW shall be cleared of all rubbish, broken skids, empty cans, card board, sacks, stamps, trash, and leftover construction material. All burnable matter shall be burned, but only after obtaining appropriate permits for such burning. If burning is not allowed, CONTRACTOR shall haul the clean-up material to approved dumping area. All scrap metal and unburnable material shall be disposed of, in an appropriate manner, but never be buried in the ROW.

14.3.3 Surplus soil can only be removed from the Owner's plot after authorisation by COMPANY.

14.3.4 All dumping fees connected with the disposal of materials shall be to the account of CONTRACTOR.

14.3.5 All loose stones and rock exposed by the construction operations and scattered over the ROW or adjacent grounds shall be removed by CONTRACTOR and be transported to a location considered suitable by the authorities having jurisdiction, for satisfactory disposal. For stones, gravel or other hard material which may be buried in the trench the provisions of the specifications shall apply with the understanding that the use of the land by the land-owner and/or tenant will not be interfered with.


14.4 **Temporary Structures**

All auxiliary structures such as bridges, culverts, sheet piling, posts, signs, etc., which were erected or installed by CONTRACTOR as temporary measure, shall be removed. However, it may be necessary to remove the fence of ROW during the maintenance period.

14.5 **Repair of Damage**


Damages to roads, bridges, private property shall be repaired by CONTRACTOR. All fences and other structures which are damaged during construction shall be restored to original condition.

Slopes, water course sides or banks which have been partially or totally demolished during the execution of the works shall be properly consolidated and restored without waiting for their natural consolidation and settling.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 38 of 41
			REVISION : 0
			EDITION : 1

All boundary stones which have been moved or removed during the work must be reset in their original location to the satisfaction of the landowner concerned.

- 14.6 On completion of clean-up, the ROW shall be restored to such stable and usable condition as may be reasonably consistent with the condition of the ROW prior to laying the pipeline. The COMPANY shall be completely indemnified and held harmless by CONTRACTOR from any and against all claims, demands, losses, expenses etc. that may arise in this behalf or the COMPANY may anyway suffer or sustain, relative to, arising out of, or in connection with same. The COMPANY may require from the CONTRACTOR signed Releases from land owners regarding satisfactory indemnification and restoration of their lands.
- 14.7 Special precautions shall be taken near slopes prone to erosions and land slides. All necessary steps shall be taken to ensure the rapid growth of grass by providing wicker barriers and by regulating the drainage of surface waters.
- 14.8 All cadastral or geodetic markers which may have been removed during the execution of the works shall be restored in their exact position.
- 14.9 Ditches for which no instructions for restoration have been issued, or restoration cannot be done according to existing banks because of the absence of it, shall be restored as instructed by COMPANY. The bed of ditches crossed by the pipeline, shall be cleaned over the full width or the ROW, also outside the ROW if necessary. This restoration might involve the supply and installation proper materials for backfill and protection, sodding or other precautions to prevent erosion or guarantee the stability. Work has to be done after deliberation and acceptance of the authorities and COMPANY. Other field drains have to be restored by hand and/or special equipment to be used for that purpose as soon as possible and if necessary, also outside the ROW.
- 14.10 Any subsidence, cave-ins, wash-outs, which have been caused during the pipeline construction and maintenance, caused by whatever reason within the edge of ditches and open drains, shall be repaired by CONTRACTOR immediately or at first notice given by COMPANY.
- 14.11 After the clean-up, the ROW of pastures has to remain fenced and to be removed during the maintenance period. When agricultural and other traffic (requested by tenant) have to cross the ROW the cross-overs have to be fenced with the same material as the ROW. If necessary, special materials have to be used to allow traffic on the cross-over. Fencing of the right-of-way as specified shall not be removed until CONTRACTOR has obtained written permission by COMPANY. In general this has to be done during the maintenance period.
- 14.12 All openings in or damage to the fence or enclosures shall be repaired by installing new fencing of quality which shall be at least equal to the parts damaged or removed. Provisional gates shall be removed and replaced with new fencing. All repairs to fences and enclosures shall be carried out to the complete satisfaction of COMPANY, land owner and/or tenant.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 39 of 41
			REVISION : 0
			EDITION : 1

14.13 If, in the opinion of COMPANY, the sod in pasture land has been damaged by vehicles and wheel tracks are visible, the ROW shall be tilled with a disc-harrow or rotary cultivator several times. The damaged sod shall be firmly cut up and thoroughly mixed through the top-soil. In general the ROW has also to be ripped. After this procedure no closed-in layers must be found and sufficiently loose top-soil 25 to 30cm thick must be present. The whole procedure has to be approved by COMPANY. Subsequently, the entire ROW which is part of pasture land, shall be prepared for seeding and fertilized according to the instructions of COMPANY.

14.14 In crop fields the tillage shall consist of passing over the land several times with a disc harrow, cultivating with a spading machine, or plow, to a depth of approx. 20 cm. In general the ROW has also to be ripped. After this cultivation process no closed-in layers must be found in the ROW. The equipment used and methods adopted shall require the approval of COMPANY. Ripping, has to be done with rippers with a distance of 50 cm between the ripper blades. The type to be used shall be approved by COMPANY.

14.15 A sapling of any plant/tree uprooted or cut during construction shall be planted along the route as per the direction of the COMPANY and in accordance with the Forest Preservation Act, 1981. The cost of sapling and its plantation shall be to CONTRACTOR's account.

14.16 The ROW and the backfilled trench in particular has to be finished in such a way that after settlement of the soil the fields are at their original level.


If during the maintenance period certain parts of the ROW are lower than the original level, COMPANY can order CONTRACTOR to bring these parts to the original level. If the level of the ROW for clean-up is ordered by COMPANY, risk of above mentioned additional restoration shall not be to CONTRACTOR's account.

In cases where heavy damage has occurred to the structure of the subsoil as a result of special circumstances, COMPANY reserves the right to order CONTRACTOR to carry out special work. Said special work can include:

- spading with dragline (depth 30 - 80 cm);
- spading with dragline (depth 80 - 100 cm);
- fertilizing;
- cover with sand.

If during clean-up operations, soil shortages become apparent outside the trench, CONTRACTOR shall supplement said soil shortage using suitable materials, approved by COMPANY.

If site and/or climatic conditions should render this necessary, COMPANY shall have the right to order CONTRACTOR to suspend certain parts of the WORK related to the clean-up and postpone it to a later date.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 40 of 41
			REVISION : 0
			EDITION : 1

14.17

Soil Surplus

If on site, as a result of the work and after careful backfilling and compacting, a sub-soil surplus exists, this shall be worked up by grading and compacting below the sub-soil top layer and as a rule this shall be done in the same plot of land. It shall not be permitted to remove the surplus from the plot concerned, unless it concerns rejected soil which has to be removed. Working up surplus soil or removal of rejected soil shall be considered to pertain to the WORK.

To work a soil surplus into the ground CONTRACTOR shall remove an additional strip of top soil beside the trench. Next the upper layer of sub-soil shall also be removed. Both soil types shall be stored separately across a width depending on the size of the soil surplus. The soil surplus shall then be distributed across the trench thus widened, after which it shall be graded and compacted and subsequently the top layer of sub-soil and the top-soil shall be replaced in the correct order, in accordance with the Specifications.

In case COMPANY has given prior permission for mixed excavation of the sub-soil as well as in cases where COMPANY deems mixed excavation permissible, the above provision of separate storage of the upper layer of sub-soil shall not apply to the working up of the soil surplus.

In cases where the soil surplus can be worked up in other plots where soil shortages have arisen due to the WORK, this shall only be done after prior permission by land-owner, land-user and COMPANY.

14.18

Soil Shortages

If due to unforeseen circumstances during backfilling and compacting there isn't enough soil to fill the trench properly, or to install the crown height as stipulated, CONTRACTOR shall supply the necessary backfill material.

Soil shortages shall be supplemented and applied before the top-soil is replaced.

The soil to be supplied shall be worked up in those locations and into those layers where a soil shortage has been established. The quality of the supplemented soil shall be equal to that of the shortage.


15.0

MAINTENANCE DURING DEFECTS LIABILITY PERIOD

Defects liability Period (defined as period of liability in the CONTRACT) means the period of 12 months calculated from the date certified in the Completion Certificate.

COMPANY reserves the right to carry out instrumented pigging survey of the completed pipeline.

CONTRACTOR shall be responsible for making good with all possible speed at his expense any defect in or damage to any portion of the Work which may appear or

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAINLINE CONSTRUCTION (ONSHORE)	DOCUMENT NO. BR/TS/033	Page 41 of 41
			REVISION : 0
			EDITION : 1

occur during the Defects liability Period and which arise either:

- a) from any defective material (other than supplied by COMPANY), workmanship or design (other than a design made, furnished or specified by COMPANY and for which CONTRACTOR has disclaimed responsibility in writing), or
- b) from any act or omission of CONTRACTOR done or omitted during the said period.

If such defect shall appear or damage occur, COMPANY shall forthwith inform CONTRACTOR thereof stating in writing the nature of the defect or damage.

If any such defect or damage be not remedied within a reasonable time, COMPANY may proceed to execute the work at CONTRACTOR's risk and expense, provided that he does so in a reasonable manner. Such defect or damage can be, but is not limited to:

- Clean up of ROW, including water courses
- Sagging or sinking of site level or pipe supports
- Sliding of ditch banks
- Repair of fencing or removal of construction fencing
- Repaving of pavements, repair of pavements, repair of coating, painting
- Realigning markers, signs
- Leak/burst of pipe, leaking flanges, washouts
- Short-circuit in casings
- Construction defects such as dents, ovality, welding offsets/defects, etc. detected during intelligent pigging survey.
- etc.


Company reserves the right to have the required Computerised Potential Logging Test executed during the DEFECTS LIABILITY PERIOD and whenever conditions are more favorable for this job. The work shall at or as soon as practicable after the expiration of the Defects Liability Period be delivered to COMPANY in the conditions required by the CONTRACT, fair wear and tear excepted, to the satisfaction of COMPANY. CONTRACTOR shall finish the work, if any outstanding, at the date of completion as soon as possible after such date and shall execute all such work.

SPECIFICATION FOR WELDING OF ONSHORE GAS PIPELINES

SPECIFICATION NO.: BR/TS/034




**(OIL & GAS)
BRIDGE AND ROOF CO. (INDIA) LTD.**

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 1 of 1
			REVISION : 1
			EDITION : 1

CONTENTS


<u>SL.NO.</u>	<u>DESCRIPTION</u>
01.0	SCOPE
02.0	APPLICABLE CODES, STANDARDS & SPECIFICATIONS
03.0	MATERIAL SPECIFICATIONS
04.0	WELDING CONSUMABLES
05.0	EQUIPMENT & ACCESSORIES
06.0	WELDING PROCESSES
07.0	BEVEL CLEANING AND BEVEL INSPECTION
08.0	ALIGNMENT AND SPACING
09.0	WEATHER CONDITIONS
10.0	WELDING
11.0	HEAT TREATMENT
12.0	INSPECTION AND TESTING
13.0	REPAIR OF WELDS
14.0	DESTRUCTIVE TESTING OF WELDED JOINT - BUTT WELDS
15.0	ULTRASONIC INSPECTION
16.0	AUTOMATED ULTRASONIC TESTING (AUT)
17.0	RADIOGRAPHY
ANNEXURE-I -	ELECTRODE QUALIFICATION TEST RECORD
ANNEXURE-II -	STRESS RELIEF HEAT TREATMENT PROCEDURE SPECIFICATION
ANNEXURE-III -	FORMAT FOR WELDING PROCEDURE SPECIFICATION (WPS)
ANNEXURE-IV -	FORMAT FOR PROCEDURE QUALIFICATION RECORD (PQR)
ANNEXURE-V -	FORMAT FOR MANUFACTURER'S RECORD FOR WELDER OR WELDING OPERATOR QUALIFICATION TESTS
ANNEXURE-VI -	RADIOGRAPHIC PROCEDURE QUALIFICATION RECORD FOR PIPE WELDING
ANNEXURE-VII -	WELDERS IDENTIFICATION CARD
ANNEXURE-VIII -	TYPE OF SOURCE AND FILMS TO BE USED FOR RADIOGRAPHY

PREPARED BY:	CHECKED BY:	APPROVED BY:	ISSUE DATE :
(Shalini Singh)	(Sunil Kumar)	(A.K. Johri)	Jan. 2009

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 1 of 1
			REVISION : 1
			EDITION : 1

AMENDMENT STATUS

Sl. No.	Clause / Paragraph / Annexure / Exhibit / Drawing Amended	Page No.	Rev.	Date	By		Verified	
					Name	Sig.	Name	Sig.
1.	General	-	1	06.06.1 1	Hitesh Manju		Sunil Kumar	

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 1 of 54
			REVISION : 1
			EDITION : 1

01. **SCOPE**

This specification stipulates requirements for fabrication of all types of welded joints of carbon steel main pipeline systems covering the pipeline and its facilities, which will include the following:

- All line pipe joints of the longitudinal and circumferential butt welded and socket welded types.
- Branch connections
- Joints in welded/ fabricated piping components.
- Attachments of castings, forgings, flanges and supports to pipes.
- Attachments of smaller connections for vents/ drain pipes and tapplings for instrumentation.
- Welded manifold headers and other sub-assemblies.

Note: Any approval accorded to the Contractor shall not absolve him of his responsibilities and guarantees.


02. **APPLICABLE CODES, STANDARDS & SPECIFICATIONS**

All welding works, equipment for welding, heat treatment, other auxiliary functions and the welding personnel shall meet the requirements of the latest editions of the following codes, standards and specifications as listed below :-

- Code for Gas Transmission and Distribution Piping System (ANSI B31.8).
- Standard for welding of Pipelines and Related Facilities (API 1104).
- Specification for welding Electrodes and Filler Materials (ASME Sec. II C).
- Non Destructive examination (ASME Sec. V).
- Welding and Brazing Qualification, ASME Sec. IX.

03. **MATERIAL SPECIFICATIONS**

- In general carbon steel is used in this specification. The details of material specifications will be given in a welding Specification Chart attached alongwith other project data sheets.
- The CONTRACTOR will keep a record of test certificates of all the materials for the reference of the welding engineer.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 2 of 54
			REVISION : 1
			EDITION : 1

04. **WELDING CONSUMABLES**

The CONTRACTOR shall provide at his own expenses all the welding consumables necessary for the execution of the job such as electrodes, oxygen, acetylene etc. and the same shall be approved in advance by the Purchaser/ Consultant.

The welding electrodes/ filler wires supplied by the CONTRACTOR shall conform to the class specified in the welding specification chart. The materials shall be of the make approved by the COMPANY.

The electrode shall be suitable for the welding process recommended and base metal used. Physical properties of the welds produced by an electrode recommended for the welding of a particular base metal shall not be lower than the minimum values specified for the base metal unless otherwise specified in Welding Specification Chart and shall correspond to the physical properties of the class of electrode adopted. The choice of electrode shall be made after conducting the required tests on the electrodes as per relevant standards, and shall be the sole prerogative of the COMPANY.

The CONTRACTOR shall submit batch test certificates from the electrode manufacturers giving details of physical and chemical tests carried out by them for each batch of electrode to be used.

Electrode Qualification test records shall be submitted as per **Annexure-I** with respect to the electrodes tested by the CONTRACTOR and submitted for approval of the COMPANY, for each batch of electrode.

All electrodes shall be purchased in sealed containers and stored properly to prevent deterioration. The electrodes removed from the containers (except cellulosic coated electrodes) shall be kept in holding ovens at the temperature recommended by the electrode manufacturer. Ovens shall be used for low hydrogen electrodes only. Out-of-the oven time of electrodes, before they are consumed, shall not exceed the limits recommended by the electrode manufacturer. The electrodes shall be handled with care to avoid any damage to the flux covering.


The electrodes used shall be free from rust, oil grease, earth and other foreign matter which affect the quality of welding.

Different grades of electrodes shall be stored separately. Cellulosic electrodes used shall however be used as per specific recommendations of manufacturer.

04.01 **Shielding Gas**

The composition and purity of shielding gas when required by the welding processes other than shielded metal arc welding, when permitted by the COMPANY, shall have prior approval of the COMPANY. Where appropriate, gases or gas mixture of the following quality shall be used.

- a) argon complying with BS 4365

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 3 of 54
			REVISION : 1
			EDITION : 1

- b) carbon dioxide complying with type 1 specified in BS 4105
- c) gas mixture that have been proved to be satisfactory as a result of procedure approval tests.

When a gas mixture is used which has specified additions, e.g. 2% O₂, 5% CO₂ the variation of such addition shall not exceed $\pm 10\%$ of that stated. Moisture content shall correspond to a dew point of - 30°C or lower.

05. EQUIPMENT & ACCESSORIES

- 5.1 The CONTRACTOR shall have sufficient number of welding and cutting equipment, auxiliaries and accessories of sufficient capacities to meet the target schedule.
- 5.2 All the equipment for performing the heat treatment including transformers, thermocouples, pyro-meters, automatic temperature recorders with suitable calibration arrangements, etc. shall be provided by the CONTRACTOR, at his own expenses and these shall bear the approval of the COMPANY. Adequate means of measuring current and voltage shall be available.
- 5.3 Redoing of any work necessitated by faulty equipment or operation used by the CONTRACTOR, will be done at his own expense.

06. WELDING PROCESSES

- 6.1 Welding of various materials under this specification shall be carried out using following process.
 - 6.1.1 Main line (24" ϕ & above API 5L Gr. X-70, PSL-2)


Welding shall be carried out by automatic or semi automatic welding process.
 - 6.1.2 Main line (24" ϕ & above API 5L Gr. X-80, PSL-2)

Welding shall be carried out by automatic welding process. When welding is carried out only from outside, copper backing shall be used at the root side.
- 6.2 Tie-Ins and Crossings

Shielded Metal Arc Welding and Semi-automatic Flux Cored Arc Welding shall be used for tie-ins and crossings.
- 6.3 Any deviation desired by the Contractor shall be obtained through the written consent of the Company.

Following agencies for Automatic Welding Systems are acceptable:

- a) CRC-Evans Automatic Welding Systems, Houston
- b) Pipe Welding Technology, Italy

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 4 of 54
			REVISION : 1
			EDITION : 1

- c) RMS Welding Systems, Canada
d) Sermier Dasa, France

In case, the bidder proposes to employ any other agency, the proposed agency shall meet the qualification criteria mentioned in the following paragraph and shall submit necessary documentation meeting the criteria. The detailed system description and the procedure shall be submitted to the COMPANY for evaluation and approval

"Automatic welding systems and agencies who have proven track record of high productivity with satisfactory quality of weld and have done a single project of diameter 20" or above for a minimum length of 50 km and for a cumulative length of 500 km or above on large diameter Pipe lines in the last ten years shall only be accepted. CONTRACTOR shall engage only such automatic welding systems and agencies for the work to be covered by main line automatic welding. The track record shall be submitted to the COMPANY for approval prior to engagement".


- 6.4 The welding specification charts specifically developed for welding of the pipeline under this project shall be followed. The welding procedure adopted and the consumables used shall be specifically approved.
- 6.5 A combination of different welding processes or a combination of electrodes of different classes/ makes could be employed for a particular joint only after qualifying the welding procedures to be adopted and obtaining the approval of the COMPANY.

07. BEVEL CLEANING AND BEVEL INSPECTION

Line pipe supplied by COMPANY shall have bevel ends as specified in the applicable specification for Line Pipe attached with the Bid Package. Any modification thereto, if required by CONTRACTOR due to his special welding technique shall be carried out by the CONTRACTOR at his own cost.

Before welding, all rust and foreign matter shall be removed from the bevelled ends by power operated tools. This shall be effected inside and outside and for a minimum distance of 25mm from the edge of the weld bevel. The bevels shall be thoroughly inspected at this stage. If any of the ends of the pipe joints are damaged to the extent that, in the opinion of COMPANY, satisfactory weld spacing cannot be obtained and local repair by grinding cannot be successfully done, the damaged ends shall be cut and re-bevelled to the satisfaction of the COMPANY, with an approved bevelling machine. Manual cutting and weld repairs of bevels is not allowed. Should laminations, split ends or inherent manufacturing defects in the pipe be discovered, the lengths of pipe containing such defects shall be removed from the line to the satisfaction of COMPANY. On pipes which have been cut back, a zone extending 25mm back from the new field bevel, shall be ultrasonically tested to the requirement of the line pipe specification to ensure freedom from laminations. The new bevel shall be subjected to 100% visual and 100% dye penetrant/ MPI tests. A report shall be written for all testing and records kept.

08. ALIGNMENT AND SPACING

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 5 of 54
			REVISION : 1
			EDITION : 1

Immediately prior to line-up CONTRACTOR shall inspect the pipe ends inside and outside for damage, dents, laminations etc. Pipe for welding shall be set up, correctly spaced, allowing for temperature changes during welding, in correct alignment and shall in no circumstances be sprung into position. Temporary attachments of any kind shall not be welded to the pipe. Welds joining the sections of the pipelines, valve installation or similar welds classified as tie-in welds shall be made in the trench. Otherwise the alignment and welding shall be made alongside the ditch with the pipe supported on skids and back pad or other suitable means approved by COMPANY, at least 500mm above the ground, unless approved by the COMPANY in specific cases.

Seam orientation of welded pipe shall be selected to ensure that at the circumferential welds, the longitudinal welds shall be staggered in the top 90° of the pipeline, or 250mm whichever is the lesser. A longitudinal joint shall pass an appurtenance of a structural element at a minimum distance of 50mm. Should a section of the line containing uncompleted welds fall from the skids, the CONTRACTOR shall immediately inform COMPANY.

Every effort shall be made to reduce misalignment by the use of the clamp and rotation of the pipes to obtain the best fit. For pipe of same nominal wall thickness off-set shall not exceed 1.6mm. The off set may be checked from outside using dial gauges. Any branch connection, sleeve, etc. shall be atleast 150mm from any other weld. The welds for fittings shall be so located that the toe of the weld shall not come within 50 mm of any other weld. Cold dressing is permissible only in cases of slight misalignment and may only be carried out with a bronze headed hammer. Hot dressing shall not be permitted. When welding pipes of different wall thickness (as directed by COMPANY) a special transition piece shall be used. This shall have a minimum of 1:4 taper. The welds shall be subject to both ultrasonic and radiographic inspection.

The root gap shall be accurately checked and shall conform to the qualified welding procedure. The use of internal line-up clamps is mandatory for pipe diameters 10" and above. However, in some cases (tie-in welds, flanges, fittings, diameter of pipe 10" etc.) where it is impossible to use internal clamps, an external line-up clamp may be used.


The internal line-up clamp shall not be released before the entire root pass has been completed.

When as external line-up clamp is used, all spaces between bars or atleast 60% of the first pass shall be welded before the clamp is released and the pipe remaining adequately supported on each side of the joint.

Segments thus welded shall be equally spaced around the circumference of the pipe. Slag, etc. shall be cleaned off and the ends of the segments shall be prepared by grinding, so as to ensure continuity of the weld bead.

09.0

WEATHER CONDITIONS


BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 6 of 54
			REVISION : 1
			EDITION : 1

The parts being welded and the welding personnel shall be adequately protected from rain and strong winds. In the absence of such a protection no welding shall be carried out. The completed welds shall be suitably protected in case of bad weather conditions.

10.0 **WELDING**

10.1 **Root Pass**

- a) Root pass shall be made with electrodes/ filler wires recommended in the welding specification chart attached along with other project data sheets. The size of the electrodes used shall be as per the approved welding procedure.
- b) Position or roll welding (for yard double jointing) may be permitted. Separate procedures shall be submitted and qualified for up hill, down hill, vertical down and roll welding. The vertical up method of welding shall be used for the root pass of the tie-ins, special crossings, fittings and special parts, filled welds, repairs and when an external line up clamp is used. The down hill welding may be used for root run welding of tie-ins and special crossings when (a) the edges are machined or have equivalent preparation (b) line up clamps are used and the fit up is geometrically and mechanically similar to one of the ordinary line welding without misalignment or unevenness.
- c) The root pass of butt joints shall be executed properly so as to achieve full penetration with complete fusion of the root edges. Weld projection inside the pipe shall not exceed 1.6 mm wherever not specified by the applicable code.
- d) Any deviation desired from the recommended welding technique and electrodes indicated in the welding specification chart shall be adopted only after obtaining express approval of the COMPANY.
- e) Welding shall be continuous and uninterrupted during a pass.
- f) On completion of each run, craters, welding irregularities, slag, etc., shall be removed by grinding and chiselling.
- g) While the welding is in progress care shall be taken to avoid any kind of movement of the components, shocks, vibration and stresses to prevent occurrence of weld cracks.
- h) Fillet welds shall be made by shielded metal arc welding process irrespective of the thickness and class of piping. Electrode size shall not exceed 3.25mm diameter for socket joints. Atleast two passes shall be made on socket weld joints
- i) Root pass of fillet weld for branch connection can also be made by GTAW process. However other pass shall be made by SMAW process as mentioned above (point h).

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 7 of 54
			REVISION : 1
			EDITION : 1

j) Peening shall not be used.

10.2

Joint Completion

The first pass shall be carried out by a minimum of two welders, working simultaneously and so placed as to cause minimum distortion of the pipe.

The number of welders and the allowable welding sequences shall be as those laid down in the qualified welding procedure specification. Once the deposit of the first pass has been started, it must be completed as rapidly as possible, reducing interruptions to the minimum. The welding and wire speed shall be approximately same as that established in the Qualified Welding Procedure Specification (QWPS).

The pipe shall always be adequately supported and must not be pumped or shaken during welding. The clamp shall be removed, as indicated in clause 8.0 above. Before starting the second pass, the first pass shall be cleaned and flattened with rotating grinders.


The interruption between completion of the first pass and starting the second pass shall be as stated in the procedure specification.

For crack prevention a top and bottom reinforcement of at least one electrode shall be applied before lowering the pipe on the skid.

The welding speed selected shall enable production of a bead which is sufficiently thick and which shows no undercutting.

The time lapse between second and third pass shall be as stated in the procedure specification, normally not exceeding five minutes. After completion of the third or following passes, welding operations may be suspended, so allowing the joint to cool down, provided that the thickness of the weld metal deposited is equal to at least 50% of the pipe thickness. Upon restarting, depending on the materials, wall thickness and welding process, a preheating to atleast 100°C shall be carried out. Subsequent passes up to weld completion shall be protected to avoid rapid cooling, if meteorological conditions so dictate. Cleaning between passes shall be done carefully so as to reduce the possibility of inclusions.

Electrodes starting and finishing points shall be staggered from pass to pass. Arc-strikes outside the bevel on the pipe surface are not permitted. Arc - strike or arc-burn on the pipe surface outside the weld, which are caused accidentally by electrical arcs between the electrodes, electrode holder, welding cable shall be removed by grinding in accordance with a procedure approved by COMPANY and the repair checked by ultrasonic, radiographic, magnetic particle or dyepenetrant tests which the COMPANY feels necessary. The pipe wall thickness after grinding shall not be less than the minimum thickness limit permitted for the pipe. Repair of arc-strikes by welding is prohibited.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 8 of 54
			REVISION : 1
			EDITION : 1

The completed weld shall be carefully brushed and cleaned and shall appear free from spatters, scales, etc.

These requirements apply not only to completed welds but also to the bare strip at least so wide so as to allow full skid examination at both ends of the pipe to allow a good ultrasonic inspection when it is required.

11.0 HEAT TREATMENT


11.1 Preheating

Preheating, if required, shall be carried out as per the following :

- a) Preheating requirements for the various materials shall be as per the welding specification chart.
- b) Preheating shall be performed using resistance or induction/ heating methods. Preheating by LPG flame with ring burner may be used with the permission of the COMPANY under careful supervision.
- c) Preheating shall extend uniformly to atleast three times the thickness of the joint, but not less than 50mm, on both sides of the weld.
- d) Preheating temperature shall be maintained over the whole length of the joint during welding. Temperature indicating crayons or other temperature indicating devices shall be provided by the CONTRACTOR to check the temperature.

11.2 Postweld Heat Treatment


- a) Post weld heat treatment, wherever required for joints between pipes and fittings, pipe body and supports shall be carried out by the CONTRACTOR at his expense as per the relevant specifications, applicable standards and the instructions of the COMPANY.
- b) The heat treatment of welded joints shall be carried out as per the requirements laid down in ANSI B31.8 and other special requirements mentioned in welding specification chart.
- c) The CONTRACTOR shall submit for the approval of the COMPANY, well before carrying out actual heat treatments the details of the post weld heat treatment procedure, as per **Annexure-II** attached, that he proposes to adopt for each of the materials/ assembly/ part involved.
- d) Post weld heat treatment shall be done in a furnace or by using an electric resistance or induction heating equipment, as decided by the COMPANY.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 9 of 54
			REVISION : 1
			EDITION : 1

- e) While carrying out local post weld heat treatment, technique of application of heat must ensure uniform temperature attainment at all points of the portion being heat treated. Care shall be taken to ensure that width of heated band over which specified post weld heat treatment temperature is attained is atleast as that specified in the relevant applicable standards/ codes.

The width of the heated band centered on the weld shall at least be equal to the width of weld plus 2" (50mm). The temperature gradient shall be such that the length of the material on each side of the weld, at a temperature exceeding half the heat treatment temperature, is atleast $2.5 \sqrt{rt}$ where r is the bore radius and t is the pipe thickness at the weld.

- f) Throughout the cycle of heat treatment, the portion outside the heat band shall be suitably wrapped with insulation so as to avoid any harmful temperature gradient on the exposed surface of pipe. For this purpose temperature at the exposed surface of the pipe shall not be allowed to exceed 400°C.
- g) The temperature attained by the portion under heat treatment shall be recorded by means of thermocouple pyrometers. Adequate number of thermocouples shall be attached to the pipe directly at equally spaced locations along the periphery of the pipe joint. The minimum number of thermocouples attached per joint shall be 2 upto 10" dia and 3 for 12" dia and above. However, the COMPANY can increase the required minimum number of thermocouples to be attached, if found necessary.
- h) Automatic temperature recorders which have been suitably calibrated shall be employed. The calibration chart of each recorder shall be submitted to the COMPANY prior to starting the heat treatment operation and its approval shall be obtained.
- i) Immediately on completion of the heat treatment, the post weld heat treatment charts/ records alongwith the hardness test results on the weld joints (whenever required as per the welding specification chart) shall be submitted to COMPANY for its approval.
- j) Each joint shall bear an identification number which shall be maintained in the piping sketch to be prepared by the CONTRACTOR. The joint identification number shall appear on the corresponding post weld heat treatment treatment charts. The same identification numbers shall also be followed for identification on corresponding radiographic films. The chart containing the identification number and piping sketch shall be submitted to the COMPANY in suitable folders.
- k) Vickers hardness/ Brinnel hardness of the heat affected zone as well as of the weld metal, after heat treatment shall be measured using a suitable hardness tester and shall not exceed the maximum hardness specified in the welding specification chart. The weld joint shall be subjected to reheat treatment, when

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 10 of 54
			REVISION : 1
			EDITION : 1

hardness measured exceeds the specified limit, at the CONTRACTOR's own expense.

- l) The CONTRACTOR shall arrange for the hardness testing and shall maintain the records of all the joints tested. These records shall be checked by the COMPANY.


12.0 **INSPECTION AND TESTING**

12.1 **General**

- a) The COMPANY's Inspector shall have free access to all concerned areas, where the actual work is being performed. The CONTRACTOR shall be also provide the COMPANY's inspector all means and facilities necessary to carry out inspection.
- b) The COMPANY is entitled to depute its own inspector to the shop or field where pre-fabrication and erection of pipelines are being done, with (but not limited to) the following objectives :-
- To check the conformance to relevant standards/ specifications and suitability of various welding equipment and the welding performance.
 - To supervise the welding procedures qualification.
 - To supervise the welder's performance qualification.
 - To carry out visual/NDT examination of the weldings.
 - To check whether shop/ field welding is being executed in conformity with the relevant specification and codes of practice followed in pipe construction.
- c) CONTRACTOR shall intimate sufficiently in advance the commencement of qualification tests, welding works and acceptance tests, to enable the Company's inspector to be present to supervise the same.

12.2 **Welding Procedure Qualification**

- a) Welding procedure qualification shall be carried out in accordance with the relevant requirements of API 1104 latest edition or other applicable codes and other special requirements of the specification / job requirements by the CONTRACTOR at his expense. The CONTRACTOR shall submit the welding procedure specification chart format as per **Annexure-III** (attached) immediately after the receipt of the order.
- b) COMPANY's inspector will review, check and approve the welding procedure submitted and shall release the procedure for procedure qualification tests. The procedure qualification test shall be carried out by the CONTRACTOR under field conditions at his own expense. A complete set of test results in format as per **Annexure-III & Annexure-IV** (attached) shall be submitted to the

	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 11 of 54
			REVISION : 1
			EDITION : 1

COMPANY's Inspector for approval immediately after completing the procedure qualification test and atleast 2 weeks before the commencement of actual work. Standard tests as specified in the code shall be carried out in all cases. In addition to these, tests, other tests like radiography, macro/ micro examination, hardness tests, dye penetrant examination, charpy V-notch etc. shall be carried out on specimens. It shall be the responsibility of the CONTRACTOR to carry out all the tests required to the satisfaction of the COMPANY's Inspector. The destructive testing of welded joints shall be as per Clause 14.0.

12.3 Welder's Qualification

- a) Welders shall be qualified in accordance with the API 1104 and other applicable specifications by the CONTRACTOR at his expense. The butt weld test pieces of the qualification test shall meet the radiographic test requirements specified in Clause 12.5 and 16.0 of this specification. The COMPANY's Inspector shall witness the test and certify the qualification of each welder separately. Only those welders who have been approved by the COMPANY's Inspector shall be employed for welding. CONTRACTOR shall submit the welder qualification test reports in the standard format as shown in **Annexure-V** and obtain express approval, before commencement of the work. It shall be the responsibility of CONTRACTOR to carry out qualification tests of welders and obtain written approval, before commencement of works.
- b) The welders shall always have in their possession the identification card as shown in **Annexure-VII** and shall produce it on demand by the COMPANY's Inspector. It shall be the responsibility of the CONTRACTOR to issue the identity cards after it has been duly certified by the COMPANY.
- c) No welder shall be permitted to work without the possession of identity cards.
- d) If a welder is found to perform a type of welding or in a position for which he is not qualified, he shall be debarred from doing any further work. All welds performed by an unqualified welder shall be cut and redone by a qualified welder at the expense of the CONTRACTOR.


12.4 Visual Inspection

Inspection of all welds shall be carried out by COMPANY as per the latest editions of the applicable codes and specifications. All finished welds shall be visually inspected for parallel and axial alignment of the work, excessive reinforcement, concavity of welds, shrinkage, cracks, under-cuts, dimensions of the weld, surface porosity and other surface defects. Undercutting adjacent to the completed weld shall not exceed the limits specified in the applicable standard/ code.

12.5 Non Destructive Examination

- 12.5.1 The non destructive examination of one hundred percent (100%) girth welds will be required by the COMPANY.

The non-destructive examination shall mainly consist of examination using Automated

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 12 of 54
			REVISION : 1
			EDITION : 1

Ultrasonic Testing (AUT) as detailed in clause no. 16.0. This shall be applicable for all welds made by automatic GMAW process with narrow gap edge preparation and welds made by semi-automatic FCAW process.

The CONTRACTOR shall make all the arrangements for the AUT of work covered by the specification at his expense. The CONTRACTOR shall furnish all the reports to the COMPANY, immediately after examination together with the corresponding interpretation reports on the approved format. The details of the AUT reports along with the joint identification number shall be duly entered in a register and signed by the CONTRACTOR and submitted to the COMPANY for approval. The COMPANY will review all the AUT records of welds and inform the CONTRACTOR to those welds, which are unacceptable. The decision of the COMPANY shall be final and binding in this regard.

For 150# Rating Pipeline, welds shall meet the standards of acceptability as set forth in API 1104. However for higher class rating pipeline welds shall meet the standards of acceptability as set forth in API 1104 and as well as the requirements laid in subsequent paragraphs.

The CONTRACTOR shall make all the arrangements for the NDT work covered by the specification at his expense.

All requirements mentioned in the specification shall be arranged and executed by the CONTRACTOR through his own resources. In addition, Radiography examination shall be required in the following cases as per clause no. 17.0 of this specification :

- a) On the first 100 welded joints corresponding to each automatic GMAW welding procedure used.
- b) When welds are repaired.
- c) When in the opinion of COMPANY, radiography inspection is required to confirm or clarify defects indicated by Ultrasonic examination.
- d) Welding of Transition piece of pipe.


In addition, Radiography inspection may be required for certain critical welds of the pipeline, i.e. tie-ins, welding of valves, flanges, randomly selected at COMPANY discretion. All fillet and groove welds, other than those AUT examined, shall be subjected to Dye-Penetrant /MP testing followed by manual Ultrasonic testing.

The non-destructive testing system used for inspecting welds must be approved by the COMPANY.

All other welds and Tie-in joints having API bevel shall be examined by Radiography. When Radiography is used, the provisions stated in this para shall be applicable.

- For all production welds, X-ray Radiography by internal crawlers be used.

Welds shall meet the standards of acceptability as set forth in API 1104 and as well as the requirements laid in subsequent paragraphs.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 13 of 54
			REVISION : 1
			EDITION : 1

The CONTRACTOR shall make all the arrangements for the Radiography examination of work covered by the specification at his expense.

The COMPANY will review all the radiographs of welds and inform the CONTRACTOR regarding unacceptable welds. The decision of the COMPANY shall be final and binding in this regard.

All the requirements mentioned in the specification shall be arranged and executed by the CONTRACTOR through his own resources. In addition, Ultrasonic inspection is required in the following cases as per clause no. 15.0 of this specification:

- a) On the first 10 welded joints corresponding to each automatic GMAW welding procedures used.
- b) When welds are repaired.
- c) When in the opinion of COMPANY, Ultrasonic inspection is required to confirm or clarify defects indicated by Radiography.

In addition, Ultrasonic inspection may be required for certain critical welds of the pipeline, i.e. tie-ins, welding of valves, flanges, randomly selected at COMPANY discretion. All fillet and groove welds, other than those are subjected to Radiography, shall be subjected to Dye-Penetrant/MP inspection. The non-destructive testing system used for inspecting welds must be by approved by the COMPANY.

Acceptance Criteria

Weld quality is judged on the basis of the acceptability criteria mentioned below:

Any weld which as a result of radiographic and/ or ultrasonic examination in the opinion of COMPANY exhibits imperfections greater than the limits stated in API-1104 latest edition or as superseded in this specification shall be considered defective and shall so be marked with an identification point marker.


In addition to the API-1104 requirements, the welds containing cracks including crater cracks regardless of size of location are unacceptable.

1. Any length of inadequate penetration of the root bead as defined by API-1104 is not acceptable except that root concavity is allowed as per API 1104.
2. Any amount of incomplete fusion at the root of the joint as detailed in API 1104 is considered unacceptable.
3. Unrepaired burn through areas are unacceptable.

Suitable records shall be maintained by the CONTRACTOR as desired by the COMPANY on the day to day work done on welding, radiography, ultrasonic testing. The CONTRACTOR shall present the records to the COMPANY on day to day basis and whenever demanded, for approval.

12.6

Destructive Testing

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 14 of 54
			REVISION : 1
			EDITION : 1

The COMPANY has the authority to order the cutting of upto 0.1% of the total number of welds completed for destructive testing at no extra cost of COMPANY. The destructive testing of weld joints shall be made as per Clause 14.0.

In addition, welds already cut out for defects for any reason may also be subjected to destructive testing. The sampling and the re-execution of welds shall be carried out by the CONTRACTOR at his own expense. If the results are unsatisfactory, welding operations shall be suspended and may not be restarted until the causes have been identified and the CONTRACTOR has adopted measures which guarantee acceptable results. If it is necessary in the COMPANY's opinion the procedure shall be re-qualified. The weld joint represented by unsatisfactory welds shall stand rejected unless investigation prove otherwise.

13.0 **REPAIR OF WELDS**

13.1 With the prior permission of COMPANY, welds which do not comply with the standards of acceptability shall be repaired or the joint cut out and re-welded.


A separate welding procedure specification sheet shall be formulated and qualified by CONTRACTOR for repair welds simulating the proposed repair to be carried out. Separate procedures are required to be qualified for (a) thorough thickness repair (b) external repair and (c) internal repair. Welders shall be qualified in advance for repairs. The root pass, for repairs opening the root, shall be done by the vertical uphill technique. The procedure shall be proven by satisfactory procedure tests to API 1104 including the special requirement of the specification, and shall also be subject to metallographic examination, hardness surveys and Charpy tests to determine the effects of repair welding on the associated structure.

Root sealing or single pass repair deposit shall not be allowed. Internal root defects shall be ground thoroughly and welded with a minimum of two passes. However, while grinding for repairs, care shall be taken to ensure that no grinding marks are made on the pipe surface anywhere.

The repair shall be subjected, as a minimum requirement to the same testing and inspection requirements as the original weld. The re-radiography of repaired weld shall be limited to 6" weld length on either edge of the repaired area. A 100% ultrasonic test shall be done at the repaired area externally. Any repaired area that is wide, irregular or rough shall be rejected and a full cut out shall be done. Single pass repairs shall be subjected to 100%, Dye-Penetrant / MP testing.

Repairs are limited to a maximum of 30% of the weld length. Not more than two repairs are permitted on the same location. All repairs shall be carried out the day after initial Radiography or earlier. A report of all repairs shall be maintained by CONTRACTOR and submitted every day to the Company / Consultant.

13.2 **Weld Rejected by Accumulation of Defects**

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 15 of 54
			REVISION : 1
			EDITION : 1

Where a weld is rejected by the accumulation of defect clause, as defined by API 1104 and this specification, repairs within these limitations are permitted. Defects in the filling and capping passes shall be repaired preferentially.

14. **DESTRUCTIVE TESTING OF WELDED JOINT - BUTT WELDS**

14.1 **Preparation**

Having passed the visual and the non-destructive-inspection the test weld shall be subject to mechanical test.

After satisfactory completion of all visual and non-destructive testing the test weld shall be set aside for a period not less than 24hours. No further work on the test weld and no cutting of test specimens from the weld shall be performed until a period of at least 24 hours has expired. Having passed the visual and the nondestructive inspection, the test weld shall be subjected to mechanical test.

Weld specimens shall be taken from the positions indicated in Fig. 1 of this specification from areas as free from defects as possible; for this reason it is necessary to take the previous non-destructive tests into account. The minimum number of tests to be carried out is given in Table-1 of this specification.

The tests shall be carried out in laboratories approved by the COMPANY. The specimens shall be prepared in accordance with the figures given in the paragraphs which refer to the individual tests.

14.2 **Tensile Strength**

Specimens shall be taken from the position indicated in Fig. 1 & 1A of this specification. Two ISO type specimens and two API - type specimens shall be taken.

The ISO test specimen are shown in Fig. 2 of this specification.


14.2.1 **Method**

The test shall be carried out in accordance with ISO:375.

Table-1

**Type and Number of Test Specimens for
Procedure Qualification Test & Production Welds**

Pipe Size, Out Side Diameter-	Number of Specimens									
	Tensile	Tensile	Nick	Root	Face	Side	Macro	Hard-	Impact	Total

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 16 of 54
			REVISION : 1
			EDITION : 1

Inches	API	ISO	Break	Bend	Bend	Bend	Bend	ness		
Wall Thickness - ½ inch (12.7mm) and Under										
Under 2-3/8	0	0	2	2	0	0	0	0	0	4
2-3/8 to 4-½ incl.	0	0	2	2	0	0	0	0	0	4
Over 4-½ less than 12.75	2	0	2	2	2	0	2	2	12	24
12- 3/4 and over	2	2	4	4	4	0	2	2	24	44
Wall Thickness - Over ½ inch (12.7mm)										
4-½ and smaller	0	2	0	0	0	2	0	0	0	4
Over 4-½ less than 12-3/4	2	0	2	2	2	0	2	2	12	24
12-3/4 and over	2	2	4	0	0	8	2	2	24	44

14.3 Nick-Break Test

14.3.1 Preparation

Specimens for Nick-break test with notches thus worked can break in the base metal, instead of in the fusion zone; therefore an alternative test piece may be used after authorisation by the COMPANY with a notch cut in the reinforcement of outside weld bead to a maximum depth of 1.5mm measured from the surface of the weld bead.

14.4 Macroscopic Inspection


14.4.1 Preparation

Specimens shall be taken from the positions indicated in Fig. 1 of this specification and shall be prepared in accordance with ASTM E2 and E3.

The width of the macrosection has to be at least three times the width of the weld. The section is to be prepared by grinding and polishing and etched to clearly reveal the weld metal and heat affected zone.

14.4.2 Method

Specimens shall be carefully examined under the microscope, with a magnification of atleast 25 times (25:1). The COMPANY may ask for a macrograph with 5 times (5:1) magnification for DOCUMENTATION purposes.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 17 of 54
			REVISION : 1
			EDITION : 1

14.4.3 Requirements

Under macroscopic examination, the welded joints shall show good penetration and fusion, without any defect exceeding the limits stated in the evaluation criteria of the nick break test.

14.5 Hardness Test

14.5.1 Preparation

The prepared macrosection is to be used for hardness testing using the Vickers method with 10 kg load. Indentations are to be made along traverses each approximately 1mm below the surface on both sides of the weld.

In the weld metal a minimum of 6 indentations equally spaced along the traverses are to be made. The HAZ indentations are to be made along the traverses for approximately 0.5mm each into unaffected materials, and starting as close to the fusion line as possible.

One indentation on each side of the weld along each traverse is to be made on parent metal. Refer Fig.3. The indentations are to be made in the adjacent regions as well on the opposite sides of the macrosection along the specified traverses.

14.5.2 Method

The test shall be carried out in accordance with Recommendation ISO R81, Vickers hardness, using a laboratory type machine controlled as pre-recommendation ISO R146 and using a diamond pyramid penetrator set at 2.37 rad (136°) with a load of 10 kg.

14.5.3 Requirements


Hardness value shall not exceed the limit specified in welding Specification chart. In case of a single reading having a slightly (+10 HV) higher value than the specified limit, further indentations shall be made to check if the high value was an isolated case.

All the hardness values contained from the heat affected zone shall not exceed 100 HV with respect to the average hardness of the values obtained for the base metal. If these additional tests give a hardness within the specification limit the slightly higher value may be accepted.

14.6 Charpy - V - Notch Impact Test

Specimens shall be taken from the position indicated in Fig. 1 of this specification. The test specimens will be prepared in accordance with ISO R148. Charpy V-notch specimens shall have dimensions as given in Fig. 3 of this specification.

Three test specimens shall be taken from each sample and they shall be cut and worked so that their length is transverse and perpendicular to the weld bead with the notch

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 18 of 54
			REVISION : 1
			EDITION : 1

position as shown in Fig. 4 of this specification. The notch shall be perpendicular to the roller surface. The test specimen width shall depend upon the pipe wall nominal thickness as following :

Sl. No.	Nominal Wall Thickness in mm	Test Specimen width mm
1.	Over 12	10
2.	Over 9.5 and upto 12	7.5
3.	From 7 upto 9.5	5
4.	Less than 7	2.5

14.6.2 Test Method

The test shall be carried out as indicated in ISO R148 "Beam impact test V-notch".

Test pieces shall be immersed in a thermostatic bath and maintained at the test temperature for at least 15 minutes. They shall then be placed in the testing machine and broken within 5 seconds of their removal from the bath. The test temperature shall be as mentioned in Special conditions of the Contract.

14.6.3 Requirements (Note-1)

The impact energy shall be as follows :

Sl. No.	Test Specimen in mm	"Average of three Specimens (Note-2) Value (Note-1) Joules (Min.)"	Minimum Single Value (Note-1) Joules
1.	10.0	27.0	22.0
2.	7.5	21.5	17.0
3.	5.0	18.5	15.0
4.	2.5	10.0	8.0

Note :

- Only one value is permitted to be lower than average value upto the value specified.
- These values are specified for resistance to brittle fracture only, where additional requirements are specified in project data sheet. (Ex. pipeline materials with arrest properties i.e. a higher upper shelf charpy V-energy for resistance against propagating ductile fractures) the same shall be followed.

14.7 Bend Test Requirements

The Bend test Specimens shall be made and tested as per the requirements of API 1104 Sixteenth Edition May 1983 except that the dimensions of the Jig for guided bend test


BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 19 of 54
			REVISION : 1
			EDITION : 1

Fig. 5 para 2.6 API 1104 shall be modified as follows:

Radius of the Plunger 'A'	:	2 t
Radius of the die 'B'	:	3 t + 1.6mm
Width of the die 'C'	:	50.8mm

The acceptance criterion on shall however be as per para 2.643 and 2.653 of API 1104 nineteenth edition Sept. 1999.

Note : t = thickness of specimen

15. **ULTRASONIC INSPECTION**

In addition to the radiographic inspection, ultrasonic inspection is required as per conditions listed in paragraph 12.5 of this specification. This section concerns manual ultrasonic inspection. However ultrasonic by automatic equipment may be used if approved by the COMPANY.

15.1 **Equipment and Operators**

The CONTRACTOR who carries out the ultrasonic inspection shall have sufficient qualified personnel equipment and instruments at his disposal to be able to effect the tests without hindering or delaying the pipeline assembly operations.

The operators shall be fully qualified as per a recognised standard (ASME Sec. V or equivalent) and they shall have as minimum level II as described in para 11.4.3, API 1104; nineteenth edition. The operators shall be able to :

- calibrate the equipment ;
- perform an operational test under production conditions;
- interpret the screen picture ;
- evaluate the size and location of reflectors
- interpret the type of defects detected


The COMPANY has the option of checking the ability of personnel employed for ultrasonic testing by means of qualification tests.

The CONTRACTOR appointed to carry out ultrasonic inspection shall supply all the instruments necessary for their execution on site.

15.2 **Specification for Ultrasonic Inspection Procedure Qualification**

Before work begins, the CONTRACTOR shall present a specification describing the proposed U.T. procedure qualification.

This specification shall state, as an indication only but not limited to the following

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 20 of 54
			REVISION : 1
			EDITION : 1

information :

- type of U.T. equipment used
- type and dimensions of transducers
- frequency range
- details for calibration
- coupling medium
- inspection technique
- record details
- reference to the welding procedure where it is intended to adopt the specification.
- temperature range of the joints to be inspected.

15.3

Qualification of Ultrasonic Inspection Procedure

The ultrasonic inspection procedure shall be approved by the COMPANY. Before inspection begins, the COMPANY may require the qualification test of the ultrasonic inspection procedure. This specification test consists in testing (under normal operating conditions) some CONTRACTOR welds made according to the same production procedure, where there are typical defects the test intends to detect.

This test shall be conducted in the presence of the COMPANY. The Ultrasonic inspection procedure shall be approved by the Company.

15.4

Test Procedure

Circumferential welds shall be inspected from both sides using angled probes.

The surface with which the probes comes into contact shall be free of metal spatter, dirt, iron oxide, and scales of any type; therefore it shall be necessary to clean a strip at least 50mm wide on both sides of the weld with steel wire brushes and anyhow the cleaned strip must be atleast wide enough to allow full skip examination.


If, during the test, echoes of doubtful origin appear, it shall be necessary to inspect a convenient area on the pipe surface, close to the weld, with a straight beam transducer in order to check whether any manufacturing defects are present which could have interfered with the ultrasonic beam.

By way of an example, the equipment shall include but not be limited to the following:-

- ultrasonic equipment and coupling medium
- sample sections for calibration of instruments
- equipment for cleaning of surface to be examined
- rules calibrated in centimeters for exact location of the position of defects.

The characteristics of the above - listed instruments and equipment shall guarantee:

- a) that the required standards of the inspection procedure, as previously

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 21 of 54
			REVISION : 1
			EDITION : 1

established and approved by the COMPANY, are satisfied.

b) continuous operation

All the instruments and equipment shall be approved by the COMPANY before being used. The COMPANY has the authority to reject any item which is considered unsuitable. The decision of the COMPANY is final. The CONTRACTOR appointed to carry out ultrasonic inspections shall also ensure the operational efficiency and maintenance of the instruments and equipment, and shall immediately substitute any item rejected by the COMPANY.

All the instruments and equipment necessary for carrying out ultrasonic inspection on site shall satisfy the requirements laid down by the public boards of institutions which regulate 'safety at work'.

15.5 Ultrasonic Instruments

The Ultrasonic Instruments shall satisfy the following:


- be pulse-echo type, able to generate, receive and display, on the screen a cathode ray tube (CRT) pulse at frequencies between 1 and 6 MHz. The useful part of the CRT screen shall be at least 70mm wide and at least 50mm high.
- shall have variable amplification, with steps of 1 or 2 dB over a range of at least 60 dB.
- the regulation control shall be accurate to within ± 1 db and this accuracy shall be certified by the instrument manufacturer.
- may be powered by a battery or an electric generator. In the first case, the autonomy of operation (endurance) of the instrument shall be sufficient to carry on working without frequent interruptions, and the instruments shall be equipped with an automatic switch which switches it off when the battery runs down; in the second case, there must be a voltage stabilising device with a tolerance of ± 2 Volts.

15.6 Probes

The probes used shall have dimensions, frequencies, and a refraction angle suited to the type of steel, the diameter, the thickness of the pipe and to the joint design.

15.7 Reference Sample Pieces

The efficiency of the equipment used, the effective refraction angle of the probe, and the beam output point, shall be checked using a V_1 and V_2 sample block, IIW type or calibration block ASTM E-428.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 22 of 54
			REVISION : 1
			EDITION : 1

For manual Ultrasonic testing and automated Ultrasonic testing, the reference sample pieces shall be as described in API 1104, Nineteenth Edition, para 11.4.5.

15.8 Calibration

The calibration, qualification of the testing procedure shall be done as provided in API 1104.

15.9 Regulation of Amplification During Production Testing

Scanning sensitivity shall be as provided in API 1104 para 11.4.7.2 & 11.4.7.3.

15.10 Qualification of Ultrasonic Testing Operators

Before the inspection begins or during the same inspection, the COMPANY may require a qualification test for the ultrasonic equipment operators.

15.11 Evaluation of Indications Given by Ultrasonic Tests


Each time that echoes from the weld bead appear during production testing, the instrument amplification shall be altered to coincide with the reference amplification and the probe shall be moved until maximum response is obtained, paying attention all the time of the probe-tube coupling.

If, under these conditions, the heights of the defect echo is equal to or greater than that of the reference echo, the defect shall be evaluated according to other clauses of this Specification. If the defect has also been detected by the radiographic and or visual examination, the dimensions shall be judged according to the type of examination which detects the greater defect. Returns which are less than 50% of the reference echo, will not be considered. If returns are above 50% but lower than 100% of the reference echo, and if the operator has good reasons to suspect that the returns are caused by unfavourably oriented cracks, the same shall be informed to the COMPANY. Moreover, when there is a defect to be repaired, such defect shall be removed for a length corresponding to the one where no more return echo is given.

15.12 Other Equipment

The use of rules calibrated in centimeters, attached if possible to the probe, for the precise location of the position of welding defects, is recommended. Defect location is effected by measuring the projection distance between the probe output and the reflecting surface.

The operators carrying out the tests shall have besides the probing instrument, tools for cleaning the pipe surface (files, brushes, etc.), as well as, the coupling liquid or paste appropriate for the temperature of the section to be examined.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 23 of 54
			REVISION : 1
			EDITION : 1

16.0 **AUTOMATED ULTRASONIC TESTING (AUT)**

▪ **INTRODUCTION**

The specification shall be applicable for Automated Ultrasonic Testing (AUT) system suitable for pipeline girth welds. The system shall be based on focused pulse-echo, tandem or through transmission methods enhanced with mapping image and augmented by Time Of Flight Diffraction (TOFD) technique.

▪ **REFERENCE DOCUMENTS**

ASTM E 1961-98 "Standard Practice for Mechanized Ultrasonic examination of Girth Welds using Zonal Discrimination with Focused Search Units". The inspection system shall meet and exceed the requirements of ASTM E 1961-98.

Appendix-E, "Automated Ultrasonic Girth Weld Testing", OS-F101, Submarine Pipeline Systems, January 2000.

API Std. 1104 – "Welding of Pipeline and Related Facilities".

▪ **APPROVED AGENCIES**


Following agencies for Automatic Ultrasonic Testing (AUT) are acceptable:

- a) RTD Quality Services, Rotterdam, Netherlands
- b) SHAW Pipeline Services, Canada
- c) WELDSOINX, USA
- d) UT Quality, Canada
- e) SCI, Spain
- f) SIEVERT India Private Ltd., India

In case bidder proposes to employ any other agency, the proposed agency shall meet the qualification criteria listed below and shall submit necessary documentation. The detailed system description and procedure shall be submitted for COMPANY evaluation/ approval.

Automatic Ultrasonic Testing (AUT) systems and agencies who have proven track record and have done a single project of diameter 20" or above and minimum length of 50 km and also have inspected a cumulative length of 500 km or above on large diameter Pipe lines in the last ten years shall only be accepted. The agency should have been approved by the reputed inspection agencies. The track record shall be submitted to the COMPANY for approval prior to engagement.

▪ **AUT SYSTEM**

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 24 of 54
			REVISION : 1
			EDITION : 1

The system shall meet and exceed the requirements of ASTM E1961-98.

The system shall provide an adequate number of examination channels to ensure the complete volumetric examination of the weld through the thickness in one circumferential scan. The evaluation zones should be of maximum 2.0mm height. The instrument linearity should be such that the accuracy is within 5%.

Each examination channel should be selective for pulse-echo or through transmission mode gate position and length for a minimum of two gates and gain.

TOFD techniques & B-scan mapping should be available to improve characterization. Recording thresholds should be selectable to display signals between 0 and 100% of full screen height for simple amplitude and transit time recording and it should be from 0 to 100% for B-scan or mapping type recording of data. Two recordable signals output per gate should be available being either analog or digital and representative of signal height and time of flight. Measuring distance accuracy of circumferential weld shall be within 1.0 cm from zero (0) position.

Electronic noise shall be lower than acoustical noise in all channels for the probes and sensitivities to be used during inspection. The signal to noise ratio for each channel during examination shall be at least ≥ 20 dB for shear waved probes.

▪ **COUPLING**

The coupling shall be obtained by using a medium suitable for the purpose. It shall be suitable for the temperature used. No residue shall remain on the pipe surface. A method should be employed to determine that constant coupling is achieved during examination. An examination of the test piece with its surface wiped dry should produce a record showing an absence of the couplant recording signal.

▪ **SEARCH UNITS**

The search unit shall meet all the requirements specified in Para 6.4 of ASTM E1961-98.

▪ **CALIBRATIONS**

Reference standards shall be manufactured from a section of unflawed project specific line pipe supplied by pipeline CONTRACTOR. The agency shall then submit the reference standard design to the COMPANY before manufacturing. No design changes in the reference standard shall be made without the prior approval. Annexure A3 of the standard ASTM E1961-98 provides an example for minimum requirements for reference standards.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 25 of 54
			REVISION : 1
			EDITION : 1

The system shall be optimized and calibrated as stated in Para 7.0 and 8.0 of ASTM E 1961-98. Static and Dynamic calibration shall be done and the approved procedure shall clearly state the gain setting fixed for each channel.

The reference standard should be used to verify the scanning sensitivity at the start of each shift and thereafter at intervals not exceeding two (2) hours or ten (10) welds.

A re-calibration shall be carried out if :

- The calibration of an inspection function differs more than +/- 3dB from the previous calibration
- The gate settings need to be adjusted with more than +/- 1.5 mm with the previous calibration
- After a weld repair
- After equipment breakdown.


In case the calibration differs from the initial setting, outside the given tolerances, the applicable probe(s) and coupling shall be checked. If the calibration has to be changed, the welds before this calibration upto the previous calibration will be re-examined.

The reference standard design for calibration shall be approved separately. The procedure for calibration and verification shall be same as given above.

■ **PROCEDURE**

A detailed AUT procedure shall be prepared and qualified for each wall thickness and joint geometry to be examined prior to the start of any NDT work. Repair procedure shall be separately qualified for each joint geometry. All the requirements of ASTM E1961-98 should be met. The procedure as a minimum shall include the following:

- Functional description of equipment
- Reference standards and guidelines controlling equipment maintenance
- Instructions for scanning device, Ultrasonic instrument, Ultrasonic electronics, Hard & Software for recording processing, Display presentation and storage of inspection data
- Transducer configuration(s), characteristics types coverage.
- Number of examination zones for each wall thickness to be examined.
- Gate settings
- Equipment settings -Description of calibration blocks including type, size and location of calibration reflectors, a) calibration intervals, b) calibration records - Static and dynamic calibration procedure
- Identification of inspection starting point scanning direction and indication of length inspected

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 26 of 54
			REVISION : 1
			EDITION : 1

- Method for scanner alignment and maintenance of alignment
- Allowed temperature range
- Couplant coupling and coupling control and channels provided to indicate lack of coupling and method to ensure constant coupling
- Transducer and over all functional checks
- Height and length sizing methodology
- Surface condition and preparation
- Description of inspection work
- Acceptance criteria and instructions for reporting including example of recorder chart and form to be used.
- A table indicating corresponding channel no., probe, type, location of reflector, probe coupling etc.

▪ **Setting of Inspection Gates**

Pulse-echo and Tandem Channels

With each transducer positioned for the peak signal response from the calibration reflector the detection gates are to be set. The gate shall start 2-6mm (allowance for width of heat affected zone) before the theoretical weld bevel preparation. The gate ends shall be after the theoretical weld centerline. All gates will be programmed to record amplitude and/or transit distance information. The length of the transit distance in the root channel will be extended to enable root penetration registration.

Mapping Channels

The mapping gates in the body of the weld shall start 2-6mm (allowance for width of heat affected zone) before the theoretical weld bevel preparation. The gate length will be extended to enable cap reinforcement registration. The mapping gates in the root will be set identical to the pulse-echo transit distance channels to enable the registration of the root penetration.


TOFD Channel

The TOFD gate start will be set 1 μ Sec before the arrival of the lateral wave and should extend up to the first back wall echo to achieve full cover of wall thickness.

Note: The gate settings may be altered if geometry indications dictate.

Sensitivity Settings

With each transducer positioned for the peak signal response from the calibration

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 27 of 54
			REVISION : 1
			EDITION : 1

reflector (flat bottom holes), the detection gates are to be set. In this position, the probe holder is fixed to the probe frame. The equipment sensitivity (echo amplitude) for all inspection channels shall be set at 80% Full Screen Height (FSH).

Mapping channels in the body of the weld will be used to detect the presence of porosity and in addition to identify the position of the weld cap reinforcement for pattern recognition purpose. The sensitivity as a minimum is equal to the related pulse- echo channels, increased with additional gain to ensure proper detection.

Mapping channels in the root will be used to identify the position of the root penetration for pattern recognition purpose. The sensitivity as a minimum shall be equal to the related pulse-echo channels, increased with additional gain to ensure proper detection.

The lateral wave of the TOFD channel sensitivity is set at 80% FSH.

▪ **TRAINING AND QUALIFICATION**

1. All Inspectors' of the COMPANY (Owner) shall be imparted training at the CONTRACTOR's cost. The inspector shall be provided complete awareness and knowledge regarding the equipment, limitations, capabilities complete range, method of operation, calibration, scanning, including development of suitable procedure, training on variables effecting the system performance and interpretation of results.
2. The Ultrasonic lead operator performing the examination shall be qualified in accordance with the COMPANY's written practice and in accordance with ASNT Practice SNT-TC-1A and EN 473 Level II. He should have experience in multichannel UT equipment and be trained in using mechanized UT manipulators.


▪ **FIELD EXAMINATIONS AND REPORTING**

All the requirements stated in Para 9 and 10 of ASTM E1961-98 shall be followed a minimum.

▪ **INTERPRETATION OF RESULTS**

General

With the transit distance measurements and with the information from the mapping and TOFD channels visible on the result presentation, indications shall be judged whether they are from the weld geometry or from the defects. The coupling channels will check for coupling loss; in case of coupling loss, a re-scan shall be carried out.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 28 of 54
			REVISION : 1
			EDITION : 1

Inspection Result

The inspection result should be evaluated and/or reported as follows:


Welds shall be evaluated using both the pulse-echo and TOFD criteria shown below.

This shall be performed in parallel and rejection against either of these criteria shall be cause for rejection of the weld. The exceptions to this are described in the following notes:

1. All indications in the pulse echo channels should be evaluated which exceed the threshold level of 20% FSH.
2. Defect length shall be measured for the pulse-echo channels from the point where the signal exceeds 20% FSH to the point the signal falls below. The largest height assessed with TOFD or the greatest measured amplitude with pulse-echo shall be assumed to apply over the whole defect length.
3. If the indication cannot be resolved by TOFD i.e. the upper and lower flaw diffraction tips cannot be separately distinguished, no measurement can be made to determine the defect height. In this case, the signal from the pulse-echo channels will be solely used to determine that particular area of the scan.
4. Defects shall be assessed for interaction as follows:
 - a) Horizontal interaction
If the distance between two adjacent defects is less than the length of the smaller of the two defects, then the defect shall be treated as a single defect.
 - b) Vertical interaction
Vertical interaction of defects shall be assessed using TOFD. If the distance between the two adjacent defects is less than the height of the shorter of the two defects, then the defect shall be treated as a single defect. Where the individual defects cannot be resolved by TOFD for the vertical interaction, then the defects are assumed to interact and shall be treated as a single defect.
5. The maximum allowable accumulated defect length shall be as per the criteria given in welding specification.

■ ACCEPTANCE CRITERIA

Weld quality shall be judged on the basis of the acceptability criteria mentioned in welding specification.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 29 of 54
			REVISION : 1
			EDITION : 1

17.0 **RADIOGRAPHY**

17.1 **Scope**

This covers the radiographic inspection of all types of welded joints of the main pipeline.

The welded joints shall include the following :-

- i. Full girth welds on the mainline construction including double jointing of pipe, if adopted.
- ii. Welds for installation of block valves, insulating joints and other appurtenances and tie-ins.
- iii. Welds at scraper launching and receiving barrels.
- iv. Terminal Piping

17.2 **Applicable Standards**

This specification shall apply in conjunction with the following (all latest edition):


- i. API 1104, Standard for welding Pipelines and Related Facilities.
- ii. ANSI B31.8, Code for Gas Transmission and Distribution Piping Systems.
- iii. ANSI B31.4, Code for Liquid Petroleum Transportation Piping Systems.
- iv. ASTM E94, Recommended practice for Radiographic Testing.
- v. ASTM E142, Standard Method for Controlling Quality of Radiographic Testing.
- vi. The American Society for Non-destructive Testing. Recommended Practice No. SNT - TC-1A Supplement A.

17.3 **Procedure**

17.3.1 The radiographic examination procedure to be adopted shall be submitted by the CONTRACTOR as per Annexure VI.

17.3.2 The procedure of radiographic examination shall be qualified to the entire satisfaction of COMPANY prior to use. It shall include but not be limited to the following requirements :


- i. Lead foil intensifying screens, at the rear of the film shall be used for all exposures.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 30 of 54
			REVISION : 1
			EDITION : 1

- ii. Type 2 and 3 films as per ASTM E-94 shall be used.
- iii. A densitometer shall be used to determine film density. The transmitted film density shall be 2.0 and 3.5 throughout the weld. The unexposed base density of the film shall not exceed 0.30.
- iv. Radiographic identification system and documentation for radiographic interpretation reports and their recording system.

- 17.3.3 The CONTRACTOR shall qualify each procedure in the presence of the COMPANY prior to use.
- 17.3.4 The procedure of radiographic examination shall produce radiographs of sufficient density, clarity and contrast so that defects in the weld or in the pile adjacent to the weld, and the outline and holes of the penetrameter are clearly discernible.
- 17.3.5 All the girth welds of mainline shall be subjected to 100% radiographic examination. The CONTRACTOR shall furnish all the radiographs to the COMPANY, immediately after processing them, together with the corresponding interpretation reports on approved format. The details of the radiographs all along with the joint identification number shall be duly entered in a register and signed by the CONTRACTOR and submitted to the COMPANY for approval.
- 17.3.6 When the radiation source and the film are both on the outside of the weld and located diametrically opposite each other, the maximum acceptable length of film for each exposure shall not exceed the values given in Table-4 of API 1104. The minimum film overlap, in such cases, shall be 40mm. The ellipse exposure technique may be used on nominal pipe sizes of 2 inch and smaller provided that the source to film distance used is a minimum of 12 inch.
- 17.3.7 Three copies of each acceptable radiographic procedure (as per Annexure-VI) and three copies of radiographic qualification records, shall be supplied to COMPANY. One set of the qualifying radiographs on the job shall be kept by the CONTRACTOR's authorised representative to be used as a standard for the quality of production radiographs during the job. The other two sets shall be retained by COMPANY for its permanent record.
- 17.3.8 Three copies of the exposure charts relating to material thickness, kilo voltage, source of film distance and exposure time shall also be made available to COMPANY by the CONTRACTOR.
- 17.3.9 The CONTRACTOR shall, on a daily basis, record for each radiograph (1) radiograph's number, (2) welder's number (3) approximate chainage of weld location, (4) whether or not the welds meet the specified acceptance standards and (5) the nature and approximate location of unacceptable defects observed. It must be possible to relate back to a particular butt weld and welder on piping drawing and pipe line alignment drawing.

17.3.10 Each day's production of processed radiographs shall be properly packaged separately, identified

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 31 of 54
			REVISION : 1
			EDITION : 1

by at least the (1) date, (2) radiographic unit, (3) job locations, (4) starting and ending progress survey stations and (5) shall include original and three copies of the daily radiographic record. The package shall be submitted to the COMPANY daily when possible, but in no event later than noon of the following day.

17.3.11 The CONTRACTOR shall provide all the necessary facilities at site, such as a dark room with controlled temperature, film viewer etc. to enable the COMPANY to examine the radiographs.

17.3.12 The CONTRACTOR, if found necessary, may modify the procedure of radiographic examination suiting to the local conditions prevailing. This shall, however, be subject to the approval of the COMPANY.

17.3.13 COMPANY shall have free access to all the CONTRACTOR's work facilities in the field.

17.3.14 Any approval granted by the COMPANY shall not relieve the CONTRACTOR of his responsibilities and guarantees.

17.4 **Radiation Source**

17.4.1 Radiographic examination shall be carried out using x-radiations, Radiographic examination by Gamma rays may be allowed, at the discretion of the COMPANY, in case of inaccessible joints. Radiography by Gamma-Ray for tie-in-joints shall be acceptable provided D4 AGFA film or equivalent is used and the required sensitivity obtained.

17.4.2 Whenever possible, pipeline welds will be inspected by placing the radiation source inside the pipe, on the pipeline axis, with a radiation of 6.28 rad. (360°C).


If it is impossible to place the radiation source inside the pipe, the weld will be inspected with the source on the outside. An overlap of at least 40mm at the ends of each film shall be required to ensure that the first and last location increment numbers are common to successive films and to establish that no part of a weld has been omitted.

17.5 **Level of Quality**

The quality level of Radiographic sensitivity required for radiographic inspection shall be at least equivalent to the values in Fig. 6

17.6 **Penetrameters**

The image quality indicator (abbreviation : IQI) shall be used for the qualification of the welding procedure and during normal line production. Radiographic sensitivity shall be measured with the wire image quality indicator (Penetrameter). The penetrameter shall be selected according to DIN54109 or ISO1027. For radiographs made with the source on the outside, a penetrameter shall be placed on each side of the film with the smaller wire of the penetrameter turned towards the end of the film itself. When a complete weld is radiographed in a single exposure using a source inside the piping, four

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 32 of 54
			REVISION : 1
			EDITION : 1

penetrameter approximately equally spaced around the circumference shall be used. During the procedure qualification, IQI shall be placed both on the source side and on the film side. The sensitivity obtained with IQI on the source side shall not be less than the values shown in Fig. 6 of this specification.

The sensitivity limit may be considered to have been reached when the outline of the IQI, its identification number and the wire of the required diameter show up clearly on the radiograph.

The COMPANY may authorise use of types of IQI other than those planned, provided that they conform with recognised standards and only if the CONTRACTOR is able to demonstrate that the minimum sensitivity level required is obtained. For this demonstration, a test shall be carried out comparing the IQI specified and the CONTRACTOR's, to show up the identification number and other details of the proposed IQI, which must be visible in the test radiograph.

17.7 **Film Identification Markers**


All films shall be clearly identified by lead numbers, letters, and/or markers. The image of the markers shall appear on the films, without interfering with the interpretation. These markers positions shall also be marked on the part to be radiographed and shall be maintained during radiography.

17.8 **Protection and care of film**

- 17.8.1 All unexposed films shall be protected and stored properly as per the requirements of API 1104 standard and ASTM E.94.
- 17.8.2 The exposed and unexposed film shall be protected from heat, light, dust and moisture. Sufficient shielding shall be supplied to prevent exposure of film to damaging radiation prior to and following the use of the film for radiographic exposure.

17.9 **Re-radiography**

- 17.9.1 The weld joints shall be re-radiographed in case of unsatisfactory quality of the radiographs, at the expense of the CONTRACTOR.
- 17.9.2 All the repaired weld joints shall be re-radiographed at no extra cost to the COMPANY in the same manner as that followed for the original welds. In addition, the repaired weld areas shall be identified with the original identification number plus the letter R to indicate the repair.
- 17.9.3 When evaluating repair film, radiographers shall compare each section (exposure) of the weld with the original film to assure repair was correctly marked and original defect removed.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 33 of 54
			REVISION : 1
			EDITION : 1

17.9.4 The COMPANY will review prior to any repair of welds, all the radiographs of welds which contain, according to the CONTRACTOR's interpretation, unacceptable defects. The final disposition of all unacceptable welds shall be decided by the COMPANY.

17.10 **Qualification of Radiographers**

17.10.1 Pipeline radiographers shall be qualified in accordance with the requirement of API 1104 and to the full satisfaction of COMPANY.

17.10.2 Certification of all the radiographers, qualified as per 16.10.1 above, shall be furnished by the CONTRACTOR to the COMPANY before a radiographer will be permitted to perform production radiography. The certificate record shall include :

- i. Background and Experience Record
- ii. Training Course Record
- iii. Technical Examination Record
- iv. Doctor's report on radiographer's Oaeruer 0-1 acquity eye test.
- v. Date of qualification

17.10.3 The radiographers shall be required to qualify with each radiographic procedure they use, prior to performing the work assigned to him in accordance with the specification.

17.11 **Preservation of Radiographs**

17.11.1 The radiographs shall be processed to allow storage of films without any discoloration for at least three years. All the radiographs shall be presented in suitable folders for preservation alongwith necessary documentation.

17.11.2 All radiographs shall become property of the COMPANY.


17.12 **Equipment and Accessories**

17.12.1 CONTRACTOR shall make necessary arrangement at his own expense, for providing the radiographic equipment, radiographic film and all the accessories for carrying out the radiographic examination for satisfactory and timely completion of the job.

17.12.2 For carrying out the mainline radiographic examination the CONTRACTOR shall be equipped with suitable mobile/ stationary type dark rooms.

These shall have all the required facilities for film processing. Film viewer used shall be equipped with the film illuminator that has a light source of sufficient intensity and suitably controlled to allow viewing film densities upto 4.0 without damaging the film.

17.13 **Radiation Protection**

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 34 of 54
			REVISION : 1
			EDITION : 1

17.13.1 CONTRACTOR shall be responsible for the protection and personnel monitoring of personnel with or near radiation sources.

17.13.2 The protection and monitoring shall comply with local regulations.

17.13.3 In view of visual hazards in the handling of Radioactive source of material, CONTRACTOR shall be solely responsible for complying with all rules and regulations set forth by Atomic Energy Commission or any other Government agency of India in this regard and COMPANY shall not be responsible and shall be kept indemnified by the CONTRACTOR for default (s) of whatever nature by the CONTRACTOR. Safety equipment as considered adequate by the COMPANY for all necessary personnel shall be made available for use and maintained for immediate and proper use by the CONTRACTOR.

17.14 **Display of Safety Instructions**

17.14.1 The safety provisions shall be brought to the notice of all concerned by display on a notice board at a prominent place at the work spot. The person responsible for the "safety" shall be named by the CONTRACTOR.

17.15 **Enforcement of Safety Regulations**

17.15.1 To ensure effective enforcement of the rules and regulations relating to safety precautions, the arrangement made by CONTRACTOR shall be open to inspection by COMPANY or its representatives.

17.16 **First Aid and Industrial Injuries**


17.16.1 CONTRACTOR shall maintain first aid facilities for its employees and sub-contractors.

17.16.2 CONTRACTOR shall make outside arrangements for ambulance service and for treatment of industrial injuries. Names of those providing these services shall be furnished to COMPANY prior to start of work and their telephone no. shall be posted prominently in CONTRACTOR's field office.

17.16.3 All critical industrial injuries shall be reported promptly to the COMPANY and a copy of CONTRACTOR's report covering each personal injury requiring the attention of physician shall be furnished to the COMPANY.

17.17 **No Exemption**

17.17.1 Notwithstanding the above there is nothing in these to exempt the CONTRACTOR from the operation of any other act or rules in force.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 35 of 54
			REVISION : 1
			EDITION : 1

ANNEXURE-I
Sheet 1 of 3

ELECTRODE QUALIFICATION TEST RECORD

A. **Tested at (Site name)** Date :

Manufacturer's Name :

Brand Name :

Batch Number & Size Tested :

Classification & Code :

Intended for Welding in Position :

In combination with (if any) :

Code of Reference
(used for testing) :

Special requirements (if any) :

B. **All Weld Tensile Test**

Base Material used :

Pre-heat temp. :

Postweld Heat Treatment Details :

Visual Examination :


Radiographic Examination Results :

Tensile Test Results :

Sl.No.	Identification No.	U.T.S.	Yield Point	Elongation
--------	--------------------	--------	-------------	------------

1.

2.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 36 of 54
			REVISION : 1
			EDITION : 1

ANNEXURE-I

Sheet 2 of 3

C. Impact Test Results

Test Temperature : Notch in :

Type of Specimens : Size of Specimens :
(Charpy)

Sl.No.	Specimen No.	Impact Value	Average
1.			
2.			
3.			
4.			
d 5.			
6.			

D. Chemical Analysis Result

Electrode Size used :

Batch No. :

%C	%S	%P	%SI	%Mn	%Cr	%Ni	%Mo	Other
----	----	----	-----	-----	-----	-----	-----	-------

E. Fillet Weld Test Results


Welding Positions :

Base Materials :

Size of Electrode used :

Visual Inspection Results :
1)
2)
3)

Macro Test results :

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 37 of 54
			REVISION : 1
			EDITION : 1

ANNEXURE-I
Sheet 3 of 3

Fracture Test Results :

Remarks :

F. Other Test Results

1. Transverse Tensile Test :

In combination with :

Base Material used :

Position of Welding :

Preheat Temperature :

Post Weld Heat Treatment :

Radiography :


Identification No.	U.T.S.	Fracture in	Remarks
--------------------	--------	-------------	---------

2. Guided Bend Test

<u>Position</u>	<u>ID No.</u>	<u>Root, Face or Side Bend</u>	<u>Remarks</u>
	1.		
	2.		
	3.		
	4.		
	5.		

Any other Tests :

Conclusion :

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 38 of 54
			REVISION : 1
			EDITION : 1

ANNEXURE-II
Sheet 1 of 2

STRESS RELIEF HEAT TREATMENT PROCEDURE SPECIFICATION

Name of the Heat-Treater :

Name of the Project :

Specification Reference No.:

1. **General Details**

Name of the Equipment :

Name of the Assembly/ Part :

Assembly/ Part Drawing No. :

Material :

2. **Furnace Details**

Type of Heating : Gas/ Oil/ Elec. Res./ Induction Type of Heating
(Tick mark)

Capacity (Size) :

Maximum Temp.(°C) :


Method of Temp. :
Measurement

Atmosphere Control :

3. **Heat Treatment Cycle Details**

Changing Temp. °C :

Rate of Heating, °C/ Hr. :

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 39 of 54
			REVISION : 1
			EDITION : 1

ANNEXURE-II
Sheet 2 of 2

Soaking Temp. °C :

Soaking Time, Hrs. :

Rate of Cooling, °C/ Hr. :


Mode of Cooling :

4. Other Details, if any.

Notes :

The following documents shall be furnished alongwith the specifications :

- i. Material Test Certificates
- ii. Assembly/ Part Drawing.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 40 of 54
			REVISION : 1
			EDITION : 1

ANNEXURE-III

Sheet 1 of 3

FORMAT FOR WELDING PROCEDURE SPECIFICATION (WPS)

Company Name _____ By _____
Welding Procedure Specification No. _____ Date _____ Supporting PQR No. (S)
_____ Revision No. _____ Date _____
Welding Process (es) _____ Type (s) _____
(Automatic, Manual, Machines or Semi Auto)

JOINTS

Joint Design _____
Backing (Yes) _____ (No) _____
Backing Material (Type) _____
Sketches Production Drawings. Weld Symbols Written
Description should show the general arrangement of the parts to be welded. Where applicable, the
root spacing and the details of weld groove may be specified.


(At the option of the Manufacturer sketches may be attached to illustrate joint design weld layers
and bead sequence e.g. for notch toughness procedures, for multiple process procedures, etc.)

BASE METALS

P.No. _____ Group No. _____ to P. No. _____ Group No. _____
OR

Specification type and grade _____
to Specification type and grade _____
OR

Chem. Analysis and Mech. Prop. _____
to Chem. Analysis and Mech. Prop. _____
Thickness Range :
Base Metal: Groove _____ Fillet _____
Deposited Weld Metal: Groove _____ Fillet _____
Pipe Dia Range : Groove : _____ Fillet _____
Other _____

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 41 of 54
			REVISION : 1
			EDITION : 1

ANNEXURE-III

Sheet 2 of 3

FILLER METALS

F.No. _____ Other _____
A.No. _____ Other _____
Spec. No. (SFA) _____
A WS No. (Class) _____
Size of filler metals _____

(Electrodes, Cold Wire, Hot Wire etc.)

Electrode-Flux (Class) _____

Flux Trade Name _____

Consumable Inset _____

Each base metal/filler metal combination should be recorded individually.

WPS NO. _____ Rev. _____


POSITIONS : Position (s) of Groove _____ Welding Progression: UP ____ Down ____ Position (s) of Fillet _____	POSTWELD ED HEAT TREATMENT Temperature Range _____ Time Range _____
PREHEAT Preheat Temp. Min. _____ Interpass Temp. Max. _____ Preheat Maintenance _____	GAS Shielding Gas (es) _____ Percent Composition (mixtures) _____ Flow Rate _____ Gas Backing _____ Trailing Shielding Gas Composition _____

ELECTRICAL CHARACTERISTICS

Current AC or DC _____ Polarity _____
Amps (Range) _____ Volts (Range) _____
(Amps and volts range should be recorded for each electrode size, position, and thickness, etc. This information may be listed in a tabular form similar to that shown below).

Tungsten Electrode Size and Type _____
(Pure Tungsten, 2% Ceriated, etc)

Mode of Metal Transfer for GMAW _____
(Spray arc, short circuiting arc, etc.)

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 42 of 54
			REVISION : 1
			EDITION : 1

ANNEXURE-III

Sheet 3 of 3

Electrode Wire feed speed range _____

TECHNIQUE

String or Weave Bead _____

Orifice or Gas Cup Size _____

Initial and Interpass Cleaning (Brushing, Grinding, etc.) _____

Method of Back Gouging _____

Oscillation _____

Contact Tube to Work Distance _____

Multiple or Single Pass (per side) _____


Multiple or Single Electrodes _____

Travel Speed (Range) _____

Peening _____

Other _____

Weld Layer(s)	Process	Filler Metal		Current		Volt Range	Travel Speed Range	Others
		Class	Dia	Type Polarity	Amp. Range			
								e.g. Remarks, comments, Hot wire Addition, Technique Torch Angle, etc.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 43 of 54
			REVISION : 1
			EDITION : 1

ANNEXURE-IV

Sheet 1 of 3

FORMAT FOR PROCEDURE QUALIFICATION RECORD (PQR) RECORD ACTUAL CONDITIONS USED TO WELD TEST COUPON

Company Name _____

Procedure Qualification Record No. _____ Date _____

WPS No. _____

Welding Process (es) _____

Types (Manual, Automatic, Semi-Auto) _____

JOINTS

Groove Design of Test Coupon


(For combination qualification the deposited weld metal thickness shall be recorded for each Filler metal or process weld)

BASE METALS Material Sepc. _____ Type of Grade _____ P.No. _____ to P.No. _____ Thickness of Test Coupon _____ Diameter of Test Coupon _____ Other _____	POSTWELD HEAT TREATMENT Temperature _____ Time _____ Other _____
FILLER METALS Weld Metal Analysis A No. _____ Size of Filler Metal _____ Filler Metal E.No. _____ SF A Specification _____ A WS Classification _____ Other _____	GAS Type of Gas on Gases _____ Composition of Gas Mixture _____ Other _____
POSITION Position of Groove _____ Weld Progression (Uphill, Downhill) _____ Other _____	ELECTRICAL CHARACTERISTICS Current _____ Polarity _____ Amps. _____ Tungsten Electrode Size _____ Other _____

ANNEXURE-IV

Sheet 2 of 3

PREHEAT	TECHNIQUE
----------------	------------------

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 45 of 54
			REVISION : 1
			EDITION : 1


We certified that the statements in this record are correct and test welds were prepared, welded and tested in accordance with the requirements of Section IX of the ASME Code.

Date : _____

Manufacturer : _____

By : _____

(Detail of record of tests are illustrative only and may be moulded to conform to the type and number of tests required by codes and specifications).

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 46 of 54
			REVISION : 1
			EDITION : 1

ANNEXURE-V

Sheet 1 of 2

FORMAT FOR MANUFACTURER'S RECORD FOR WELDER OR WELDING OPERATOR QUALIFICATION TESTS

Welder Name _____ Check No. _____ Stamp. No. _____

Using WPS No. _____ Rev. _____


The above welder is qualified for the following ranges

Variable	Record Actual Values Used in Qualification	Qualification Range
Process	_____	_____
Process Type	_____	_____
Backing (metal, Weld metal, flux, etc)	_____	_____
Material Spec.	_____ to _____	_____ to _____
Thickness		
Groove	_____	_____
Filler	_____	_____
Diameter		
Groove	_____	_____
Filler	_____	_____
Filler Metal		
Spec. No.	_____	_____
Class	_____	_____
F. No.	_____	_____
Position	_____	_____
Weld Progression	_____	_____
Gas Type	_____	_____
Electrical Characteristics		
Current	_____	_____
Polarity	_____	_____

ANNEXURE-V

Sheet 2 of 2

Guided Bend Test Results

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 47 of 54
			REVISION : 1
			EDITION : 1

Type and Fig. No.	Result

Radiographic Test Results
For alternative qualification of groove welds by radiography

Radiographic Results _____

Fillet Weld Test Results

Fracture Test (Describe the location, nature and size of any crack or tearing of the specimen _____

Length and Per Cent of Defects _____ inches _____%

Macro Test – Fusion _____

Appearance - Fillet Size (ing) _____ x _____ Convexity or Concavity _____

Test Conducted by _____ Laboratory - Test No. _____

We certify that the statements in this record are correct and that the test welds were prepared.
Welded and tested in accordance with the requirements of Section IX of the ASME Code.


Date _____

Organization _____

By _____

(Details of record tests are illustrative only and may be modified to conformation to the type & number of tests required by the Code).

Note: Any essential variables in addition to those above shall be recorded.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 48 of 54
			REVISION : 1
			EDITION : 1

ANNEXURE-VI

Sheet 1 of 1


RADIOGRAPHIC PROCEDURE QUALIFICATION RECORD FOR PIPE WELDING

1. Location
2. Date of Testing
3. Name of the Contractor / Agency
4. Material : Carbon steel / Alloy Steel / Stainless Steel
- 4.A Technique: DWSI / SWSI / DWDI
5. Diameter & Thickness:
6. Type of Weld Joint:
7. Radiation Source:
8. Intensifying Screens/Lead Screens:
9. Geometric Relationship:
10. Limit of Film Coverage:
11. Film Type and Make:
12. Exposure Time:
13. Processing:
14. Density:
15. Sensitivity:
- 16.* Type of penetrameter:
(Source side)
- 17.* Type of penetrameter:
(Film side)

Signature of Contractor / Agency with Seal

Approval of B&R's Inspector

- * Ref. Para regarding recommended practice on placement of penetrameters Article 22, SE 142, ASME Sec. V.
- * For "Random Radiography" lines placement of penetrameters as per Article 2, ASME, Sec. V is permitted.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	WELDING OF ONSHORE GAS PIPELINES	DOCUMENT NO. BR/TS/034	Page 49 of 54
			REVISION : 1
			EDITION : 1

ANNEXURE-VII
Sheet 1 of 1

WELDERS IDENTIFICATION CARD

Name :

Identification :

Date of Testing :

Process :

Diameter and Thickness :

Thickness Range Qualified :

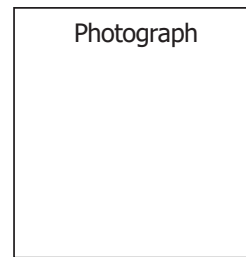
Diameter Range Qualified :

WPS No. :

Welding Position & Progression :

Type of welding consumables used :

Valid Till :



Approved by :

Employer's Signature with seal

WELDING SPECIFICATION CHART

WELDING SPECIFICATION CHART

WELDING SPECIFICATION CHARTS TO SPECIFICATION FOR WELDING OF ONSHORE GAS PIPELINES NO. *BR/TS/034*

12 /10 /8 /6 4 LINE PIPE THK RANGE 6.4 mm				
MATERIAL SPECIFICATIONS	PIPES	API 5L GR X-52/56 PSL 2		
	FITTINGS	-		
	FLANGES	-		
	OTHERS	-		
BASE METAL 'P' NO	1			
WELDING PROCESS	GROOVE JOINTS SINGLE SIDE BEVEL			
	BUTT		OTHER THAN BUTT	
	ROOT PASS & HOT PASS : SMAW	FILLER PASS : SMAW	ROOT PASS : N.A.	FILLER PASS : N.A.
	FILLET JOINTS / SOCKET JOINTS : N.A.			
WELDING MATERIAL	GROOVE JOINTS			
	BUTT		OTHER THAN BUTT	
	ROOT PASS: E6010 HOT PASS: E7010	FILLER & CAP PASS E7010	ROOT PASS : N.A.	FILLER PASS : N.A.
	FILLET JOINTS / SOCKET JOINTS : N.A.			
	BACKING RING N.A.		CONSUMABLE INSERT N.A.	
JOINT PREPARATION	API 1104 Latest Edition			
GASES	PURGING :	SHIELDING :		
GAS COMPOSITION	PURGING :	SHIELDING :		
PREHEATING	PREHEAT TEMP: 100°C MIN	POST HEATING :		
CONTINUITY OF WELDING AND PREHEAT : REFER TO SPECIFICATION				
POST WELD HEAT TREATMENT	HOLDING TEMP :	N.A.	HOLDING TIME :	
	RATE OF HEATING:	N.A.	MIN. HOLDING TIME :	
	METHOD OF COOLING	N.A.	RATE OF COOLING :	
			WIRE SPEED	
MECHANICAL PROPERTY REQUIREMENTS	CHARPY 'V' NOTCH VALUE :		MIN: 22	AVERAGE : 27
	AT TEMPERATURE :		0°C	
	HARDNESS :			
CODE OF FABRICATION :		API 1104 / B 31.8, latest edition		
TECHNICAL NOTES :				
1. All passes shall be carried out by SMAW process. 2. D7 Film shall be used for radiography by X-Ray				

WELDING SPECIFICATION CHARTS TO SPECIFICATION FOR WELDING OF ONSHORE GAS PIPELINES NO. *BR/TS/034*

Terminal Piping PIPING CLASS		A1A, A3A, B1A, D1A, E1A	
MATERIAL SPECIFICATIONS	PIPES	ASTM A106 GR.B, API 5L GR B PSL 2, API 5L GR X-65 PSL 2, API 5L GR X-70 PSL 2, IS-1239 (BLACK) ASSORTED PIPES	
	FITTINGS	ASTM A105, ASTM A234 GR. WPB, ASTM A234 GR. WPB-W, MSS SP-75 GR. WPHY-52, MSS SP-75 GR. WPHY-65	
	FLANGES	ASTM A105, ASTM A694 GR. F-52, ASTM A694 GR. F-70, ASTM A516 GR. 70	
	OTHERS	-	
BASE METAL 'P' NO		1	
WELDING PROCESS	GROOVE JOINTS SINGLE SIDE BEVEL		
	BUTT		OTHER THAN BUTT
	ROOT PASS: GTAW / SMAW	FILLER PASS: GTAW / SMAW	ROOT PASS: GTAW / SMAW FILLER PASS: SMAW / GTAW
	FILLET JOINTS / SOCKET JOINTS : SMAW		
WELDING MATERIAL	GROOVE JOINTS		
	BUTT		OTHER THAN BUTT
	ROOT PASS : ER70S-2 / E6010 HOT PASS : ER70S-2 / E7018-1	FILLER & CAP PASS ER70S-2 / E7018-1	ROOT PASS : ER70S-2 HOT PASS : ER70S-2 / E7018-1 FILLER PASS : ER70S-2 / E7018-1
	FILLET JOINTS / SOCKET JOINTS : E7018-1.		
	BACKING RING N.A.		CONSUMABLE INSERT N.A.
JOINT PREPARATION		ASME SEC. IX, latest edition	
GASES	PURGING :	SHIELDING : Argon	
GAS COMPOSITION	PURGING :	SHIELDING : 99.995	
PREHEATING/ INTERPASS	PREHEAT TEMP: 10⁰C -100⁰C INTERPASS Max 200⁰C		POST HEATING : N.A.
CONTINUITY OF WELDING AND PREHEAT : REFER TO SPECIFICATION			
POST WELD HEAT TREATMENT	HOLDING TEMP :		HOLDING TIME :
	RATE OF HEATING:		MIN. HOLDING TIME :
	METHOD OF COOLING :		RATE OF COOLING :
MECHANICAL PROPERTY REQUIREMENTS	CHARPY 'V' NOTCH VALUE :		MIN: 22 AVERAGE : 27
	AT TEMPERATURE :		0°C
	HARDNESS :		
CODE OF FABRICATION :		ASME SEC. IX / B 31.8/ OISD 226, latest edition	
TECHNICAL NOTES :			

WELDING SPECIFICATION CHARTS TO SPECIFICATION FOR WELDING OF ONSHORE GAS PIPELINES NO. *BR/TS/034*


Terminal Piping PIPING CLASS		A4A, B4A, D4A, E4A	
MATERIAL SPECIFICATIONS	PIPES	ASTM A 333 GR.6 ASSORTED PIPES	
	FITTINGS	ASTM A 350 GR.LF2, ASTM A 420 GR.WPL6, ASTM A 420 GR.WPL6-W	
	FLANGES	ASTM A 350 GR.LF2	
	OTHERS	-	
BASE METAL 'P' NO	1		
WELDING PROCESS	GROOVE JOINTS SINGLE SIDE BEVEL		
	BUTT		OTHER THAN BUTT
	ROOT PASS: GTAW / SMAW	FILLER PASS: GTAW / SMAW	ROOT PASS: GTAW FILLER PASS: SMAW / GTAW
	FILLET JOINTS / SOCKET JOINTS : SMAW		
WELDING MATERIAL	GROOVE JOINTS		
	BUTT		OTHER THAN BUTT
	ROOT PASS : ER70S-2 / E6010 HOT PASS : ER70S-2 / E7018-1	FILLER & CAP PASS ER70S-2 / E7018-1	ROOT PASS : ER70S-2 / E6010 HOT PASS : ER70S-2 / E7018-1 FILLER PASS : ER70S-2 / E7018-1
	FILLET JOINTS / SOCKET JOINTS : E7018-1		
	BACKING RING N.A.		CONSUMABLE INSERT N.A.
JOINT PREPARATION	ASME SEC. IX, latest edition		
GASES	PURGING :	SHIELDING : Argon	
GAS COMPOSITION	PURGING :	SHIELDING : 99.995	
PREHEATING	PREHEAT TEMP: 10°C -100°C INTERPASS Max 200°C		POST HEATING :
CONTINUITY OF WELDING AND PREHEAT : REFER TO SPECIFICATION			
POST WELD HEAT TREATMENT	HOLDING TEMP :		HOLDING TIME :
	RATE OF HEATING:		MIN. HOLDING TIME :
	METHOD OF COOLING :		RATE OF COOLING :
MECHANICAL PROPERTY REQUIREMENTS	CHARPY 'V' NOTCH VALUE :		MIN: 22 AVERAGE : 27
	AT TEMPERATURE :		0°C
	HARDNESS :		
CODE OF FABRICATION :	ASME SEC. IX / B 31.8 / OISD 226, latest edition		
TECHNICAL NOTES :			

SPECIFICATION FOR HYDROSTATIC TESTING OF ONSHORE PIPELINE

SPECIFICATION NO.: BR/TS/035



**(OIL & GAS)
BRIDGE AND ROOF CO. (INDIA) LTD.**


BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	HYDROSTATIC TESTING OF ONSHORE PIPELINE	DOCUMENT NO. BR/TS/035	Page 1 of 1
			REVISION : 0
			EDITION : 1

C O N T E N T S

<u>SL.NO.</u>	<u>DESCRIPTION</u>
----------------------	---------------------------

1.0	SCOPE
2.0	REFERENCE CODES, STANDARDS AND SPECIFICATIONS
3.0	GENERAL
4.0	HYDROSTATIC TEST PROCEDURE MANUAL
5.0	TEST PRESSURE
6.0	EQUIPMENT AND INSTRUMENTATION
7.0	PROCEDURES
8.0	ACCEPTANCE
9.0	TERMINATION
10.0	TEST REPORT
11.0	MEASUREMENTS
12.0	CALCULATION
13.0	PRECAUTIONS DURING THE TEST
14.0	PRESERVATION OF PIPELINE
 TABLE A	 DIFFERENCE BETWEEN WATER THERMAL EXPANSION FACTOR AND STEEL THERMAL EXPANSION FACTOR.
 FIG.1	 WATER COMPRESSIBILITY FACTOR VS PRESSURE AND TEMPERATURE.

PREPARED BY:	CHECKED BY:	APPROVED BY:	ISSUE DATE :
---------------------	--------------------	---------------------	---------------------


BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	HYDROSTATIC TESTING OF ONSHORE PIPELINE	DOCUMENT NO. BR/TS/035	Page 1 of 17
			REVISION : 0
			EDITION : 1

1.0 **SCOPE**

- 1.1 This specification covers the minimum requirements of supply, works and operations to be performed by CONTRACTOR for hydrostatic testing of cross-country steel pipelines transporting hydrocarbons in liquid or gaseous phase under high pressure. This specification does not cover the requirements of drying/precommissioning of the tested pipelines. This specification shall be read in conjunction with the conditions of all specifications and documents included in the CONTRACT between COMPANY and CONTRACTOR.

2.0 **REFERENCE CODES, STANDARDS AND SPECIFICATIONS**

- 2.1 Reference has been made in this specification to the latest edition/ revision of the following codes, standards and specifications.
- | | | |
|----|----------------------|---|
| a) | ANSI B 31.8 | Gas Transmission and Distribution Piping Systems. |
| b) | ANSI B 31.4 | Liquid Petroleum Transportation Piping Systems. |
| c) | API RP 1110 | Pressure Testing of Liquid Petroleum Pipelines. |
| d) | ASME Sec. VIII Div-1 | Boiler & Pressure Vessel Code. |
| e) | OISD 226 | Natural Gas Transmission Pipelines and City Gas Distribution Networks |
- 2.2 In case of conflict between the requirements of this specification and that of the above referred codes, standards, and specifications, the requirements of this specifications shall govern.
- 2.3 For the purpose of this specification the following definitions shall hold:
- the words 'shall' and 'Must' are mandatory;
 - the words 'Should', 'May', and 'Will' are non-mandatory, advisory or recommended.
- ## 3.0 **GENERAL**
- 3.1 Hydrostatic test shall be performed on the entire length of the pipeline. Hydrostatic test shall be performed in accordance with approved Hydrostatic Test Diagrams for each test section. The maximum length of each test section shall not exceed 50 kms.
- 3.2 For pipeline sections which in COMPANY's opinion, once installed would require an inordinate amount of effort for repair in case of a leak, a provisional pre-test shall be conducted. However, after installation, such pretested sections shall be tested again along with the entire pipeline.
- 3.3 Hydrostatic test shall commence only after mechanical and civil works completion, i.e., all welds have been accepted and the pipeline has been laid and backfilled according to the specifications. Hydrostatic test shall include those sections which have been previously tested, viz. Rail/ road crossing, major water crossings including test on banks and in place after installation, and scraper traps at the terminals. CONTRACTOR shall perform all works required for hydrostatic testing after obtaining prior written approval from the COMPANY.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	HYDROSTATIC TESTING OF ONSHORE PIPELINE	DOCUMENT NO. BR/TS/035	Page 2 of 17
			REVISION : 0
			EDITION : 1

- 3.4 The pipeline shall be tested in accordance with the requirements of the latest edition of ANSI B 31.8 or ANSI B 31.4, OISD 226 as applicable, and requirements laid down in this specification.

4.0 **HYDROSTATIC TEST PROCEDURE MANUAL**

CONTRACTOR shall prepare for COMPANY's approval a hydrostatic test procedure manual. The procedure shall strictly comply with the requirements of this specification and shall be submitted to COMPANY for approval well in advance. The procedure manual shall include all temporary materials & equipment, but not be limited to the following items:

- For the systems to be tested, a diagram indicating all fittings, vents, valves, temporary connections, relevant elevations and ratings. The diagram shall also indicate injection locations and intake and discharge lines.
- Estimated amount of test water, water sources, including required concentration of corrosion inhibitors and additives, procedure for inhibitor injection and control of concentration.
- Filling and flushing procedures, including a complete description of all proposed equipment and instruments (including spares), their location and set-up.
- The type and sequence of pigs and the pig tracking systems for cleaning and removal of air pockets. Pig inspection procedures, including procedure to be followed in case the calliper pig indicates damage.
- Procedures for levelling and stabilization after filling and for pressurization and to allow for temperature stabilization.
- Pressure testing procedure including a complete description of all proposed equipment and instruments (including spares), their location and set-up, and proposed system for observation and recording of data during the pressure test.
- Procedure for detection and location of leaks.
- Procedure for dewatering the pipeline section(s) after testing, including a complete description of all proposed equipment and instruments, their location and set-up, the type and sequence of pigs and the pig tracking system along with the pig specifications.
- Forms for recording the test data.

5.0 **TEST DURATION AND PRESSURE**

- 5.1 The duration of hydrostatic test shall be a minimum of 24 hours after stabilization and the test pressure shall be as indicated in the approved hydrostatic test diagram.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	HYDROSTATIC TESTING OF ONSHORE PIPELINE	DOCUMENT NO. BR/TS/035	Page 3 of 17
			REVISION : 0
			EDITION : 1

5.2 Unless specified otherwise in the CONTRACT, the hydrostatic test pressure shall be as follows :

For pipeline handling hydrocarbon in gaseous phase :

- a) 1.25 times the design pressure for pipeline located in Class-1 and Class-2 locations as per ASME B 31.8.
- b) 1.4 times the design pressure for pipeline located in Class-3 and Class-4 locations as per ASME B 31.8.

6.0 EQUIPMENT AND INSTRUMENTATION

The CONTRACTOR shall furnish all necessary equipment for performing the work as stated in cleaning, flushing, filling, levelling, stabilizing, testing and dewatering procedures. This shall include the following :

- a) Pigs for filling , cleaning and gauging including
 - Cleaning pigs with spring loaded steel wire brushes except for internal coated pipes. In this case pigs to be provided with nylon / polyurethane brushes.
 - Four cup batching pigs
 - Calliper pigs with gauge plate diameter equal to 95% of the heavy wall pipe in the pipe sections. Gauging pig fitted with gauge plate.

The CONTRACTOR shall provide sufficient number of pigs including spares.


- b) Fill pumps : The CONTRACTOR shall determine the type and number of fill pumps in order to guarantee the following :

Differential head 20% greater than the maximum required.

Flow rate : 400m³ / hr. min. ; 1000m³ / hr. max.

If a single pump is used, a standby unit must be available.

- c) Variable speed positive displacement pumps equipped with a stroke counter to pressurise the line with a known stroke and capable of exceeding the maximum test pressure by at least 20 bar.
- d) Two positive displacement meters to measure the volume of water used for filling the line. These meters shall be provided with a calibration certificate not older than one month.
- e) Portable tanks of sufficient size to provide a continuous supply of water to the pump during pressurizing.
- f) Bourdon pressure gauges of suitable pressure range and accuracy.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	HYDROSTATIC TESTING OF ONSHORE PIPELINE	DOCUMENT NO. BR/TS/035	Page 4 of 17
			REVISION : 0
			EDITION : 1


- g) Dead weight testers with an accuracy of 0.01 bar measuring in increments of 0.05 bar provided with a calibration certificate not older than one month.
- h) Two 48 hours recording pressure gauges tested with charts and ink gauges tested with dead weight tester prior to use. These shall be installed at the test heads.
- i) Pressure recording charts.
- j) Two temperature recorders for fill water.
- k) Thermocouples for measuring the pipe wall temperature.
- l) Two laboratory thermometers 0°C to 60°C range, accuracy ± 0.1 degree to be used in thermowells.
- m) Means to measure the volume of water necessary to drop the line pressure by 0.5 bar (container on scales or graduated cylinder).
- n) Injection facilities to inject additives into the test medium in the required proportions.
- o) Communication equipment suitable for a continuous connection between the beginning and the end of the test section and with the inspection team along the line, in accordance with the requirements of local Authorities.
- p) The temporary scraper traps shall be installed according to the testing sections fixed in the test procedure manual. Proper piping and valving arrangements shall be available to allow launching and receiving of each pig independently.

The test heads shall be sized in conformity with ASME specification Section VIII, Division 2 with particular reference to Appendices 4 and 5.

- q) Thermocouples for assuring the temperature of the pipe wall shall be installed on the pipeline to be tested:
 - 1 thermocouple at about 500m distance from the pumping head.
 - 1 thermocouple every 2500m of the pipe the spacing may be increased to maximum 5000m depending on the terrain and nature of sub-soil along the alignment of section.
 - 1 thermocouple at about 500m distance from the terminal head.

The spacing may be increased to maximum 5000 metre depending on the terrain and nature of sub soil along the alignment of test section.

Thermocouples shall be attached on the external surface of the pipe after removal of external coating and shall be adequately protected and COMPANY's coating instructions shall be followed.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	HYDROSTATIC TESTING OF ONSHORE PIPELINE	DOCUMENT NO. BR/TS/035	Page 5 of 17
			REVISION : 0
			EDITION : 1

7.0 **PROCEDURES**


- 7.1 Equipment and/or parts which need not or must not be subjected to the test pressures, must be disconnected or separated from the pipeline to be tested.
- 7.2 If the difference of minimum and maximum atmosphere temperature should cause thermal instability on the pipe section directly exposed to atmospheric condition, the scraper traps and above ground pipeline shall be properly protected.

The pipeline test shall exclude long segments of line exposed to atmospheric conditions, viz. Aerial lengths on piers, suspension bridges, etc., which shall be tested separately.

- 7.3 The test medium shall be soft non-aggressive water furnished by the CONTRACTOR. The water to be used shall be filtered, shall not be contaminated, and free from sand or silt. CONTRACTOR shall submit laboratory test reports of water used for testing. The possible use of sea water shall be subject to its degree of cleanliness, the possibility of obtaining a pre determined salinity neutralization and the use of corrosion inhibitors, this at the sole discretion of COMPANY. CONTRACTOR shall provide COMPANY approved corrosion inhibitors, oxygen scavengers and bactericides to be added to the test water. The CONTRACTOR shall furnish and install all temporary piping which may be necessary to connect from source of water to its pumps and manifolds/ tankage.
- 7.4 Before filling operation the CONTRACTOR shall clean the pipeline by air driven pigs provided with spring loaded bushes and chisels to remove all mill scale rust/ sand from the inside of pipe section. For this purpose temporary headers for air cleaning shall be attached to the pipeline. The number of pig runs is depending upon the cleaning results and shall be determined by the COMPANY at site.
- 7.5 "After cleaning the pipeline by using air and acceptance by Company, gauging shall be carried out by using gauging pig. The gauge plate diameter shall be equal to 95% of inside diameter of the heaviest wall pipe in the test section. While computing the ID of heaviest wall pipe, pipe manufacturing tolerance shall not be considered. A 10mm thick aluminium plate shall be used for making gauge plate.

After receipt of gauging pig at the other end, the gauge plate shall be inspected in the presence of Company representative. A deformed, bent or severally nicked plate or damaged pig shall be evidence of gauging pig run failure and the same is not acceptable to company. In such cases the Contractor shall repair and rectify the line and repeat the gauging pig run to the satisfaction and approval of the Company Representative. Any obstruction and/ or faults such as dents, buckles, flat spots, etc. analysed and noted during gauging pig run shall be located and any necessary repair work shall be performed to rectify the same to the satisfaction of the Company. A written approval shall be obtained from Company regarding successful completion of gauging pig run.

After acceptance of gauging operation, air header shall be cut and removed. Pre-tested test headers loaded with three numbers of four cup batching pig shall be welded to test Section. Un-inhibited water equal to 10% of the volume of test section shall be introduced in front of the first pig. The first pig shall be launched by introducing about 1.5 km un-inhibited water.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	HYDROSTATIC TESTING OF ONSHORE PIPELINE	DOCUMENT NO. BR/TS/035	Page 6 of 17
			REVISION : 0
			EDITION : 1

Then the second pig shall be launched by pumping the inhibited water till the second pig is received at the other end. The thermal stabilisation and pressurisation can now be started".

7.6 Thermal Stabilization

After a check has been made to confirm if the pressure has attained at least 1 bar (g) on the highest section, thermal stabilization can be started.

Thermal equilibrium between the pipeline and environment shall be checked through the thermocouples installed on the pipeline.

Temperature readings shall be made at 2 hours-intervals. Thermal stabilization shall be considered to have been achieved when a difference not higher than 1°C is attained between the average values of the last two readings. Thermal stabilization completion shall be approved by COMPANY.

7.7 Pressurisation

Pressurisation shall be performed in the presence of COMPANY at moderate and constant rate not exceeding 2 bars/min. One pressure recording gauge shall be installed in parallel with the dead weight tester. Volume required to reach the test pressure shall be recorded periodically throughout the pressurization as follows:


- each 5 bar increments up to 80% of test pressure as recorded by the dead weight tester;
- each 2 bar increment between 80% to 90% of test pressure as recorded by the dead weight tester;
- each 0.5 bar increment between 90% of test pressure to full test pressure as recorded by the dead weight tester.

The pressurizing shall be cycled according to the following sequence:

- a) Pressurize to 50% of test pressure, hold pressure for 1 hour.
- b) Drop pressure to static head of test section at test head.
- c) Pressurize to 75% of test pressure, hold pressure for 1 hour.
- d) Drop pressure to static head of test section at the test head.
- e) Pressurize to test pressure.

During the pressurization to each test pressure, two tests shall be carried out for the calculation of air volume in the pipeline under test.

In case, during the hold pressure periods indicated above, a decrease in pressure is observed, the operations shall not be repeated more than twice, after which the line shall not be considered capable of test, until the CONTRACTOR has isolated and eliminated the cause for the lack of water tightness.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	HYDROSTATIC TESTING OF ONSHORE PIPELINE	DOCUMENT NO. BR/TS/035	Page 7 of 17
			REVISION : 0
			EDITION : 1

7.8 Air Volume Calculation

In order to check the presence of air in the pipeline, two separate consecutive pressure lowering of 0.5 bar shall be carried out.

For calculation of air in the pipeline the second pressure lowering shall be used, and the relevant drained water shall be accurately measured (V_1). This amount measured shall be compared to the theoretical amount (V_p) corresponding to the pressure lowering that has been carried out, by using the procedure outlined in clause 12.1 of this specification.

If no air is present in the length under test:

$$\frac{V_1}{V_p} = 1$$

In order that the above ratio is acceptable, it shall not differ from 1 by more than 6% (i.e. 1.06).

If the air found in the pipeline is within the above established tolerance, then the pressurizing can continue. If the ratio V_1 / V_p exceeds 1.06, the hydrostatic testing cannot go on and additional pig passages shall be performed to remove the air pockets.

The test shall be repeated as per the above procedure until above estimated tolerances are satisfied. The pressurizing can then continue, to reach the value of test pressure.

7.9 Testing


After the section has been pressurized and the air volume test has given acceptable results the test pressure shall be held for a minimum of 24 hours after stabilization. After temperature and pressure has stabilized, the injection pump shall be disconnected and all connections at the test heads shall be checked for leakage. The pressure recorders shall then be started with the charts in a real time orientation for continuous recording throughout the test.

During the testing period the following measurements shall be recorded :

- every one hour pressure measurements from dead weight testers.
- every two hours the ambient temperature and the pipe temperature at the thermocouples.

All data shall be recorded on appropriate forms attached to the hydrostatic test procedure manual. Care shall be taken that the maximum test pressures are not exceeded.

Bleed-off water shall be accurately measured and recorded.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	HYDROSTATIC TESTING OF ONSHORE PIPELINE	DOCUMENT NO. BR/TS/035	Page 8 of 17
			REVISION : 0
			EDITION : 1

8.0 **ACCEPTANCE**

- 8.1 The hydrostatic test shall be considered as passed if pressure has kept a constant value throughout the test duration, except for change due to temperature effects. Such change shall be evaluated as described under clause 12.2 of this specification.

The pressure change value as a function of temperature change shall be algebraically added to the pressure value as read on the meters. The pressure value thus adjusted shall be compared with the initial value and the test shall be considered as acceptable if the difference is less than or equal to 0.3 bar. In case of doubt the testing period shall be extended by 24 hours.


- 8.2 If test section fails to maintain the specified test pressure after isolation, CONTRACTOR shall determine by search the location of leakage or failure. All leaks and failures within the pipe wall or weld seam shall be repaired by replacement of entire joint or joints in which leakage or failure occurs. In circumferential welds the method of repair shall be determined by the COMPANY. CONTRACTOR shall comply with instructions of the COMPANY whether to replace a section of the line pipe that includes the line leak or whether to repair the circumferential weld. This repair should however meet the requirements of 'Specification for Welding Pipelines and Related Facilities'. Where failure occurs in pipeline field bends, bends shall be replaced with same degree of bends. After completion of repairs, the hydrostatic test shall be repeated in full, as per this specification.
- 8.3 The cost of repairs or replacements, followed by refilling and repressurizing the line, due to poor workmanship, shall be borne by the CONTRACTOR. In the event of leaks or failures resulting from faulty COMPANY furnished materials, CONTRACTOR shall be reimbursed for furnishing all labour, equipment, materials, except those materials furnished by the COMPANY, and transportation necessary to repair and repressurize the section of the pipeline to the pressure at the time of recognition of leak or line failure. CONTRACTOR shall be entitled for compensation as per the provisions of the CONTRACT. All work of re-installing line pipe, to replace pipe failures shall be done in accordance with the relevant specification included in the CONTRACT.
- 8.4 CONTRACTOR shall haul and stockpile all damaged and defective pipes to storage locations designated by the COMPANY. All cracks and splice resulting from failures shall be coated with an application of grease to preserve the characteristics of failures from corrosion. Joint of failed pipes shall be marked with paint, with a tag indicating failure details, date and location of failure and pressure at which failure occurred.

9.0 **TERMINATION**

After the positive results of testing and collection of all data the test shall be terminated upon written approval given by the COMPANY.

- 9.1 CONTRACTOR shall dewater the tested line as per the following requirement after test acceptance.

The dewatering shall be carried out by using four cup pigs and foam pigs driven by compressed air. The detailed dewatering procedure shall be developed by the CONTRACTOR

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	HYDROSTATIC TESTING OF ONSHORE PIPELINE	DOCUMENT NO. BR/TS/035	Page 9 of 17
			REVISION : 0
			EDITION : 1


in such a way as to provide adequate control of pigs during dewatering. Pigs and equipment required for dewatering the line shall be furnished by CONTRACTOR and shall be approved in advance by the COMPANY. Four cup pigs shall first be passed through the line to displace the water. Foam pigs shall then be passed in order to complete the line dewatering. CONTRACTOR shall use a number of foam pigs, each in different colors/ numbered for this purpose. The line shall be considered dewatered when a negligible amount of water is flushed out by the last foam pig and approval is given by the COMPANY.

- 9.2 During dewatering, care shall be taken to properly dispose the discharging water in order to avoid pollution, damages to fields under cultivation and/or existing structures and interference with the traffic. Before start of dewatering and disposal of hydrotest water, a procedure for treatment of inhibited water to prevent pollution shall be submitted by contractor to owner/ consultant for review and approval.
- 9.3 Upon completion of the testing and dewatering operation, any provisional traps for pigs and all other temporary installation relating to the test shall be removed. Subsequently the individual sections of the line already tested shall be joined in accordance with the requirements of relevant specifications issued for the purpose.

10.0 **TEST REPORT**

A complete report signed by CONTRACTOR and the COMPANY shall be submitted upon completion of the hydrostatic test for each test section.
This report shall contain as a minimum:

- the cleaning, flushing, filling and testing procedures used;
- schematic layout of cleaning, filling and testing facilities;
- instruments calibration certificates;
- a profile of the pipeline that shows the test sites, all instrument and injection connections;
- pipe filling logs and records;
- additive specification, required concentration and additive injection records;
- pig specifications;
- pig inspection records including photographs of the damages;
- records of gauging pig survey and photographs;
- pressurization and stabilization records;
- pressure and temperature recording charts with appropriate information inscribed thereon;

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	HYDROSTATIC TESTING OF ONSHORE PIPELINE	DOCUMENT NO. BR/TS/035	Page 10 of 17
			REVISION : 0
			EDITION : 1

- temperature data along the pipeline;
- dead weight tester logs and recording;
- air volume calculations;
- pressure change due to temperature change calculations;
- environmental data;
- depressurization logs and records;
- dewatering procedure and schematic layout of relevant facilities;
- dewatering logs and records;
- records and photograph of all leaks.

11.0 **MEASUREMENTS**

11.1 **Water Amount Measurement**

The water volume added to the section to be tested shall be measured during the filling stage through a positive displacement meter (a turbine meter may also be used). In the calculation, as per clause 12.1 of this specification, use shall be made of the geometrical volume of the section in question.


11.2 **Pressure Measurement**

Pressure shall be measured with a dead weight tester with an accuracy of 0.01 bar that shall permit readings of at least 0.05 bar.

During the test the pressure shall be recorded by means of a pressure recorder featuring the following specifications:

- | | | |
|-----------|---|--|
| Accuracy | : | $\pm 0.1\%$ of the full-scale value |
| Recording | : | continuous on tape or disk, graph width 100mm |
| Feed | : | 20mm/h for tape diagrams, 7.5°/h for disk diagrams |
| Recording | : | to be such as to record pressure between 50% and 90% of the diagram width. |

The pressure recorder shall be checked by means of dead weight tester at the beginning, during and at the end of the hydrostatic test.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	HYDROSTATIC TESTING OF ONSHORE PIPELINE	DOCUMENT NO. BR/TS/035	Page 11 of 17
			REVISION : 0
			EDITION : 1

A pressure gauge tested with dead weight tester shall be connected in parallel to the dead weight tester at the test head.

11.3 Temperature Measurements

Water temperature shall be taken at every 2 hours through the thermocouple that have been installed on the pipe wall along the section under test on the pipe wall.

Further the temperature measurement shall be taken :

- during the filling operation
- during the thermal stabilization stage
- during the hydrostatic test

The thermocouple's sensitivity shall enable temperature readings with an accuracy of $\pm 0.2^\circ\text{C}$.

- b) Water temperature shall also be measured on the pump delivery by means of a recording thermometer (temperature recorder) throughout the filling stage.

The recording thermometer shall have the following features :

Accuracy $\pm 1\%$ of the scale range

Scale - 10° to $+ 40^\circ\text{C}$

Recording: Continuous on tape or disk, diagram within 100mm

Feed : 20mm/h for tape diagrams, 7.5°/h for disk diagrams.

- c) Ground temperature shall be taken by measuring pipe temperature at the thermocouple prior to starting the filling operation.

- d) Environmental temperature shall be recorded from the beginning of pressurization to the end of the test by means of a recording thermometer featuring the following characteristics:

Accuracy $\pm 1\%$ of the scale range


Scale - 0° to $+ 60^\circ\text{C}$

Recording: Continuous on tape or disk, diagram width 100mm

Feed : 20mm/h for tape diagrams, 7.5°/h for disk diagrams.

12.0 **CALCULATIONS**

- 12.1 The theoretical water amount that is necessary for filling the section to be tested shall be obtained from the geometrical volume of the section considering the pipe tolerances.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	HYDROSTATIC TESTING OF ONSHORE PIPELINE	DOCUMENT NO. BR/TS/035	Page 12 of 17
			REVISION : 0
			EDITION : 1

The theoretical water amount that is necessary for pressurizing the section shall be calculated by means of the following formula:

$$V_p = (0.884 r_i/t + A) \times 10^{-6} \times V_t \times \Delta P \times K$$

Where:

V_p = computed water amount required to raise by P the pressure in the section to be tested (m^3).

V_t = geometrical volume of the section (m^3)

ΔP = Pressure rise (bar)

r_i = nominal inner radius of the pipe (mm)

t = nominal pipe thickness (mm)

A = isothermal compressibility value for water at the pressurization temperature in the P range (bar^{-1}) $\times 10^6$.

(Refer water compressibility factor vs pressure and temperature chart). For temperature above 30°C the values may be extrapolated.

K = a dimensionless coefficient that is equal to a value of 1.02 for longitudinally welded pipe.

12.2 The pressure change due to a water temperature change shall be calculated by the following formula:

$$\Delta P = \frac{B}{0.884 r_i/t + A} \Delta T$$

Where,


ΔP = pressure change resulting from a temperature change (bar)

ΔT algebraical difference between water temperature at the beginning of the test and water temperature as measured at the end of the test ($^{\circ}C$).

B = value of the difference between the thermal expansion of water at the pressure and temperature as measured at the end of the test and that of steel ($^{\circ}C^{-1}$) $\times 10^6$

(Refer table – A)

A = Isothermal compressibility value of water as estimated at the pressure and temperature values obtained at the end of test (bar^{-1}) $\times 10^6$ (Refer Figure 1)

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	HYDROSTATIC TESTING OF ONSHORE PIPELINE	DOCUMENT NO. BR/TS/035	Page 13 of 17
			REVISION : 0
			EDITION : 1

r_i = nominal inner radius of the pipe (mm).

t = nominal thickness of pipe (mm).

13.0 **PRECAUTIONS DURING THE TEST**

In addition to all that has been expressly described in the procedures for carrying out the tests, the following additional requirements shall be complied with:

- 13.1 Provision shall be made for the installation of no-admittance signs to unauthorized personnel from the roads to the R.O.W.
- 13.2 Signs stating "PIPE UNDER TEST-KEEP OFF" with local language translation shall be placed where the pipeline is uncovered, and particularly where the provisional traps and stations are located. Such areas shall be suitably fenced in such a way as to prevent access of unauthorized personnel. No unauthorized personnel shall be closer than 40 m to the pipeline or equipment under test.
- 13.3 Provisional scraper traps shall be installed in compliance with methods and suitable locations so that their rupture cannot cause any injuries to the personnel or third parties.
- 13.4 The test station shall be placed in such a location as to prevent it from being affected by a catastrophic failure in the test head.
- 13.5 Once dewatering is over, the sectionalizing valves and other valve assemblies tested previously, shall be installed at locations shown in the drawings and in accordance with the procedures contained in the relevant specifications. All thermocouple installed in the pipeline shall be removed and damaged corrosion coating shall be repaired using COMPANY approved materials and procedure.

14.0 **PRESERVATION OF PIPELINE**

When so stated in the CONTRACT, to preserve/conservate the pipeline for a specified duration, CONTRACTOR shall completely fill the pipeline with water, with sufficient quantity of corrosion inhibitors depending upon quality of water and the period of conservation, at a pressure to be agreed upon with the COMPANY at a later stage. CONTRACTOR shall obtain necessary approval from the COMPANY of the procedure and the type and quantity of the inhibitors used before commencement of the works.


BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	HYDROSTATIC TESTING OF ONSHORE PIPELINE	DOCUMENT NO. BR/TS/035	Page 14 of 17
			REVISION : 0
			EDITION : 1

TABLE - A

⁰ C Bar	1	2	3 4		5	6 7		8
0.981	-98.62	-79.89	-61.81	-44.34	-27.47	-11.14	+4.66	+19.98
10	-95.55	-76.94	-58.99	-41.65	-24.89	-8.67	+7.02	+22.23
20	-92.15	-73.68	-55.86	-38.64	-22.01	-5.92	+9.65	+24.74
30	-88.74	-70.40	-52.72	-35.63	-19.14	-3.16	+12.29	+27.26
40	-85.32	-67.12	-49.58	-32.62	-16.24	-0.41	+14.93	+29.78
50	-81.90	-63.84	-46.43	-29.60	-13.36	+2.36	+17.57	+32.31
60	-78.47	-60.55	-42.27	-26.58	-10.46	+5.15	+22.89	+34.85
70	-75.03	-57.25	-40.10	-23.54	-7.56	+7.92	+22.89	+37.39
80	-71.60	-53.96	-36.94	-20.51	-4.65	+10.70	+25.55	+39.94
90	-68.16	-50.66	-33.77	-17.47	-1.73	+13.50	+28.23	+42.50
100	-64.72	-47.35	-30.60	-14.43	+1.18	+16.29	+30.90	+45.05
110	-61.28	-44.05	-27.43	-11.38	+4.10	+19.08	+33.58	+47.61
120	-57.84	-40.74	-24.26	-8.34	+7.02	+21.88	+36.26	+50.18
130	-54.40	-37.44	-21.08	-5.29	+9.95	+24.68	+38.94	+52.75
140	-50.96	-34.13	-17.90	-2.25	+12.87	+27.49	+41.63	+55.32
150	-47.53	-30.83	-14.73	+0.80	+15.79	+30.29	+44.31	+57.89
160	-44.10	-27.53	-11.56	+3.85	+18.72	+33.10	+47.00	+60.46
170	-40.67	-24.23	-8.40	+6.89	+21.64	+35.90	+49.69	+63.04
180	-37.24	-20.94	-5.23	+9.94	+24.56	+38.70	+52.37	+65.62
190	-33.83	-17.65	-2.06	+12.98	+27.48	+41.51	+55.06	+68.19
200	-30.42	-14.37	+1.09	+16.01	+30.40	+44.30	+57.75	+70.77
210	-27.02	-11.09	+4.25	+19.04	+33.31	+47.10	+60.43	+73.34
220	-23.63	-7.82	+7.40	+22.06	+36.22	+49.90	+63.12	+75.90
230	-20.24	-4.56	+10.54	+25.08	+39.13	+52.69	+65.80	+78.48
240	-16.87	-1.30	+13.67	+28.10	+42.03	+55.48	+68.48	+81.05
250	-13.50	+1.94	+16.79	+31.11	+44.92	+58.26	+71.15	+83.61
260	-10.14	+5.17	+19.90	+34.12	+47.81	+61.04	+73.81	+86.81
270	-6.80	+8.39	+23.00	+37.11	+50.69	+63.80	+76.48	+88.73
280	-3.48	+11.60	+26.11	+40.09	+53.56	+66.57	+79.14	+91.29
290	-0.17	+14.80	+29.19	+43.07	+56.43	+69.33	+81.78	+93.83
300	+3.13	+17.98	+32.27	+46.03	+59.29	+72.06	+84.83	+96.38

DIFFERENCE BETWEEN THE WATER THERMAL EXPANSION FACTOR AND THE STEEL THERMAL EXPANSION FACTOR ($^{\circ}\text{C}^{-1}$) (10^{-6})


BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	HYDROSTATIC TESTING OF ONSHORE PIPELINE	DOCUMENT NO. BR/TS/035	Page 15 of 17
			REVISION : 0
			EDITION : 1

TABLE - A

⁰ C Bar	9	10	11	12	13	14	15
0.981	+34.82	+49.22	+63.20	+76.78	+89.99	+102.83	+115.34
10	+36.97	+51.26	+65.15	+78.64	+91.75	+104.51	+116.93
20	+39.36	+53.55	+67.33	+80.71	+93.72	+106.39	+118.71
30	+41.76	+55.84	+69.51	+82.79	+95.70	+108.26	+120.49
40	+44.18	+58.14	+71.70	+84.87	+97.68	+110.14	+122.28
50	+46.60	+60.45	+73.90	+86.96	+99.68	+112.04	+124.07
60	+49.02	+62.76	+76.10	+89.07	+102.67	+113.93	+125.88
70	+51.44	+65.08	+78.32	+91.17	+103.68	+115.84	+127.69
80	+53.88	+67.40	+80.53	+93.29	+105.69	+117.76	+129.50
90	+56.32	+69.73	+82.75	+95.41	+107.70	+119.67	+131.32
100	+58.77	+72.07	+84.98	+97.53	+109.73	+121.59	+133.15
110	+61.21	+74.41	+87.22	+99.66	+111.75	+123.52	+134.98
120	+63.67	+76.74	+89.45	+101.79	+113.79	+125.46	+136.82
130	+66.12	+79.09	+91.69	+103.93	+115.83	+127.39	+138.67
140	+68.58	+81.45	+93.93	+106.07	+117.67	+129.34	+140.51
150	+71.05	+83.80	+96.18	+108.21	+119.90	+131.20	+142.37
160	+73.51	+86.15	+108.43	+110.36	+121.96	+133.74	+144.22
170	+75.97	+88.51	+100.68	+112.51	+124.01	+135.19	+146.08
180	+78.44	+90.87	+102.94	+114.66	+126.06	+137.15	+147.94
190	+80.91	+93.23	+105.19	+116.82	+128.12	+139.11	+149.81
200	+83.37	+95.59	+107.45	+118.97	+130.17	+141.07	+151.68
210	+85.84	+97.95	+109.71	+121.13	+132.24	+143.03	+153.55
220	+88.30	+100.31	+111.97	+123.29	+134.29	+144.99	+155.42
230	+90.67	+102.67	+114.23	+125.45	+136.36	+146.96	+157.30
240	+93.22	+105.03	+116.48	+127.60	+138.42	+148.93	+159.18
250	+95.69	+107.39	+118.74	+129.76	+140.48	+150.90	+161.05
260	+98.14	+109.74	+121.00	+131.92	+142.54	+152.87	+162.93
270	+100.60	+112.10	+123.25	+134.08	+144.61	+154.84	+164.81
280	+103.05	+114.44	+125.50	+136.24	+146.67	+156.84	+166.69
290	+105.50	+116.79	+127.75	+138.39	+148.73	+158.78	+168.57
300	+107.94	+119.13	+130.00	+140.54	+150.79	+160.75	+170.45

DIFFERENCE BETWEEN THE THERMAL EXPANSION FACTOR THE STEEL THERMAL EXPANSION
FACTOR (⁰ C ⁻¹) (10⁻⁶)


BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	HYDROSTATIC TESTING OF ONSHORE PIPELINE	DOCUMENT NO. BR/TS/035	Page 16 of 17
			REVISION : 0
			EDITION : 1

TABLE - A

⁰ C Bar	16	17	18 19		20	21 22		23
0.981	+127.52	+139.41	+151.00	+162.31	+173.37	+184.18	+194.75	+205.08
10	+129.02	+140.83	+152.36	+163.58	+174.56	+185.30	+195.79	+206.07
20	+130.71	+142.42	+153.85	+165.00	+175.90	+186.55	+196.96	+207.16
30	+132.40	+144.02	+155.35	+166.42	+177.23	+187.80	+198.14	+208.26
40	+134.10	+145.62	+156.87	+167.85	+178.58	+189.07	+199.33	+209.37
50	+135.80	+147.24	+158.39	+169.85	+179.93	+190.34	+200.52	+210.49
60	+137.51	+148.86	+159.92	+170.73	+181.29	+191.62	+201.72	+211.61
70	+139.22	+150.49	+161.46	+172.18	+182.66	+192.91	+202.93	+212.74
80	+140.95	+152.11	+163.00	+173.64	+184.03	+194.20	+204.14	+213.88
90	+142.67	+153.75	+164.56	+175.10	+185.41	+195.50	+205.36	+215.03
100	+144.42	+155.40	+166.11	+176.58	+186.80	+196.80	+206.59	+216.17
110	146.15	+157.04	+167.66	+178.05	+188.20	+198.12	+207.82	+217.33
120	+147.90	+158.70	+169.24	+179.54	+189.59	+199.44	+209.06	+218.49
130	+149.65	+160.36	+170.81	+181.02	+191.00	+200.75	+210.31	+219.66
140	+151.40	+162.03	+172.39	+182.51	+192.41	+202.09	+211.56	+220.84
150	+153.16	+163.70	+173.98	+184.00	+193.82	+203.42	+212.81	+222.02
160	+154.93	+165.37	+175.56	+185.51	+195.24	+204.76	+214.08	+223.20
170	+156.69	+167.05	+177.15	+187.02	+196.66	+206.10	+215.34	+224.39
180	+158.47	+168.73	+178.75	+188.53	+198.09	+207.45	+216.61	+225.55
190	+160.24	+170.42	+180.35	+190.05	+199.52	+208.80	+217.89	+226.79
200	+162.01	+172.10	+181.95	+191.57	+200.97	+210.16	+219.17	+227.99
210	+163.80	+173.80	+183.55	+193.09	+202.40	+211.53	+220.46	+229.20
220	+165.58	+175.43	+185.16	+194.62	+203.85	+212.89	+221.74	+230.41
230	+167.36	+177.19	+186.78	+196.14	+205.30	+214.26	+223.04	+231.63
240	+169.16	+178.89	+188.39	+197.68	+206.75	+215.63	+224.33	+232.85
250	+170.94	+180.59	+190.01	+199.21	+208.20	+217.00	+225.63	+234.08
260	+172.73	+182.30	+191.63	+200.75	+209.66	+218.40	+226.93	+235.31
270	+174.53	+184.00	+193.25	+202.29	+211.12	+219.77	+228.24	+236.54
280	+176.32	+185.70	+194.88	+203.83	+212.59	+221.16	+229.55	+237.77
290	+178.11	+187.42	+196.50	+205.37	+214.05	+222.54	+230.86	+239.01
300	+179.90	+189.13	+198.13	+206.92	+215.51	+223.93	+232.18	+240.26

DIFFERENCE BETWEEN THE WATER THERMAL EXPANSION FACTOR AND THE STEEL THERMAL EXPANSION FACTOR (⁰ C⁻¹) (10⁻⁶)


BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	HYDROSTATIC TESTING OF ONSHORE PIPELINE	DOCUMENT NO. BR/TS/035	Page 17 of 17
			REVISION : 0
			EDITION : 1

TABLE -A

⁰ C Bar	24	25	26	27	28	29	30
0.981	+215.22	+215.14	+234.88	+244.41	+253.79	+263.00	+272.03
10	+216.13	+225.99	+235.66	+245.13	+254.44	+264.59	+272.57
20	+217.15	+226.94	+236.53	+245.94	+255.18	+264.27	+273.18
30	+218.18	+227.88	+237.41	+246.75	+255.93	+264.95	+273.80
40	+219.21	+228.85	+238.30	+247.58	+256.69	+265.64	+274.42
50	+220.25	+229.82	+239.20	+248.40	+257.45	+266.33	+275.07
60	+221.30	+230.79	+240.11	+249.24	+258.22	+267.04	+275.70
70	+222.35	+231.78	+241.02	+250.08	+258.99	+267.75	+276.35
80	+223.42	+232.77	+241.94	+250.93	+259.78	+248.47	+277.01
90	+224.48	+233.76	+242.87	+251.79	+260.57	+269.19	+277.66
100	+225.56	+234.76	+243.79	+252.66	+261.36	+269.92	+278.33
110	+226.64	+235.78	+244.73	+253.53	+262.17	+270.77	+279.01
120	+227.73	+236.79	+245.68	+254.40	+262.98	+271.41	+279.69
130	+228.82	+237.81	+246.63	+255.28	+263.69	+272.16	+280.38
140	+229.92	+238.84	+247.59	+256.18	+264.62	+272.92	+281.08
150	+231.03	+239.87	+248.55	+257.07	+265.44	+273.69	+281.78
160	+232.14	+240.91	+249.52	+257.97	+266.28	+274.46	+282.49
170	+233.26	+241.96	+250.49	+258.88	+267.12	+275.23	+283.20
180	+234.38	+243.01	+251.47	+259.79	+267.97	+276.01	+283.92
190	+235.51	+244.06	+252.46	+260.71	+268.82	+276.80	+284.64
200	+236.64	+245.12	+253.45	+261.63	+269.67	+277.59	+285.37
210	+237.77	+246.18	+254.45	+262.50	+270.54	+278.39	+286.11
220	+238.91	+247.26	+255.45	+263.49	+271.40	+279.19	+286.85
230	+240.06	+248.33	+256.46	+264.43	+272.28	+280.00	+287.59
240	+241.21	+249.41	+257.46	+265.37	+273.16	+280.82	+288.35
250	+242.36	+250.49	+258.48	+266.31	+274.04	+281.63	+289.11
260	+243.52	+251.58	+259.49	+267.27	+274.92	+282.46	+289.86
270	+244.68	+252.66	+260.52	+268.23	+275.82	+283.29	+290.64
280	+245.84	+253.76	+261.54	+269.18	+276.71	+284.12	+291.40
290	+247.01	+254.86	+262.57	+270.15	+277.61	+284.95	+292.18
300	+248.18	+255.96	+263.60	+271.11	+278.51	+285.79	+292.95


DIFFERENCE BETWEEN THE WATER THERMAL EXPANSION FACTOR AND THE STEEL THERMAL EXPANSION FACTOR ($^{\circ}\text{C}^{-1}$) (10^{-6})

SPECIFICATION FOR MAJOR WATER CROSSINGS (CONVENTIONAL)

SPECIFICATION NO.: BR/TS/036




**(OIL & GAS)
BRIDGE AND ROOF CO. (INDIA) LTD.**

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAJOR WATER CROSSINGS (CONVENTIONAL)	DOCUMENT NO. BR/TS/036	Page 1 of 1
			REVISION : 0
			EDITION : 1

CONTENTS

<u>SL.NO.</u>	<u>DESCRIPTION</u>
0.0	DEFINITION
1.0	SCOPE
2.0	GENERAL
3.0	TRENCHING
4.0	CONTINUOUS CONCRETE COATING
5.0	HYDROSTATIC PRE-TESTING
6.0	INSTALLATION
7.0	BACKFILLING AND BANK PROTECTION
8.0	FINAL HYDROSTATIC TEST
9.0	POST-CONSTRUCTION SURVEY
10.0	FINAL CLEAN-UP
11.0	DOCUMENTATION

PREPARED BY:	CHECKED BY:	APPROVED BY:	ISSUE DATE :

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAJOR WATER CROSSINGS (CONVENTIONAL)	DOCUMENT NO. BR/TS/036	Page 1 of 11
			REVISION : 0
			EDITION : 1

00

DEFINITION

A **major water crossing** shall be reckoned the one which will necessitate passing the gas pipeline across a water body such as perennial river, major irrigation canal, pond, lake, lagoon, creek etc. using special attention and means. The parameters required to classify a particular water body as a **major water crossing** shall comprise of size, hydrological data, authority/ownership, importance and other ecological/ environmental factors associated with it, and the authority to classify it such, shall rest with the COMPANY.

1.0

SCOPE

1.1

This specification covers the minimum requirements for the various activities to be performed by CONTRACTOR for the construction of pipeline major water crossings by conventional trenching method. Provisions of this specification are applicable only for "major water crossings" specifically named as such in the CONTRACT.

1.2

This specification shall be read in conjunction with the conditions of all specifications and documents included in the CONTRACT between COMPANY CONTRACTOR.

1.3

CONTRACTOR shall, with due care and diligence, execute the work in compliance with all laws, by-laws, ordinances, regulations etc. and provide all services and labour, inclusive of supervision thereof, all materials excluding the materials indicated as "Company supplied Materials" in the CONTRACT, equipment, appliances or other things of whatsoever nature required in or about the execution of the work, whether of a temporary or permanent nature.

1.4

CONTRACTOR shall take full responsibility for the stability and safety of all operations and methods involved in the work.

1.5

CONTRACTOR shall be deemed to have inspected and examined the work area and its surroundings and to have satisfied himself so far as practicable as to the form and nature thereof, including sub-surface conditions, hydrological and climatic conditions, the extent and nature of the work and materials necessary for the completion of the work, and the means of access to the work area.

1.6

CONTRACTOR shall be deemed to have obtained all necessary information as to risks, contingencies and all other circumstances, which may influence the work w.r.t. the above.


1.7

CONTRACTOR shall, in connection with the work, provide and maintain at his own costs all lights, guards, fencing, watching etc., when and where necessary or required by COMPANY or by any duly constituted authority for the protection of the work and properties or for the safety and the convenience of public and/ or others.

1.8

For the purpose of this specification, the following definitions shall hold :

- the words 'Shall' and 'Must' are mandatory

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAJOR WATER CROSSINGS (CONVENTIONAL)	DOCUMENT NO. BR/TS/036	Page 2 of 11
			REVISION : 0
			EDITION : 1

- the words 'Should', 'May' and 'Will' are non-mandatory, advisory, or recommended.

2.0 **GENERAL**


2.1 All works of the pipeline major water crossing shall be performed in accordance with the approved construction drawings, procedures, other applicable documents as per the CONTRACT, good pipeline practice and as directed by COMPANY.

2.2 Before start of the field construction, CONTRACTOR shall submit to COMPANY, for approval for each major water crossing a complete report containing at the minimum:

- installation method
- proposed time schedule indicating start and finish dates and detailed break-up of time period for all critical activities associated with the work.
- required work area along with layout and location
- equipment to be used (including number and capacity of equipment).
- manpower deployment during construction
- proposed sub-contractors and/ or vendors along with their scope of work.

The description of the installation method as a minimum shall include the following:

- Study of water currents in relation to the method of launching (on bottom and on surface).
 - Calculation for stability of pipeline during launching and final test.
 - Buoyancy studies
 - Preparation of fabrication yard and launching areas.
 - Pipeline construction details (handling, stringing, welding, concrete coating etc.)
 - Pre-test procedure including trial mix, design & tests for concrete coating.
 - Procedure for corrosion coating of field joint
 - Dredging, anchoring program, spoil-deposit and trench survey method including facilities for COMPANY.
- Pulling or other installation method and related calculations.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAJOR WATER CROSSINGS (CONVENTIONAL)	DOCUMENT NO. BR/TS/036	Page 3 of 11
			REVISION : 0
			EDITION : 1

- j) Pulling arrangement including launchway and anchoring and breaking device.
- k) Trench correction before launching.
- l) Method of positioning and sinking of pipeline.
- m) Method of rectification of damages to the pipeline, during launching.
- n) Method of backfilling, bank protection and survey.
- o) Final test procedure after backfilling.
- p) Safety systems during launching, rope tests.
- q) Communication.
- r) Abandonment and recovery procedures concurred.
- s) Necessary permission from concerned authorities for crossing.

COMPANY shall inform CONTRACTOR within 21 days if any objection against the document and procedure described requires resubmission by CONTRACTOR.

Approval by COMPANY of the methods used by CONTRACTOR shall in no way relieve CONTRACTOR from the sole responsibility for safe and satisfactory installation of the crossing.

- 2.3 CONTRACTOR shall comply with all the conditions and requirements issued by authorities having jurisdiction in the area where the work is to be performed. CONTRACTOR shall, at his own responsibility, obtain necessary permits from the authorities having jurisdiction, for performing his work.
If no public roads exist, CONTRACTOR shall arrange on his own for access to his work area at no extra cost to COMPANY.


2.4 **Pre-construction Surveys**

Prior to start of any work, CONTRACTOR shall carry out a survey of the major water crossings and acquaint himself with site conditions and to collect any data regarding the water velocity and the tidal variations in the flow pattern and shall verify the suitability of his equipment and the methods of construction.

3.0 **TRENCHING**

3.1 **Dredging/ Excavating**

- 3.1.1 CONTRACTOR shall dredge or excavate the trench for the water crossing in conformity with the approved drawings. Dredging of the trench shall be executed as accurately as possible.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAJOR WATER CROSSINGS (CONVENTIONAL)	DOCUMENT NO. BR/TS/036	Page 4 of 11
			REVISION : 0
			EDITION : 1

3.1.2 The trench shall be excavated to such depth as required to provide the minimum cover and the pipeline configuration as specified. The pipeline profile of the crossings shall be followed as accurately as possible. Before laying, the trench shall be cleaned and levelled. The trench shall be subject to inspection by COMPANY prior to installation of the pipe.


3.1.3 Navigational traffic shall not be obstructed, unless permission has been given thereto. CONTRACTOR shall issue all necessary publications according to the local regulations. Instructions given by authorities shall be followed accurately and immediately, so that there is no hindrance to traffic. For stoppage of navigational traffic public notification, PA system, signal/ sign etc. shall be provided.

CONTRACTOR cannot request a compensation if his work is hampered or delayed due to weather conditions, any obstacles/ or by any traffic on the spot, where work is executed.

3.1.4 CONTRACTOR is fully responsible for the execution of the blasting (whenever permitted) the dredging and excavation work, hopping of the soil, transportation, dumping on land or in water, all to be executed in agreement with authorities, land owners and COMPANY.

3.1.5 CONTRACTOR may be obliged to dredge or excavate a trench deeper or wider than indicated in the drawings in order to properly lay the pipeline in unstable (underwater) areas, or near and adjacent to the banks of water courses. It shall be understood that CONTRACTOR is aware of such problems at the time of this bid and that, when such additional excavation is required, it shall be done by CONTRACTOR as part of the work and that he will install the necessary provision and/ or temporary works such as sheet-piling, special filling materials, etc. at no extra cost to COMPANY.

3.1.6 During, the execution of dredging work of CONTRACTOR, bearings, measurements and levels shall be taken by or on behalf of COMPANY. CONTRACTOR shall render assistance for this purpose and make available for COMPANY appropriate survey boats, fully manned and equipped before the start of excavation work of the water crossing trench. CONTRACTOR, if so desired by COMPANY, shall make cross profiles at intervals of not more than 10.0m of the bottom of the water-course along the surveyed center line of the water crossing. In such a case horizontal measurements shall be taken by triangulation or taping between known points and shall be made with such accuracy that the location of each vertical measurement is known within 1.0m. Vertical measurements shall be taken with a sonic recording device, or with line and rod, as directed by COMPANY and shall be taken with such accuracy that each depth is known within 0.2m. Vertical measurements shall be taken at points averaging not more than 5.0m apart and no two measurements shall be more than 7.0m apart. The cross profiles shall extend at least 10m on both sides of the top of the trench.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAJOR WATER CROSSINGS (CONVENTIONAL)	DOCUMENT NO. BR/TS/036	Page 5 of 11
			REVISION : 0
			EDITION : 1

All measurements shall be witnessed by COMPANY. The resulting profile, corrected to the elevation of the undisturbed water-course, shall then be the reference profile. Said profile shall be plotted on a 1:200 vertical and horizontal scale.

3.1.7 CONTRACTOR shall keep the trench in good condition until the pipe is laid, and no claim is to be made to the COMPANY by reason of its caving either before or after the pipe is laid. CONTRACTOR shall do whatever is required to excavate the trench, install the pipe in it and backfill the trench in accordance with these specifications at no extra cost to COMPANY.

3.1.8 Immediately before installation of the water crossing in the excavated trench, CONTRACTOR shall prepare a profile of the trench bottom along the surveyed center line of the water crossing for comparison with the reference profile. CONTRACTOR shall also make cross sections of the trench at intervals of not more than 100m. All profile and cross section measurements shall be taken as specified and shall be witnessed by COMPANY. These data shall be submitted to COMPANY for approval and COMPANY will approve or reject the trench excavation as completed within 24 hours after receipt of the profile and cross sections.

3.1.9 CONTRACTOR shall grade the trench in such a manner as to give the maximum amount of uniform support to the pipeline when it is lowered or pulled into place. The maximum unsupported span shall not exceed 10.0m.


3.1.10 In submerged sections, where rock or gravel is encountered in the bottom of the trench, padding is required. The thickness of the padding under the concrete coated pipe shall at least be 50 cm and after installation at least 50 cm around the pipe.

Blasting, if any, and padding shall be included in the work.

3.2 **Pumping Line**

In case CONTRACTOR uses pumping lines to discharge the spoil, he shall take care of the necessary permits.

Pumping lines, discharges and siphons shall be installed by CONTRACTOR and removed before the completion of the work. At crossings with existing roads, the pumping lines shall be led through a casing pipe bored/ jacked under the road or led through a porch over the road. A stress calculation must then be handed over to COMPANY. The necessary provisions to embank the dumping area and also the spoil basins shall be made by CONTRACTOR. CONTRACTOR is responsible for transportation of the soil and dumping on land and is liable for damage to works of third parties caused by leakage of pumping lines, etc. CONTRACTOR shall at all time prevent overflow of pumping water, spoil or sand over embankments, parcels or roads. Further more, CONTRACTOR shall safeguard COMPANY from claims of compensation by third parties due to encountered damage.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAJOR WATER CROSSINGS (CONVENTIONAL)	DOCUMENT NO. BR/TS/036	Page 6 of 11
			REVISION : 0
			EDITION : 1

3.3 Spoil

Spoil which is not dumped on and including spoil acquired after cleaning the water crossing trench, shall be transported and dumped in places, designated thereto by agreement between CONTRACTOR and authorities and approved of by COMPANY. Spoil shall be transported in (split) barges; only those barges shall be used that avoid spilling during transportation due to incorrect closing of the flaps, etc. Spoil which is dumped outside the designated places shall be removed by CONTRACTOR at first notice by COMPANY.

3.4 Dykes, Dams and Weirs

CONTRACTOR shall install temporary provisions in the existing dykes, dams, etc. to prevent flooding of low areas.

Therefore in general, in existing dykes, dams, etc a double substituting weir must be installed before start of excavation in the existing dyke or dam. Such a double substituting weir can be a closed wall of sheet piling, supported by soil. The provisions shall be such that the underwater profile of the dredged trench, the water movement caused by ships, etc. cause no slides/ cave-ins of the dyke or dam.

4.0 CONTINUOUS CONCRETE COATING

CONTRACTOR shall provide concrete coating over the pipeline including the bends in accordance with the specification issued for the purpose (refer specification no. BR/TS/062 and approved procedure. CONTRACTOR shall coat the weld joints in order to arrive at a continuously concrete coated pipeline. However this concrete coating shall be applied after the hydrostatic pretest.


5.0 HYDROSTATIC PRE-TESTING

CONTRACTOR shall hydrostatically pre-test the pipe string of each water crossing before installation as per approved procedure.

Joint coating of the welds shall be done after this pre-test.


The section of the pipeline corresponding to the major water crossing shall, before installation, be subjected to hydrostatic pre-testing to a combined equivalent stress of 90% of the SMYS of the pipe material.

After the temperature has been stabilised, the pressure shall be maintained in the pipeline for at least twenty four (24) hours and recorded by manothermograph. During the test CONTRACTOR shall check all welds for leakage. Failure, if any, during the test shall be rectified by the CONTRACTOR. If the same is due to failure on account of any cause other than defect in material supplied by COMPANY, the repairs shall be done free of cost, to the satisfaction of COMPANY.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAJOR WATER CROSSINGS (CONVENTIONAL)	DOCUMENT NO. BR/TS/036	Page 7 of 11
			REVISION : 0
			EDITION : 1

6.0 **INSTALLATION**

- 6.1 CONTRACTOR shall submit a detailed scheme for the method he proposes to adopt for installing the pipeline to COMPANY for a approval. CONTRACTOR shall calculate all stresses in the pipeline while laying and check whether the stresses remain within permissible limits. A set of all calculations shall be submitted to the COMPANY for approval.
- 6.2 CONTRACTOR shall perform all work required to install the water crossings, including the possible appurtenances indicated in the drawings. The water crossings shall be installed in such a manner as to comply with the requirements and conditions stated by the Authorities issuing the permits. CONTRACTOR shall pay special attention to minimize any damage to embankments and dykes in the vicinity of water crossings.
- 6.3 The equipment for launching shall be arranged in such a way that the pipeline is laid without impact or jerking and is not subjected to stresses of any type other than those which are allowable. Minimum allowed radius of curvature shall be followed, particularly at the end of the launching way towards the water in the freely suspended section.
- 6.4 After the water-crossing section has been installed in place, CONTRACTOR shall fill this section including the pertaining land sections with water for the final testing.
- 6.5 CONTRACTOR shall check if the position and depth of the water crossing are in accordance with the approved drawings, by means of a profile of the pipeline, before and after the water-crossing section is filled with water. CONTRACTOR shall lower each pipeline section which is not sufficiently deep by dredging or jetting the underlying ground.
- 6.6 The maximum allowed horizontal deviation from the required center line shall be limited to the following :-
For pipeline dia. upto and including 24" - 300 mm
For pipeline dia greater than 24" - 500 mm
- 6.7 Prior to backfill the pipeline shall, when laid in the trench, conform to the bottom contour of the trench grade, so that it will be firmly, uniformly and continuously supported. COMPANY may employ a diver or use other suitable methods to inspect the bottom of the trench and/ or after the pipe is installed prior to backfilling of the trench. CONTRACTOR shall facilitate the work of the diver and shall furnish the necessary equipment and helpers (other than actual diving equipment) necessary for the diver/ inspector to perform his work.
- 6.8 If the pipe does not properly fit the trench or does not rest at sufficient depth to satisfy the minimum requirements of cover as specified in approved drawings, the CONTRACTOR shall make necessary corrections to either trench or the pipe alignment or to both so that the pipe, when finally in position in the trench, shall fully meet the specifications, failing which CONTRACTOR may be asked to remove the pipeline. This shall be done at no extra to the COMPANY.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAJOR WATER CROSSINGS (CONVENTIONAL)	DOCUMENT NO. BR/TS/036	Page 8 of 11
			REVISION : 0
			EDITION : 1

6.9 **Installation of Parallel Pipelines**

When parallel pipelines are required to be installed for a major water crossing, CONTRACTOR shall further comply with the following requirements.


- 6.9.1 Depending on the diameters of the parallel pipelines, the characteristics of the crossing and the limitations of CONTRACTOR's equipment, CONTRACTOR may propose installation of the parallel pipelines either together in a combined operation or separately in a common trench.
- 6.9.2 If the pipelines are installed together, the minimum clear distance between the parallel pipelines (measured from the outside diameters of the concrete coated pipes) shall be 300mm. CONTRACTOR shall provide spacers at sufficient intervals along the length of the pipe section(s), securely fixed to the pipes, or shall propose other suitable alternative methods, so as to ensure that the stipulated minimum clear distance is maintained. The spacers may be removed before the trench is backfilled.
- CONTRACTOR shall furnish detailed drawings for the pipe assembly showing the details of spacers/ other arrangements for COMPANY's approval before start of construction.
- 6.9.3 If the parallel pipelines are installed separately in a common trench, the minimum clear distance between the parallel pipelines in the trench shall be 5000mm. CONTRACTOR shall ensure that this minimum spacing be maintained till the time the trench is backfilled.

7.0 **BACKFILLING AND BANK PROTECTION**

- 7.1 Backfilling of the water-crossing section shall be performed as described in the following clauses.
- 7.1.1 The bottom of the waterway shall be reinstated to its original level by backfilling the trench in a manner and with suitable material and as prescribed and approved by the authorities and COMPANY. In case material other than the original spoil is required, this shall be supplied and applied by CONTRACTOR.

Wherever boulders, rock, gravel and other hard object are encountered, they shall not be placed directly on the pipe. Sufficient earth, and or selected and approved backfill material shall be backfilled initially around and over the pipe to provide a protective padding or cushion extending to a minimum thickness of 50 centimeters around the pipe before backfilling remainder of the trench with excavated or other material.

Wherever required by COMPANY, CONTRACTOR shall cover the (nearly) backfilled trench with a layer of rock boulders to be approved by COMPANY over a width equal to the width of the excavated trench with an extra of 5 m on either side at no extra cost to COMPANY.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAJOR WATER CROSSINGS (CONVENTIONAL)	DOCUMENT NO. BR/TS/036	Page 9 of 11
			REVISION : 0
			EDITION : 1

7.1.2 Backfilling progress of the trench shall be checked continuously, and a daily progress report shall be made and handed over to COMPANY.

7.1.3 All embankments and/ or dykes, bed and banks shall be reinstated to their original state and levels, unless otherwise prescribed in the drawings or by the Competent authorities or COMPANY.

7.1.4 All remaining spoil-deposits shall be cleaned by CONTRACTOR to the satisfaction of COMPANY.


7.2 **Bank Protection**

7.2.1 Trenches in banks of major water crossings shall be backfilled with soil approved by COMPANY. The fill at the banks shall be tamped firmly and reinforced with sacked earth, rip-rap, or by other means as directed by COMPANY to the satisfaction of authorities having jurisdiction thereof. In areas where the backfilled soil is expected to be of loose type which is prone to flow, the trench shall be backfilled with boulder/ crushed rock of minimum 75mm thickness. The boulder/ crushed rock shall be derived from solid, stable, non-soluble and approved quality store approved by COMPANY and pipe shall be provided with adequate padding of soil of a quality approved by COMPANY. Wherever necessary the boulder/ crushed rock shall be held to the bed by use of 6.1 wire nets of minimum dia. of 3.2mm, made from steel having tensile strength of 400 N/mm² and with a minimum elongation at failure of 12%. The minimum zinc coating of 275 gm⁻² shall be applied on single/ double twisted wire. After the trench has been backfilled and during the clean up works, the water crossing shall be cleaned across the whole width of ROW. The existing bed profile shall be maintained after restorations.

7.2.2 Unless stipulated otherwise by the authorities or by COMPANY, CONTRACTOR shall protect the banks of the major water crossings by using gravel and boulders filled embankment mattresses of galvanized iron wire (of specification as in 7.2.1 above) to be laid over the backfilled, compacted and graded banks. In case slope of the banks is 1:1 or more, bank protection shall be carried out using gabions. Bank protection works shall be carried out by CONTRACTOR in accordance with the drawings included in the CONTRACT. All materials required for such works shall be supplied by CONTRACTOR and all works carried out in accordance with specifications, approved drawings, instructions of COMPANY and to the complete satisfaction of authorities having jurisdiction at no extra cost to COMPANY.

The length of the above protection shall be equal to the actual bank excavation edge including damage and further extending 10 m on either sides, The width of the restoration on the slope shall be determined by the levels :

- 2m above Highest Water Level, (recordable) or upto the top of bank, whichever is higher.
- 5m below Low Water Level (recordable) or upto pipe trench level in the bed.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAJOR WATER CROSSINGS (CONVENTIONAL)	DOCUMENT NO. BR/TS/036	Page 10 of 11
			REVISION : 0
			EDITION : 1

7.2.3 Before final hydrostatic testing, CONTRACTOR shall 'prove' the diameter of the pipeline by passing a gauging (caliper) pig through the pipeline. The gauging pig shall have a diameter equal to 95% of the internal diameter of the pipe.

CONTRACTOR shall supply and install all temporary scraper, launchers. Receivers and other equipment, piping and materials and consumables for the purpose.

8.0 **FINAL HYDROSTATIC TEST**

The complete water crossing must be tested immediately after the approved backfilling of the trench. The test procedure shall result in a hoop stress in pipe corresponding to 90% SMYS of the pipe material. After temperature stabilisation pressure shall be retained in the pipeline for a minimum of twenty four (24) hours and recorded by manothermograph. The hydrostatic testing shall be carried out in accordance with approved procedures.

9.0 **POST-CONSTRUCTION SURVEY**

After laying of the pipeline, CONTRACTOR shall carry out a post-construction survey jointly with COMPANY. Any defects brought to the notice of CONTRACTOR shall be promptly corrected by CONTRACTOR at his own expense to the complete satisfaction of COMPANY.


10.0 **FINAL CLEAN-UP**

After completion of construction, CONTRACTOR shall clear the site of all balance material and debris. All balance pipe lengths, in case supplied by COMPANY, shall be returned to COMPANY's designated stock yard(s). Site shall be cleared to the complete satisfaction of COMPANY and authorities having jurisdiction. All such works shall be done at no extra cost to COMPANY.

11.0 **DOCUMENTATION**

11.1 In addition to the documents specified elsewhere in this specification. CONTRACTOR shall submit to the COMPANY six copies of each of the following documents / records.

- Complete record of pipes 'taken-over' from COMPANY, number of pipe lengths used, and record of return of balance pipe lengths to COMPANY's designated stock-yard(s).
- Copies of the permits obtained from authorities having jurisdiction for the various works.
- Records of Non-destructive testing of welds.
- Clearance certificates from the land owners and authorities having jurisdiction regarding satisfactory clean-up and restoration of pipeline ROU and work areas.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	MAJOR WATER CROSSINGS (CONVENTIONAL)	DOCUMENT NO. BR/TS/036	Page 11 of 11
			REVISION : 0
			EDITION : 1


- 11.2 After completion of construction CONTRACTOR shall prepare & furnish six sets of copies and two sets of reproducible of As-built drawing for the crossings. As-built drawings shall be as a minimum, include the following information.
- True profile of the bed and banks of the water crossing along the pipeline after backfilling.
 - True profile of the pipeline as installed and the top of cover to top of pipe at regular intervals.
 - Location and angle of sag and over bends.
 - Extent of backfill.
 - Extent of bank protection.
- 11.3 All documents shall be in English Language

**SPECIFICATION
FOR
PIPELINES CROSSING ROADS, RAILROADS,
MINOR WATER AND OTHER CROSSINGS**

SPECIFICATION NO.: BR/TS/037




**(OIL & GAS)
BRIDGE AND ROOF CO. (INDIA) LTD.**

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPELINES CROSSING ROADS, RAILROADS, MINOR WATER AND OTHER CROSSINGS	DOCUMENT NO. BR/TS/037	Page 1 of 1
			REVISION : 0
			EDITION : 1

CONTENTS

<u>SL.NO.</u>	<u>DESCRIPTION</u>
1.0	SCOPE
2.0	REFERENCE CODES, STANDARDS AND SPECIFICATIONS
3.0	GENERAL
4.0	ROAD AND RAIL-ROAD CROSSINGS
5.0	CROSSINGS OF BURIED SERVICES
6.0	MINOR WATER COURSE CROSSINGS

PREPARED BY:	CHECKED BY:	APPROVED BY:	ISSUE DATE :

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPELINES CROSSING ROADS, RAILROADS, MINOR WATER AND OTHER CROSSINGS	DOCUMENT NO. BR/TS/037	Page 1 of 8
			REVISION : 0
			EDITION : 1

1.0 **SCOPE**

1.1 This specification covers the minimum requirement for the various activities to be carried out by the CONTRACTOR for or about the installation of pipelines crossing roads, railroads, minor water courses and other services.

The provisions of this specification are not applicable for pipe lines crossing water courses, which are specifically designated as "Major Water Courses" in the CONTRACT.

1.2 This specification shall be read in conjunction with the conditions of all specifications and documents included in the CONTRACT between COMPANY and CONTRACTOR.

For the purpose of this specification the following definitions shall hold :

- the words "Shall" and "Must" are mandatory
- the words "Should", "May" and "Will" are non-mandatory, advisory recommended.

2.0 **REFERENCE CODES, STANDARDS AND SPECIFICATIONS**


2.1 Reference has been made in this specification to the latest edition (edition enforce at the time of floating the enquiry) of the following codes, standards and specifications.

- | | | | |
|----|--------------------|---|---|
| a) | ASME B 31.4 | - | Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids. |
| b) | ASME B 31.8 | - | Gas Transmission and Distribution Piping Pipelines Crossing Railroads and Highways. |
| c) | API RP 102 | - | Recommended practice for Liquid Petroleum Pipelines Crossings Railroads and Highways. |
| d) | OISD 226 | - | Natural Gas Transmission Pipelines and City Gas Distribution Networks |
| e) | Part 192, Title 49 | - | Transportation of Natural and Other Gases by Pipeline. |
| f) | Part 195 | - | Transportation of liquids by Pipeline. |

2.2 In case of conflict between the requirements of above mentioned codes, standards, specifications and practices, the most stringent requirement shall govern.

3.0 **GENERAL**

3.1 Crossing of roads, railroads, buried services, canals and minor water courses with equipment and/ or personnel is allowed only after acquiring approval from the

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPELINES CROSSING ROADS, RAILROADS, MINOR WATER AND OTHER CROSSINGS	DOCUMENT NO. BR/TS/037	Page 2 of 8
			REVISION : 0
			EDITION : 1

authorities having jurisdiction and after making arrangements for safeguarding the roads, etc. and the buried services with appropriate provisions.

Highways, main-roads and railroads and their verges and banks of water crossings are not allowed to be used for loading, unloading or stacking of materials and/ or equipment. For secondary roads, such loading/ unloading is permitted only after prior approval from the concerned authorities. CONTRACTOR is not allowed to close or divert roads or water courses without prior approval from the COMPANY and the concerned authorities. CONTRACTOR shall never unnecessarily hamper the users of the roads, railroads, buried services and/ or water courses. The water flow shall not be obstructed in any way.

3.2 COMPANY reserves the right to demand for individual crossings from the CONTRACTOR a separate detailed report for approval, containing :


- Time schedule
- Working method with equipment
- Test procedure
- Manpower deployment
- Calculations of temporary works
- Soil investigations, etc.
- Approval letter from Competent Authority.

Such works shall be without any extra cost to COMPANY.

3.3 Pipeline crossings for road, railroad, canals and rivers etc., shall be hydrostatically pretested ex-situ, prior to joint coating, whenever,

- Crossing is executed by boring ;
- Crossing is installed in casing pipe;
- River crossing pipes which are to be continuously concrete weight coated (to be tested prior to concrete coating);
- Whenever, in COMPANY's opinion, the repair of pipeline at crossing, in case of a leak during final hydrostatic testing, would require inordinate amount of effort and/ or time;
- Whenever pretesting is insisted upon by the Authorities having jurisdiction over the utility crossed.

The section of the pipeline for the crossings shall be tested as a single string. Unless specified otherwise in the CONTRACT, the test pressure shall be the one resulting in a hoop stress corresponding to 90% of SMYS of pipe material. Test pressure shall be retained in the pipeline for minimum period of 4 hours. Test section shall be visually examined for leaks/ defects, etc.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPELINES CROSSING ROADS, RAILROADS, MINOR WATER AND OTHER CROSSINGS	DOCUMENT NO. BR/TS/037	Page 3 of 8
			REVISION : 0
			EDITION : 1

4.0 **ROAD AND RAILROAD CROSSINGS**

- 4.1 The work under crossings shall include necessary clearing, grading and trenching to required depths and widths, welding of casing (when required) and carrier pipes, coating, lowering-in, backfilling, clean-up, restoration to the original condition and further strengthening and protective works, testing, installation of assemblies, insulators and seals, and temporary works such as sheet piling, bridges, etc.

The work shall be carried out in accordance with the approved drawings and job standards, as directed by COMPANY and to the satisfaction of COMPANY and the authorities having jurisdiction over the facility crossed. The work carried out for road and railroad crossings shall meet the minimum requirements of API RP 1102, latest edition.


Before the installation work of crossings is started, the CONTRACTOR shall provide suitable barricades, temporary bridge/ bypass work (especially where roads are open-cut) with railing, if required by COMPANY for safety of traffic. Adequate traffic warning signals and/or traffic lights and suitable diversions shall be provided as directed by COMPANY/ Authority having jurisdiction over these areas. Such diversions shall not cross the pipeline where it has already been installed, unless proper safeguarding in COMPANY's opinion is ensured.

Prior approval from the statutory authorities shall be obtained to lay the pipeline across highways/ roads either by boring or by open-cut method. Installation of the crossing shall be by the method (i.e., boring/ open-cut) approved by Authorities having jurisdiction. Railroad crossings shall always be bored/ jacked.

- 4.2 Boring/ jacking of carrier pipes for crossings is allowed only if the pipes for boring/ jacking are provided with a suitable corrosion coating and CONTRACTOR remains liable for the suitability of the pipe and weld-coating of carrier pipes to be bored and for which coating and method of application are anyhow to be authorised by COMPANY without prejudice to CONTRACTOR's liability. In all other cases the carrier pipes shall be cased.

Before start of the boring/ jacking CONTRACTOR shall execute a soil investigation and determine the ground water table. Based on these investigations CONTRACTOR shall prepare a construction drawing and submit to COMPANY for approval including time schedule and soil investigation report. The CONTRACTOR shall submit for approval of COMPANY the method of boring / trenchless to be carried out, depending on the nature of soil conditions, nature of crossing, local requirements etc.

During the execution of boring the ground water table over the length of the boring shall be lowered up to at least 0.50 M below bottom of the pipeline. This water table is to be regularly inspected and maintained by CONTRACTOR and reported to COMPANY. To safeguard the stability of the borepit, CONTRACTOR shall, if necessary in COMPANY's opinion, use a closed sheetpiling which shall extend at least over 50% of the length in undisturbed soil. The length of the boring shall be in accordance with

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPELINES CROSSING ROADS, RAILROADS, MINOR WATER AND OTHER CROSSINGS	DOCUMENT NO. BR/TS/037	Page 4 of 8
			REVISION : 0
			EDITION : 1

the length of the ROW of the crossing (road, railroad, etc.) with minimum 0.6 m extra on either side.

If the soil conditions and groundwater for a particular boring give reasons for this, CONTRACTOR is entitled to suggest to COMPANY for a relaxation of one or more of the following requirements as defined hereforth :

- Soil investigation
- Lowering of groundwater table
- Sheetpiling
- Length of boring etc.

In approaches to the crossing, CONTRACTOR shall eliminate unnecessary bending of pipe by conforming to the contour of the ground by gradually deepening the ditch at such approaches as directed by the COMPANY.

4.3 The bottom of the trench and/ or the pit for at least twelve (12) metres at the approach to each end of a casing shall be graded and if necessary backfilled with clean sand and compacted upto atleast 95% Proctor density to an elevation that will provide sufficient and continuous support to the pipeline so that the pipeline remains correctly aligned at the casing ends during and after backfilling.


4.4 The diameter of the hole for a bored section shall have a hole diameter as close as practicable to the outside diameter of the carrier or casing pipe. If excessive void or too large hole results, or if it is necessary, in the opinion of COMPANY, to abandon the bored hole, prompt remedial measures such as filling the hole with suitable material shall be taken to the entire satisfaction of the COMPANY and Authorities having jurisdiction thereof at no extra cost to COMPANY. Equipment used for installation of casing pipe shall be of the type approved by COMPANY.

An installation consisting of hydraulic jacks shall be provided with easily readable pressure gauges (in bar) and sealable pressure limits. Their proper operation shall be demonstrated before the work is started. COMPANY can request that the maximum pressing force be limited.

At the front of the pipe there may be a cutting ring which may be 12mm larger than the outside diameter for the pipe or casing. A lubricating pipe can also be used in jacking, the nipples of which shall not protrude from the cutting edge. Said lubricating pipe shall not be fixed to the pipe casing. When jacking, only biologically degradable lubricants shall be used (e.g. WRC Medlube or an emulsion of bentonite).

Removal of soil from the pipeline during jacking shall be done mechanically by means of a standard, locked auger, which has to be safeguarded against jacking ahead of the pipe.

During jacking the progress of the pipe to be jacked and the cutting capacity of the auger shall be mutually adjusted, by regulating the speed of the auger, to prevent the road from bulging (rpm too low) or cave-ins (rpm too high). In any case no more soil

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPELINES CROSSING ROADS, RAILROADS, MINOR WATER AND OTHER CROSSINGS	DOCUMENT NO. BR/TS/037	Page 5 of 8
			REVISION : 0
			EDITION : 1


shall be removed than the volume of the pipe. The auger drive shall be provided with a clutch.

The progress in the work, the readings of the gauge pipes, the jacking pressures observed, etc., shall be recorded in a log book, to be shown to COMPANY upon request. All information shall be supplied to COMPANY on completion of the work.

If the jacking fails, the casing shall not be withdrawn. It shall be filled with sand and plugged at either end. The diameter of the casing pipe shall conform to AP I RP 1102 recommendations or as directed by the Engineer – in - charge.

COMPANY reserves the right to inspect certain lengths of pipes to assess damages, if any, to the corrosion coating of the carrier pipe used for boring. CONTRACTOR shall weld additional lengths of pipe and pull the required extra lengths of COMPANY's inspection. If during inspection any defects are noticed, CONTRACTOR, in consultation with COMPANY, shall carry out the remedial measures required.

- 4.5 While welding of the casing and vent/ drain pipes, internal high or low is not allowed. Welding of casing and vent/ drain pipes need not be radiographed, however, only normal visual checks shall be carried out. Before welding, the single length of pipe shall be inspected in order to check that there is no out of roundness and dents. When such defects are noticed, these must be completely removed before joining the pipes. If these defects cannot be repaired, the defective section shall be cut out.
- 4.6 In the case of crossing where excavation has been authorised, the welding for the casing pipe and for a continuous section of the pipeline corresponding to the expected length shall be carried out in the proximity of the crossing. Casing must be laid immediately after the trenching. Casing pipe must be laid with a single gradient in order to allow for an easy insertion and, if necessary at a future date, to allow for the removal or replacement of the pipeline, leaving the casing undisturbed.
- 4.7 The assembly of vent pipe units as approved by COMPANY shall be carried out by direct insertion and welding to the ends of the casing pipe before introducing the carrier pipe. The operation of assembling and extending the vent pipe shall be carried out in such a way that there is no contact with the carrier pipe. The painting/ coating of the vent pipes shall be applied before backfilling as per relevant specifications.
- 4.8 The casing pipe shall be considered ready for installation of the carrier pipe, after careful inspection and internal cleaning with the removal of soil, mud, stones and other foreign materials.
- 4.9 Insulators, as approved by COMPANY, shall be securely fastened to the pipe with all bolts and fixtures firmly tightened. The number of insulators and spacing shall be as shown in the drawings or at 2.5m intervals (whichever is more stringent). At the end of both sides of the casing, a double set of insulators shall be installed.
- 4.10 Care must be taken in pushing or pulling carrier pipe into the casing so that the pipe is aligned correctly in the casing and that the pushing or pulling force is evenly and

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPELINES CROSSING ROADS, RAILROADS, MINOR WATER AND OTHER CROSSINGS	DOCUMENT NO. BR/TS/037	Page 6 of 8
			REVISION : 0
			EDITION : 1

constantly applied to avoid damages to the insulators. A nose piece having a diameter equal to that of the pipe shall be welded on the front and back end of the carrier pipe to facilitate installation of the carrier pipe properly in the casing and to keep it dry and clean.


- 4.11 After installation of the carrier pipe section, the casing and the appurtenances, but prior to making tie-in welds and backfilling, an electrical test shall be conducted by the CONTRACTOR in the presence of the COMPANY, to determine the resistance between the casing and the carrier pipe or the carrier pipe and the soil. These tests shall show at least a resistance of 100 kohm/m². After backfilling and compaction, additional tests shall be conducted to determine if the casing is electrically shorted to the pipe. If the installation is found to be shorted, CONTRACTOR shall make the necessary corrections and repairs at his cost, until a test to the satisfaction of the COMPANY is obtained.

5.0 **CROSSINGS OF BURIED SERVICES**

- 5.1 The pipeline under construction may pass above or below the existing buried facilities such as pipelines, cables, etc. Type of crossing shall be such that a minimum depth of cover as required in the drawings and specifications are guaranteed. The minimum clearance required between pipeline and the existing facility shall be 500mm.
- 5.2 Whenever buried services in the ROW are to be crossed by CONTRACTOR, he shall safeguard the buried facilities and the required precautions shall be taken as approved by Owner of the buried services and by COMPANY.
- 5.3 For buried services to be crossed by boring/ jacking, the relevant provisions of Section 3.0 shall apply.

6.0 **MINOR WATER COURSE CROSSINGS**

- 6.1 Minor water crossings are crossings of ditches, canals, water courses, rivers, streams etc, whether the bed(s) contain(s) water or not, and not being specified as 'Major Water Crossings' in the CONTRACT.
- 6.2 For minor water crossings a standard drawing or a separate detailed approved drawing for individual crossing shall be applicable, and all further specifications are applicable.
- 6.3 Whenever minor water crossings in the ROW are to be crossed, CONTRACTOR shall install/ temporary bridges to facilitate movement.
- 6.4 In crossings of water courses with either moderate flow rate or of torrential nature with marked and unpredictable flooding, an adequate survey shall be carried out before starting the work with the object of determining what precautions are necessary and the most favourable period for executing the work.
- 6.5 In case of crossings of water courses for which no special methods of laying are required, a pipe section of a size as per the approved drawings shall be assembled and subsequently laid. Bends shall be of cold field type.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPELINES CROSSING ROADS, RAILROADS, MINOR WATER AND OTHER CROSSINGS	DOCUMENT NO. BR/TS/037	Page 7 of 8
			REVISION : 0
			EDITION : 1


Whenever required by COMPANY, CONTRACTOR shall, before start of construction, execute a soil investigation. Based on this soil investigation he shall prepare construction drawings, work method and time schedule for approval of COMPANY as well as concerned local agencies.

The depth of the existing bottom of a minor water course crossing shall be determined in relation to the adjacent stable ground level by taking the average of four measurements. Measurement shall be taken with a gauge and with dimensions 60 x 60mm and having a flat bottom. The minimum force to be exerted shall be 360 N (36 kgf).

CONTRACTOR shall take special care to check with the responsible authorities for special conditions applying to working on, over, under or through minor water crossings and CONTRACTOR shall comply with any such conditions. Written arrangements with authorities shall be drawn up in cooperation with COMPANY.

- 6.7 For crossings beneath the bed of water courses, the pipe section shall be made in such a way that it conforms to the existing or future bed as indicated in the approved drawings. In crossings for which an individual drawing has not been prepared, the minimum cover of the pipeline shall not be less than that indicated in the standard drawings for a similar type of crossing.
- 6.8 Whenever the crossing requires a straight section of pipe between the lower bends coinciding with the river bed, this section shall be laid at a single horizontal level.
- 6.9 For crossings of ditches, canals, banked channels, etc. by boring, the pipe section shall be prepared, laid and tested in accordance with the applicable clauses of Section 3.0 of this specification.
- 6.10 The CONTRACTOR shall arrange temporary installation of diversions as may be necessary, to ensure the effective functioning of these water courses crossed, to the entire satisfaction of the concerned Local Authorities as well as the COMPANY.
- 6.11 Banks and trenches of minor water crossings shall be backfilled with soil which is to be approved by COMPANY and shall be thoroughly compacted to prevent soil and bank erosion as per the drawings and standards to the satisfaction of authorities having jurisdiction thereof and the COMPANY. Whenever boulders, rock, gravel and other hard objects are encountered, they shall not be placed directly on the pipe. Sufficient earth, sand or selected and approved backfill material shall be backfilled initially around and over the pipe to provide a protective padding or cushion extending to a minimum thickness of 30 centimeters around the pipe before backfilling remainder of the trench with excavated or other material as per approved drawings and standards.

After the trench has been backfilled and during the clean up works, the minor water crossing shall be cleaned at least across the whole of the ROW.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPELINES CROSSING ROADS, RAILROADS, MINOR WATER AND OTHER CROSSINGS	DOCUMENT NO. BR/TS/037	Page 8 of 8
			REVISION : 0
			EDITION : 1

When directed by the COMPANY, CONTRACTOR shall stabilise and restore the bank of the water crossings with materials to be supplied by him as follows.

The excavation shall be trimmed in steps-and-berms backfilled with well compacted solid soil, followed by a minimum 0.25m thick layer of properly shaped boulders (75-150mm) encased in a net of galvanised iron wire of dia 3mm spaced at a maximum distance of 50mm to be laid over the backfilled, compacted and graded banks.

The GI wire shall be made from steel having tensile strength of 400 N/mm² and with a minimum elongation at failure of 10%. The minimum zinc coating of 200 gm⁻² shall be applied on single/ double twisted wire.

The length of the above protection shall be equal to the actual bank excavation edge including damage and extending 2m on either sides. The width of this protection on the slope shall be determined by the following :

- 2m plus the highest water level (recoverable) or upto the top of bank whichever is higher.
- Upto the bottom of the crossing or 20m below the highest water level whichever is smaller.

Bank stabilisation for certain minor water crossings shall be determined by COMPANY based on nature of crossing e.g. type of river, canal, major nallah, flood control banks and other water bodies; type of soil, regulations of local authorities; and any other socio-economic consideration evaluated by the COMPANY.

6.12 The crossing of any embankments shall be carried out strictly in accordance with approved drawings.


No drilling work on embankments shall be permitted without prior written approval from the competent authorities.

SPECIFICATION FOR PIPING FABRICATION AND ERECTION

SPECIFICATION NO.: BR/TS/038



**(OIL & GAS)
BRIDGE AND ROOF CO. (INDIA) LTD.**

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPING FABRICATION AND ERECTION	DOCUMENT NO. BR/TS/038	Page 1 of 1
			REVISION : 0
			EDITION : 1

CONTENTS

<u>SL.NO.</u>	<u>DESCRIPTION</u>
1.0	GENERAL
2.0	SCOPE
3.0	BASIS FOR WORK
4.0	FABRICATION
5.0	ERECTION
6.0	WELDING
7.0	ERECTION
8.0	INSPECTION
9.0	PROTECTIVE COATING
10.0	FLUSHING
11.0	HYDROSTATIC TESTING

ANNEXURE-1 - WELDING SPECIFICATION


EXHIBIT-A -	ELECTRODE QUALIFICATIONS TEST RECORD
EXHIBIT-B -	STRESS RELIEF HEAT TREATMENT PROCEDURE SPECIFICATION
EXHIBIT-C -	STANDARD PROCEDURE SPECIFICATION NO.
EXHIBIT-D -	COUPON TEST RECORD
EXHIBIT-E -	WELDER's IDENTIFICATION CARD
EXHIBIT-F -	RADIOGRAPHIC PROCEDURE FOR PIPE WELDING
EXHIBIT-G -	WELDING SPECIFICATION CHART

ANNEXURE-2 - DESTRUCTIVE TESTING OF WELDED JOINT - BUTT WELDS

ANNEXURE-3 - ULTRASONIC INSPECTION

ANNEXURE-4 - RADIOGRAPHY

PREPARED BY:	CHECKED BY:	APPROVED BY:	ISSUE DATE :

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPING FABRICATION AND ERECTION	DOCUMENT NO. BR/TS/038	Page 1 of 61
			REVISION : 0
			EDITION : 1


1.0 GENERAL

This specification covers general requirements of fabrication and erection of aboveground and trench piping systems at site. The specification covers the scope of work of contractor, basis of work to be carried out by contractor and standards, specifications and normal practice to be followed during fabrication and erection by the contractor.


2.0 SCOPE

Generally the scope of work of contractor shall include the following :

- 2.1 Transportation of required piping materials, pipe support and all other necessary piping materials from Owner's storage point or contractor's storage point (in case of contractor's scope of supply) to work site / shop including raising store requisitions for issue of materials in the prescribed format & maintaining an account of the materials received from Owner's stores.
 - 2.1.1 Piping materials include the following but not limited to the same.
 - a. Pipes (All sizes and schedule)
 - b. Flanges (All sizes, types & Pressure ratings).
 - c. Fittings (All sizes, types and schedule)
 - d. Valves (All sizes, types and Ratings)
 - e. Gaskets (All sizes, types & Ratings)
 - f. Bolts, Nuts or M/C Bolts (All types)
 - g. Expansion Joint / Bellows (All types)
 - h. Specialty items like online filters, ejectors, sample coolers, steam traps, strainers, air traps etc.
 - i. Online instruments like control valve, orifice flange, rotameter, safety valves etc.
- 2.2 Shop & field fabrication and erection of piping in accordance with documents listed under Cl. 3.0 i.e. 'BASIS OF WORK' including erection of all piping materials enumerated above.
- 2.3 Fabrication and erection of pipe supports like shoe, saddle, guide, stops, anchors, clips, cradles, hangers, turn buckles, supporting fixtures, bracket cantilevers, struts, teeposts including erection of spring supports and sway braces.
- 2.4 Fabrication
 - 2.4.1 Fabrication of piping specials like special radius bends, reducers, mitres etc.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPING FABRICATION AND ERECTION	DOCUMENT NO. BR/TS/038	Page 2 of 61
			REVISION : 0
			EDITION : 1

- 2.4.2 Fabrication of plain and threaded nipples from pipes as required during erection.
- 2.4.3 Fabrication of swage nipples as and when required.
- 2.4.4 Fabrication of odd angle elbow like 60°, 30° or any other angle from 90/45° elbows as and when required.
- 2.4.5 Fabrication of flange, reducing flange, blind flange, spectacle blinds as and when required.
- 2.4.6 Fabrication of stub-in connection with or without reinforcement.
- 2.4.7 Grinding of edges of pipes, fittings, flanges etc. to match mating edges of uneven / different thickness wherever required.
- 2.5 Modifications like providing additional cleats, extension of stem of valve, locking arrangement of valves etc. as and when required.
- 2.6 Preparation of Isometrics, bill of materials, supporting details of all NON-IBR lines upto 2-1/2" within the unit battery limit and get subsequent approval from Engineer-in-Charge as and when called for.
- 2.7 Obtaining approval for drawings prepared by contractor from statutory authority, if required.
- 2.8 Spun concrete lining of the inside of pipes 3" NB & above including fittings and flanges as required in accordance with specification.
- 2.9 Rubber lining inside pipes, fittings, flanges as and when required, in accordance with specification.
- 2.10 Radiography, stress relieving, dye penetration, magnetic particle test etc. as required in specification.
- 2.11 Performing PMI using alloy analysers as per 'Standard Specification for Positive Material Identification at Construction Sites, 6-82-0002'.
- 2.12 Casting of concrete pedestals and fabrication & erection of small structures for pipe supports including supply of necessary materials.
- 2.13 Providing insert plates from concrete structures and repair of platform gratings around pipe openings.
- 2.14 Making material reconciliation statement and return of Owner's supply left over materials to Owner's storage.
- 2.15 Flushing and testing of all piping systems as per standard specification for inspection, flushing and testing of piping systems (Specification No. BR/TS/042).

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPING FABRICATION AND ERECTION	DOCUMENT NO. BR/TS/038	Page 3 of 61
			REVISION : 0
			EDITION : 1

3.0 BASIS FOR WORK

3.1 The complete piping work shall be carried out in accordance with the following

3.1.1 "Approved for Construction" drawings and sketches issued by B&R to the Contractor - Plans and/or Isometrics.

3.1.2 "Approved for Construction" drawings and sketches issued by Turn-key bidders to the Contractor - Plans and/or Isometrics.

3.1.3 Approved Process licensor's standards and specifications.

3.1.4 Drawings, sketches and documents prepared by contractor duly approved by Engineer-in-Charge' (such as isometrics and offsite piping etc.)


3.1.5 Approved construction job procedures prepared by Contractor as stipulated in 2.16

3.1.6 B&R specifications/documents as below :

- a. Process and Instrument Diagram.
- b. Piping Materials Specification
- c. Piping support standards.
- d. Line list / Number
- e. Piping support index.
- f. Standard specification of NDT Requirement of Piping
- g. Welding specification charts for piping classes.
- h. Standard specification for Pressure Testing of Erected Piping System.
- i. Welding specification for fabrication of piping
- j. Any other B&R or OTHER specifications attached with Piping Material Specification or special condition of contract.
- k. Procedure for storage, preservation and positive identification of materials Contractors works / stores.

3.1.7 Following codes, standards and regulations

- a. ASME B 31.3 : Process Piping
- b. ASME Sec. VIII : Code for unfired pressure vessel.
- c. IBR Regulations

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPING FABRICATION AND ERECTION	DOCUMENT NO. BR/TS/038	Page 4 of 61
			REVISION : 0
			EDITION : 1

- d. IS:823 : Code for procedure for Manual Metal Arc Welding of Mild Steel (for structural steel).
- e. NACE Std. : Code for Sour Services material requirements MR.

Note : All codes referred shall be latest edition.

3.2 Deviations

Where a deviation from the "Basis of Work " and approved job procedure described above is required or where the basis of work does not cover a particular situation, the matter shall be brought to the notice of Engineer - in - Charge and the work carried out only after obtaining written approval from him in each case.


4.0 FABRICATION

4.1 Piping Material

Pipe, pipe fittings, flanges, valves, gaskets, studs bolts etc. used in a given piping system shall be strictly as per the "Piping Material Specification" for the "Pipe Class" specified for that system. To ensure the above requirement, all piping material supplied by the Owner / Contractor shall have proper identification marks as per relevant standards / B&R's specifications / Licensors specification. Contractor shall provide identification marks on left over pipe lengths wherever marked up pipe lengths have been fabricated / erected. Material traceability is to be maintained for AS., S.S., NACE, LTCS, material for Hydrogen service and other exotic materials by way of transferring heat number, etc. (hard punching) as per approved procedure. This shall be in addition to colour coding for all piping materials to avoid mix-up.

4.2 Fabrication

- 4.2.1 All fabrication shall be carried out in accordance with piping general arrangement drawings, (prepared by CONTRACTOR and approved by COMPANY) including this specification and codes as specified in section 2.0.
- 4.2.2 CONTRACTOR shall be responsible for working to the exact dimensions as per the approved drawings. Dimensional tolerances to be adopted during implementation of fabrication work shall be as per attached sketch "TOLERANCES FOR FABRICATION".
- 4.2.3 Flange bolt holes shall generally straddle the established centre lines unless other orientation is required and as called out in approved drawings.
- 4.2.4 Threading shall be NPT to ANSI B 1.20.1. Threading shall preferably be done after bending, forging or heat treatment operation. However if it is not possible, precaution shall be taken to protect threading against deformation. Thread shall be clean cut with no burrs or stripping. Dies shall be new, sharp and properly designed for piping material. Ends shall be reamed to remove burrs.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPING FABRICATION AND ERECTION	DOCUMENT NO. BR/TS/038	Page 5 of 61
			REVISION : 0
			EDITION : 1


- 4.2.5 All threaded joints shall be aligned properly. The pipe entering unions shall be true to centrelines so as to avoid forcing of union coupling during make up. Damaged threads shall be cut from the end of run and the pipe shall be rethreaded.
- 4.2.6 Immediately before testing the piping, all threads of pipe and fittings shall be thoroughly cleared of cuttings, fuel oil or other foreign matter. The male threads shall be sealed with thread sealant and the piping made up sufficiently for the thread to seize. Sealant shall be teflon tape.
- 4.2.7 Seal welding of threaded connections when specified shall include the first block valve, cover all threads. The joint shall be cleaned of all cutting oil and other foreign material and made up dry to full thread engagement. Instrument threaded connections which are frequently subjected to testing and maintenance shall not be seal welded.
- 4.2.8 All threaded connections shall be protected from rusting by applying greases or oil when in operating condition.
- 4.2.9 When socket weld fittings or valves are used, pipe shall be spaced approximately 1/16" to avoid bottoming which could result in excessive weld stress.
- 4.2.10 Where the ends of the piping components being welded have an internal surface misalignment exceeding 1.6mm, the wall of the component extending internally shall be trimmed by machining so that the adjoining internal surface will approximately flush.

For the purpose of common understanding the construction job procedure, to be submitted by the contractor, shall include proposal for

- Maximizing prefabrication, inspection and testing at fabrication shop with minimum field joints.
- Positive material identification, handling, storage & preservation.

4.3 Dimensional Tolerances

Dimensional tolerances for piping fabrication shall be as per B&R Standard Specification. The Contractor shall be responsible for working to the dimensions shown on the drawings. However, the Contractor shall bear in mind that there may be variations between the dimensions shown in the drawing and those actually existing at site due to minor variations in the location of equipments, inserts, structures etc. To take care of these variations "Field Welds" shall be provided during piping fabrication. An extra pipe length of 100 mm over and above the dimensions indicated in the drawing may be left on one side of the pipe at each of the field welds. During erection, the pipe end with extra length at each field weld, shall be cut to obtain the actual dimension occurring at site. Isometrics, if supplied may have the field welds marked on them. However, it is the responsibility of the Contractor to provide adequate number of field welds. In any case no extra claims will be entertained from the Contractor on this account. Wherever errors / omissions occur in drawings and Bills of Materials it shall be the Contractor's responsibility to notify the Engineer-in-Charge prior to fabrication or erection.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPING FABRICATION AND ERECTION	DOCUMENT NO. BR/TS/038	Page 6 of 61
			REVISION : 0
			EDITION : 1

4.4 IBR Piping

- 4.4.1 Contractor shall be supplied generally with all drawings for steam piping falling under the purview of Indian Boiler Regulations duly approved by Boiler Inspectorate. The Contractor shall carry out the fabrications, erection and testing of this piping as per requirements of Indian Boiler Regulations and to the entire satisfaction of the local Boiler Inspector. The Contractor shall also get the approval of IBR inspector for all fabrication and testing done by him at his own cost. All certificates of approval shall be in proper IBR forms. .
- 4.4.2 Approval of boiler inspector on the drawings prepared by the contractor shall be obtained by the contractor at his own cost.

4.5 Pipe Joints

The piping class of each line specifies the type of pipe joints to be adopted. In general, joining of lines 2" and above in process and utility piping shall be accomplished by butt welds. Joining of lines 1-1/2" and below shall be by socket welding / butt welding / threaded joints as specified in "Piping Material Specifications". However, in piping 1-1/2" and below where socket welding/ threaded joints are specified butt - welds may be used with the approval of Engineer-in-Charge for pipe to pipe joining in long runs of piping. This is only applicable for non-galvanized piping without lining.

Flange joints shall be used at connections to Vessels, Equipment's, Valves and where required for ease of erection and maintenance as indicated in drawings.

4.6 Butt Welded and Socket Welded Piping

End preparation, alignment and fit-up of pipe pieces to be welded, welding, pre-heat, post-heating and heat treatment shall be as described in the welding specification and NDT specification.

4.7 Screwed Piping

In general, Galvanized piping shall have threads as per IS:554 or ANSI B 2.1 NPT as required to match threads on fittings, valves etc. All other piping shall have threads as per ANSI B 2.1, tapered unless specified otherwise.

Threads shall be clean cut, without any burrs or stripping and the ends shall be reamed. Threading of pipes shall be done preferably after bending, forging or heat treating operations. If this is not possible, threads shall be gauge checked and chased after welding heat treatment etc.

During assembly of threaded joints, all threads of pipes and fittings shall be thoroughly cleaned of cuttings, dirt, oil or any other foreign matter. The male threads shall be coated with thread sealant and the joint tightened sufficiently for the threads to seize and give a leakproof joint.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPING FABRICATION AND ERECTION	DOCUMENT NO. BR/TS/038	Page 7 of 61
			REVISION : 0
			EDITION : 1

Threaded joints to be seal-welded shall be cleaned of all foreign matter, including sealant and made up to full thread engagement before seal welding.

4.8 Flange Connections

All flange facings shall be true and perpendicular to the axis of pipe to which they are attached. Flanged bolt holes shall straddle the normal centerlines unless different orientation is shown in the drawing.

Wherever a spectacle blind is to be provided, drilling and tapping for the jack screws in the flange, shall be done before welding it to the pipe.

4.9 Branch Connections

Branch connections shall be as indicated in the piping material specifications. For end preparation, alignment, spacing, fit-up and welding of branch connections refer welding specifications. Templates shall be used wherever required to ensure accurate cutting and proper fit-up.

For all branch connections accomplished either by pipe to pipe connections or by using forged tees the rates quoted for piping shall be inclusive of this work.

Reinforcement pads shall be provided wherever indicated in drawings/ specifications etc.

4.10 Bending


Bending shall be as per ASME B31.3 except that corrugated or creased bends shall not be used.

Cold bends for lines 1-1/2" and below, with a bend radius of 5 times the nominal diameter shall be used as required in place of elbows wherever allowed by piping specifications. Bending of pipes 2" and above may be required in some cases like that for headers around heaters, reactors etc.

The completed bend shall have a smooth surface, free from cracks, buckles, wrinkles, bulges, flat spots and other serious defects. They shall be true to dimensions. The flattening of a bend, as measured by the difference between the maximum and minimum diameters at any cross-section, shall not exceed 8% and 3% of the nominal outside diameter, for internal and external pressure respectively.

4.11 Forging and forming

Forging and forming of small bore fittings, like reducing nipples for piping 1- 1/2" and below, shall be as per ASME B 31.3.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPING FABRICATION AND ERECTION	DOCUMENT NO. BR/TS/038	Page 8 of 61
			REVISION : 0
			EDITION : 1

4.12 Mitre Bends and Fabricated Reducers

The specific application of welded mitre bends and fabrication reducers shall be governed by the Piping Material Specifications. Generally all 90 deg. mitres shall be 4-piece 3-weld type and 45 deg. mitres shall be 3-piece 2-weld type as per B&R Standard unless otherwise specified. Reducers shall be fabricated as per directions of Engineer-in-Charge. The radiographic requirements shall be as per Material Specifications for process and utility systems and NDT Specification for steam piping under IBR, radiographic requirements of IBR shall be complied with.

4.13 Cutting and Trimming of Standard Fittings & Pipes

Components like pipes, elbows, couplings, half-couplings etc. shall be cut / trimmed / edge prepared wherever required to meet fabrication and erection requirements, as per drawings and instructions of Engineer-in-Charge. Nipples as required shall be prepared from straight length piping.

4.14 Galvanised Piping

Galvanised carbon steel piping shall be completely cold worked, so as not to damage galvanised surfaces. This piping involves only threaded joints and additional external threading on pipes may be required to be done as per requirement.

4.15 Jacketed Piping

The Jacketing shall be done in accordance with B&R Specification or Licensors specification as suggested in material specification or special condition of contract.


Pre-assembly of jacketed elements to the maximum extent possible shall be accomplished at shop by Contractor. Position of jumpover and nozzles on the jacket pipes, fittings etc. shall be marked according to pipe disposition and those shall be prefabricated to avoid damaging of inner pipe and obstruction of jacket space. However, valves, flow glasses, in line instruments or even fittings shall be supplied as jacketed.

4.16 Shop Fabrication / Prefabrication

The purpose of shop fabrication or pre-fabrication is to minimise work during erection to the extent possible. Piping spool, after fabrication, shall be stacked with proper identification marks, so as facilitate their withdrawal at any time during erection. During this period all flange (gasket contact faces) and threads shall be adequately fabricated by coating with a removable rust preventive. Care shall also be taken to avoid any physical damage to flange faces and threads.

4.17 Miscellaneous

- 4.17.1 Contractor shall fabricate miscellaneous elements like flash pot, seal pot, sample cooler, supporting elements like turn buckles, extension of spindles and interlocking arrangement of valves, operating platforms as required by Engineer-in-Charge.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPING FABRICATION AND ERECTION	DOCUMENT NO. BR/TS/038	Page 9 of 61
			REVISION : 0
			EDITION : 1

4.17.2 Spun Concrete Lining

The work of inside spun concrete lining of pipes and specials of diameter 3" and above shall be done as per material specifications and special condition contract.

4.17.3 Fabrication of pipes from plate

Pipes shall be fabricated at site as and when required as per the specifications attached and the actual Piping Material Specification.

5.0 ERECTION

5.1 Cleaning of Piping before Erection

Before erection all pre-fabricated spool pieces, pipes, fittings etc. shall be cleaned inside and outside by suitable means. The cleaning process shall include removal of all foreign matter such as scale, sand, weld spatter chips etc. by wire brushes, cleaning tools etc. and blowing with compressed air/or flushing out with water. Special cleaning requirements for some services, if any shall be as specified in the piping material specification or isometric or line list. S.S jacketed piping requiring pickling shall be pickled to remove oxidation and discolouring due to welding.

5.2 Piping Routing


No deviations from the piping route indicated in drawings shall be permitted without the consent of Engineer-in-Charge.

Pipe to pipe, pipe to structure / equipments distances / clearances as shown in the drawings shall be strictly followed as these clearances may be required for the free expansion of piping / equipment. No deviations from these clearances shall be permissible without the approval of Engineer-in-Charge.

In case of fouling of a line with other piping, structure, equipment etc. the matter shall be brought to the notice of Engineer-in-Charge and corrective action shall be taken as per his instructions.

5.3 Cold Pull

Wherever cold pull is specified, the Contractor shall maintain the necessary gap, as indicated in the drawing. Confirmation in writing shall be obtained by the Contractor from the Engineer-in-Charge, certifying that the gap between the pipes is as indicated in the drawing, before drawing the cold pull. Stress relieving shall be performed before removing the gadgets for cold pulling.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPING FABRICATION AND ERECTION	DOCUMENT NO. BR/TS/038	Page 10 of 61
			REVISION : 0
			EDITION : 1

5.4 Slopes

Slopes specified for various lines in the drawings / P&ID shall be maintained by the Contractor. Corrective action shall be taken by the Contractor in consultation with Engineer-in-Charge wherever the Contractor is not able to maintain the specified slope.

5.5 Expansion Joints / Bellows

Installation of Expansion Joints/Bellows shall be as follows:

- All Expansion joints / Bellows shall be installed in accordance with the specification and installation drawings, supplied to the Contractor.
- Upon receipt, the Contractor shall remove the Expansion Joints/ Bellows from the case(s) and check for any damage occurred during transit.
- The Contractor shall bring to the notice of the Engineer-in-Charge any damage done to the bellows / corrugations, hinges, tie-rods, flanges / weld ends etc.
- Each Expansion Joint / Bellow shall be blown free of dust / foreign matter with compressed air or cleaned with a piece of cloth.
- For handling and installation of Expansion Joints, great care shall be taken while aligning. An Expansion Joints shall never be slinged from bellows corrugations / external shrouds, tie / rods, angles.
- An Expansion Joints / Bellow shall preferably be slinged from the end pipes / flanges or on the middle pipe.
- All Expansion Joints shall be delivered to the Contractor at "Installation length", maintained by means of shipping rods, angles welded to the flanges or weld ends or by wooden or metallic stops.
- Expansion Joints stop blocks shall be carefully removed after hydrostatic testing. Angles welded to the flanges or weld ends shall be trimmed by saw as per manufacturer's instructions and the flanges or weld ends shall be ground smooth.
- The pipe ends in which the Expansion Joint is to be installed shall be perfectly aligned or shall have specified lateral deflection as noted on the relevant drawings.
- The pipe ends / flanges shall be spaced at a distance specified in the drawings.
- The Expansion Joint shall be placed between the mating pipe ends / flanges and shall be tack welded/bolted. The mating pipes shall again be checked for correct alignment.
- Butt-welding shall be carried out at each end of the expansion joint. For flanged Expansion Joint, the mating flanges shall be bolted.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPING FABRICATION AND ERECTION	DOCUMENT NO. BR/TS/038	Page 11 of 61
			REVISION : 0
			EDITION : 1

- After the Expansion Joint is installed the Contractor shall ensure that the mating pipes and Expansion Joints are in correct alignment and that the pipes are well supported and guided.
- The Expansion Joint shall not have any lateral deflection. The Contractor shall maintain parallelism of restraining rings or bellows convolutions.
- Precautions
 - For carrying out welding, earthing lead shall not be attached with the Expansion Joint.
 - The Expansion bellow shall be protected from arc weld spot and welding spatter.
 - Hydrostatic Testing of the system having Expansion Joint shall be performed with shipping lugs in position. These lugs shall be removed after testing and certification is over.

5.6 Flange Connections

While fitting up mating flanges, care shall be exercised to properly align the pipes and to check the flanges for trueness, so that faces of the flanges can be pulled together, without inducing any stresses in the pipes and the equipment nozzles. Extra care shall be taken for flange connections to pumps, turbines, compressors, cold boxes, air coolers etc. The flange connections to these equipments shall be checked for misalignment, excessive gap etc. after the final alignment of the equipment is over. The joint shall be made up after obtaining approval of Engineer-in-Charge.


Temporary protective covers shall be retained on all flange connections of pumps, turbines, compressors and other similar equipments, until the piping is finally connected, so as to avoid any foreign material from entering these equipments.

The assembly of a flange joint shall be done in such a way that the gasket between these flange faces is uniformly compressed. To achieve this the bolts shall be tightened in a proper sequence. All bolts shall extend completely through their nuts but not more than 1/4".

Steel to C.I. flange joints shall be made up with extreme care, tightening the bolts uniformly after bringing flange flush with gaskets with accurate pattern and lateral alignment.

5.7 Vents and Drains

High point vents and low point drains shall be provided as per the instructions of Engineer-in-Charge, even if these are not shown in the drawings. The details of vents and drains shall be as per piping material specifications / job standards.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPING FABRICATION AND ERECTION	DOCUMENT NO. BR/TS/038	Page 12 of 61
			REVISION : 0
			EDITION : 1

5.8 Valves

Valves shall be installed with spindle / actuator orientation / position as shown in the layout drawings. In case of any difficulty in doing this or if the spindle orientation / position is not shown in the drawings, the Engineer-in-Charge shall be consulted and work done as per his instructions. Care shall be exercised to ensure that globe valves, check valves, and other uni-directional valves are installed with the "Flow direction arrow" on the valve body pointing in the correct direction. If the direction of the arrow is not marked on such valves, this shall be done in the presence of Engineer-in-Charge before installation.

Fabrication of stem extensions, locking arrangements and interlocking arrangements of valves (if called for), shall be carried out as per drawings / instructions of Engineer-in-Charge.

5.9 Instruments

Installation of in-line instruments such as restriction orifices, control valves, safety valves, relief valves, rotameters, orifice flange assembly, venturimeters, flowmeters etc. shall form a part of piping erection work.

Fabrication and erection of piping upto first block valve / nozzle / flange for installation of offline Instruments for measurement of level, pressure, temperature, flow etc. shall also form part of piping construction work. The limits of piping and instrumentation work will be shown in drawings / standards / specifications. Orientations / locations of take-offs for temperature, pressure, flow, level connections etc. shown in drawings shall be maintained.

Flushing and testing of piping systems which include instruments mentioned above and the precautions to be taken are covered in flushing, testing and inspection of piping. Care shall be exercised and adequate precautions taken to avoid damage and entry foreign matter into instruments during transportation, installation, testing etc.

5.10 Line Mounted Equipments / Items


Installation of line mounted items like filters, strainers, steam traps, air traps, desuperheaters, ejectors, samples coolers, mixers, flame arrestors, sight glasses etc. including their supporting arrangements shall form part of piping erection work.

5.11 Bolts and Nuts

The Contractor shall apply moly coat grease mixed with graphite powder (unless otherwise specified in piping classes) all bolts and nuts during storage, after erection and wherever flange connections are broken and made-up for any purpose whatsoever. The grease and graphite powder shall be supplied by the Contractor within the rates for piping work.

5.12 Pipe Supports

Pipe supports are designed and located to effectively sustain the weight and thermal effects of the piping system and to prevent its vibrations. Location and design pipe supports will be shown in drawing for lines 2" NB. However, any extra supports desired by Engineer-in-Charge

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPING FABRICATION AND ERECTION	DOCUMENT NO. BR/TS/038	Page 13 of 61
			REVISION : 0
			EDITION : 1

shall also be installed.

No pipe shoe / cradle shall be offset unless specifically shown in the drawings.

Hanger rods shall be installed inclined in a direction opposite to the direction in which the pipe move during expansion.

Preset pins of all spring supports shall be removed only after hydrostatic testing and insulation is over. Springs shall be checked for the range of movement and adjusted if necessary to obtain the correct positioning in cold condition. These shall be subsequently adjusted to hot setting in operating condition. The following points shall be checked after installation, with the Engineer-in-Charge and necessary confirmation in writing obtained certifying that :

- All restraints have been installed correctly.
- Clearances have been maintained as per support drawings.
- Insulation does not restrict thermal expansion.
- All temporary tack welds provided during erection have been fully removed.
- All welded supports have been fully welded.

6.0 **WELDING**

Welding of pipelines shall be done as per applicable codes and **Annexure-1**

7.0 **ERECTION**

7.1 **Pre-fabrication and Field Assembly**


Extent of pre-fabrication shall be purely at the discretion of CONTRACTOR keeping in view the following :-

7.1.1 Field joint shall be decided by CONTRACTOR keeping in view the transportation of pre-fabricated pieces to site.

7.1.2 There can be some variations in the dimensions and level appearing in the arrangement drawings and those actually occurring at site due to minor variations in the location of equipments, structures, cut out etc. Adequate field joints shall be provided, permitting assembly and erection of pipe work without major modification.

7.2 **Supporting**

Location and design of pipe supports shown in approved drawings and support drawings shall be strictly followed.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPING FABRICATION AND ERECTION	DOCUMENT NO. BR/TS/038	Page 14 of 61
			REVISION : 0
			EDITION : 1

7.2.1 Supports shall be installed in such a way that they do not contribute to over stressing of a line.

7.2.2 Fabrication and erection of additional supporting elements and structural fixtures which in COMPANY's view are required for proper supporting of the system, shall be carried out by CONTRACTOR at no extra cost.

7.2.3 All temporary supports, elements required for alignment, erection and assembly shall be removed after completion of work.

7.3 **Equipment hook-up**

7.3.1 Prior to hook-up, the alignment and trueness of flange faces shall be checked to ensure that no undue stresses shall be induced in the system while hooking up.

8.0 **INSPECTION**

8.1

8.2 CONTRACTOR shall provide all facilities/ assistance to COMPANY for proper execution of their inspection without any extra charge.


8.3 All piping work shall be subjected to inspection by COMPANY at any time during fabrication. CONTRACTOR shall furnish to COMPANY detailed work programme sufficiently in advance, in order to enable COMPANY to arrange for inspection.

9.0 **PROTECTIVE COATING**

9.1 All above ground piping system shall be applied with protective coating in accordance with specification for shop & field painting.

9.2 All under ground portion of piping system shall be coated with three layer P.E. coating. CONTRACTOR shall prepared procedure for epoxy painting of buried pipeline for approval of COMPANY. Procedure shall include surface preparation, brand and type of coating to be adopted. Coating of pipes shall not commence without approval of coating procedure. Total dry film thickness to be achieved shall not be less than 300 microns. Compatible primer and finish coat as recommended by coating manufacturer shall only be applied. Coating integrity shall be checked by "Holiday detector" over full length of coated pipe work. Coating to be supplied by CONTRACTOR shall be suitable for design temperature.

9.3 Once the coating has been accepted by COMPANY, backfilling operation can be started. In order to protect coated pipe from damage, the excavated trench shall be examined for stone, rock and any other hard substance detrimental to coating. All such substances shall be removed before lowering the pipe in the trench. COMPANY may ask for a 100mm padding of clear sand under and above pipeline in rocky or otherwise hard soil areas. No additional payment on account of padding shall however be admissible.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPING FABRICATION AND ERECTION	DOCUMENT NO. BR/TS/038	Page 15 of 61
			REVISION : 0
			EDITION : 1


10.0 **FLUSHING**

Completed piping systems shall be flushed by CONTRACTOR with fresh water, to clean the pipe of all dirt, debris, and foreign material. CONTRACTOR shall prepare a procedure for flushing of the system for approval of COMPANY. Flushing shall not be commenced without approval of flushing procedure.


- 10.1 CONTRACTOR shall perform all activities like dismantling and reinstalling of all strainers, in line instruments etc. before and after completion of flushing.
- 10.2 Flushing shall be considered as complete only after inspection and approval by COMPANY.
- 10.3 Disposal of muck and flushing media shall be arranged by CONTRACTOR as directed by COMPANY, in such a manner that it does not spoil the adjacent installation. CONTRACTOR shall obtain COMPANY approval regarding the place and method to be adopted for disposal of debris.
- 10.4 Record of flushing giving following details shall be submitted by CONTRACTOR to COMPANY for its approval and records :
 - a) Date of flushing
 - b) Identification of line : flushed-line number

11.0 **HYDROSTATIC TESTING**

- 11.1 Completed piping system as approved by COMPANY shall be hydrostatically tested in the presence of COMPANY. The general requirements of hydrostatic testing shall be in accordance with codes specified in section 2.0.
- 11.2 CONTRACTOR shall prepare hydrostatic test procedure based on specified codes. The hydrostatic test shall commence only after approval of procedure by COMPANY.
- 11.3 Piping system shall be hydrostatically tested to a pressure corresponding to 1.4 times the design pressure.
- 11.4 Fresh water shall be used as test media. CONTRACTOR shall locate the source of water supply and arrange for transportation of water to test site. CONTRACTOR shall arrange at his own cost the water analysis and confirm that water is suitable for testing. In case any corrosion inhibitor is to be added, the same shall be done after approval of COMPANY.
- 11.5 Lines repaired subsequent to hydrostatic test shall be retested using the same procedure as originally adopted. However COMPANY may waive such retest in case of minor repairs by taking precautionary measures to ensure sound construction.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPING FABRICATION AND ERECTION	DOCUMENT NO. BR/TS/038	Page 16 of 61
			REVISION : 0
			EDITION : 1

- 11.6 All equipment and instruments used for hydrostatic test shall be approved by COMPANY before start of tests.
- 11.7 Pressure gauges shall be installed on line to measure test pressures. In case of longer lines two or more pressure gauges shall be installed as directed by COMPANY. One gauge shall be installed at the discharge of the pressurising pump. Pressure gauge used for hydrostatic testing shall be calibrated with dead weight tester in the presence of Engineer-in-charge. Range of pressure gauge shall generally be 1.5 times the test pressure.
- 11.8 Orifice plates and restriction orifices shall not be installed until hydrostatic testing is completed. Temporary gaskets shall be used during testing.
- 11.9 First block valve of pressure instruments shall be half open & plugged at the time of hydrostatic testing. Temperature connections shall be blanked off during testing.
- 11.10 All equipments, in line instruments, relief valves shall be disconnected from piping system by means of blinds during testing. Control valves shall be replaced by spool pieces during testing.
- 11.11 High point vents and low point drain required for testing in addition to those marked in the drawings shall be provided by CONTRACTOR at his own cost.
- 11.12 All welded and screwed joints shall be kept clean for detecting leaks during testing.
- 11.13 Test pressure shall be maintained long enough to facilitate complete inspection of the system. Minimum duration of test shall be 6 hours unless otherwise specified. Pressurising equipment shall be isolated immediately after test pressure is attained.
- 11.14 After successful completion of hydrostatic testing, the piping system shall be dewatered. All lines shall be completely dried using compressed air. CONTRACTOR shall make his own arrangement for supply of compressed air. Drying of lines shall be considered complete on approval by COMPANY.
- 11.15 **Test Records**
- The records in duplicate shall be prepared and submitted by CONTRACTOR as below :
-) Date of test
 -) Identification of pipe tested - line number
 -) Test pressure
 -) Test results
 -) Signature of CONTRACTOR
 -) Approval signature by COMPANY.

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPING FABRICATION AND ERECTION	DOCUMENT NO. BR/TS/038	Page 17 of 61
			REVISION : 0
			EDITION : 1

ANNEXURE-1

WELDING SPECIFICATION

1.0

GENERAL

This specification shall be followed for the fabrication of all types of welded joints of carbon steel above ground natural gas service piping systems.

The welded pipe joints shall include the following :

- a) All line pipe joints of the longitudinal and circumferential butt welded.
- b) Attachments of castings, forgings, flanges.
- c) Welded manifold headers and other sub-assemblies
- d) Welded branch connections with or without reinforcing pads.
- e) Joints in welded/ fabrication piping components.
- f) The attachments of smaller connections for vents drain drips and other instrument tapings.

Any approval granted by the Engineer-in-charge or owner's inspectors shall not relieve the contractor of his responsibilities & guarantees.

1.1


Applicable Codes & Standards

All welding work, equipments for welding, heat treatment, other auxiliary functions and the welding personnel shall be as per the requirements of the latest editions of the following approved standards and procedures :-

- i) Code for gas transmission and distribution piping systems. ANSI B31.8.
- ii) Code for petroleum refinery piping, ANSI B31.3.

In addition, the following codes/ specifications referred to in the relevant code of fabrication shall be followed for the welding/ brazing qualifications, consumable qualifications and non destructive test procedures.

- i) Standard for welding of pipelines and related facilities API-1104.
- ii) Material Specifications - Welding rods, electrodes and filler materials - ASME Sec. - IIC.
- iii) Code for non destructive examination ASME Sec-V.
- iv) Qualification standard for welding and brazing procedure and welders, brazers, welding and brazing operators - ASME Sec-I

BRIDGE AND ROOF CO. (I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPING FABRICATION AND ERECTION	DOCUMENT NO. BR/TS/038	Page 18 of 61
			REVISION : 0
			EDITION : 1


In the event of any difference due to the additional requirements mentioned in this specification, over and above those obligation as per codes, this specification shall be binding.

1.2 **Base Material**

- a) In general carbon steel is used in this plant. The details of material specifications are given in the welding Specification Chart.
- b) The contractor shall provide the Manufacturer's test certificates for every heat of the materials supplied by him.

1.3A **Filler Materials**

- a) The Contractor shall provide all the necessary welding electrodes, filler materials, etc. required for the execution of the work.
- b) The welding electrodes/ filler wires supplied by the Contractor shall conform to the class specified in the welding specification chart. The materials shall be of the make approved by the Engineer-in-charge.
- c) The electrode shall be suitable for the welding process recommended and base metal used. Unless otherwise specified physical properties of the welds produced by a electrode recommended for the welding of a particular base metal shall not be lower than the minimum values specified for the base metal and shall correspond to the physical properties of the class of electrode adopted. The choice of electrode shall be made after conducting the required tests on the electrodes as per relevant standards, and shall be the sole prerogative of the Engineer-in-charge.
- d) Tungsten electrodes used shall conform to ASME Sec. II C SFA 5. 12 specification. Thoriated Tungsten electrodes shall not be permitted due to possible radiation hazard. Instead, ceriated Tungsten Electrodes (EWCe-2 or equivalent) shall be used for GTA Welding.
- e) Electrode qualification test records should be submitted as per the **Exhibit-A** (attached) in respect of the electrodes tested by the contractor, for obtaining the approval of the Engineer-in-charge.
- f) The Contractor shall submit batch test certificate from the electrode Manufacturers giving details of physical and chemical tests carried out by them, for each batch of electrodes to be used.
- g) All electrodes shall be purchased in sealed containers and stored properly to prevent deterioration. The electrodes removed from the containers shall be kept in holding ovens at temperature recommended by the electrode Manufacture. Out-of-the oven time of electrodes before they are consumed shall not exceed the limits recommended by the electrodes manufacturer. The electrodes shall be handled with care to avoid any damage to flux covering.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97< B=75@GD97= 75H-CB		
	C=@/ ; 5G		
TITLE	D=D-B; : 56F=75H-CB 5B8 9F 97H-CB	DOCUMENT NO. BR/TS/38	Page 19 of 61
			REVISION : 0
			EDITION : 1


- h) All low hydrogen type of electrodes shall be rebaked at 350 °C for 1 hour minimum and stored in ovens kept at 80-100°C before use. Recommendations of the electrode Manufacturer shall be followed if available.
- i) The electrodes, filler wires and flux used shall be free from rust, oil, greases, earth and other foreign matter which can affect the quality of welding.

1.3B G< =9@B-B; / DI F; -B; ; 5G

- a) Argon gas used in GTA welding for shielding purposes shall be 99.99 pure. The purity of the gas shall be certified by the manufacturer. The rate of flow for shielding purposes shall be established through procedure qualification tests. Normally this rate may be 12-20 CFH.
- b) Argon gas with a purity level of 99.995 shall be used for purging.
- c) When GTAW process alone or a combination of GTA and SMAW processes is recommended for the production of a particular joint, the purging shall be maintained during the root pass and for the first filling pass to minimize oxidation on the inner side of the pipe, unless otherwise specified in Welding Specification Chart.
- d) Initial purging shall be maintained for sufficient period of time so that at least 4-5 times the volume between the dams is displaced, in order to completely remove the entrapped air. In no case should the initial purging period be less than 10 minutes. High gas pressure should be avoided.
- e) After initial purging, the flow of the backing gas should be reduced to a point where only a slight positive pressure prevails. For systems, which have a small volume (up to 1/2 cubic foot) to be purged, a gas flow rate of 6-CFH is usually adequate. Systems of larger volume may require higher flow rates and these should be established during procedure qualification tests.
- f) Gas backing (purging) is not required for socket type of welded joints.
- g) Dams, used for conserving inert gas during purging, shall be removed after completion of the welding, and shall be accounted for. Wherever, removal of dams is not possible after welding, use of water-soluble dams should be made.

1.4 K YX]b[7cbg a UVYg

The Contractor shall provide at his own expense all the welding consumables necessary for the execution of the job such as electrodes filler wires, oxygen, acetylene, etc. and these should bear the approval of the COMPANY.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ' ; 5G'		
TITLE	D=D=B; ' : 56F =75H-CB '5B8' 9F 97H-CB'	DOCUMENT NO. BR/TS/38	Page 20 of 61
			REVISION : 0
			EDITION : 1

1.5' . 9ei Jda Ybhi/ '5WWggcf]Yg

- 1.5.1 The Contractor should have the arrangement of sufficient number of welding and cutting equipments, auxiliaries and accessories of sufficient capacities so as to meet the target schedule.
- 1.5.2 All the equipment for performing the heat treatment, including transformers, thermocouples, flow meters, automatic temperature recorders with suitable calibration arrangement etc. shall be provided by the Contractor, at his own expense and these should bear the approval of the COMPANY .
- 1.5.3 Contractor shall make necessary arrangements at his own ex pense for providing the radiographic equipment, radiographic films, and all the equipment/ materials required for carrying out the dye penetrant/ magnetic particle test for satisfactory and timely completion of the job.
- 1.5.4 Redoing of any work necessitated by faulty equipments or operation used by the Contractor, will be done at his own expense.

1.6' . K YX]b['DfcWggYg

- 1.6.1 Welding of various materials under this specification shall be carried out using Shielded Metal Arc Welding (SMAW) Process with the approval of the Engineer-in-charge.
- 1.6.2 The welding processes to be employed are given in the welding specification chart. Any deviation desired by the Contractor shall be obtained through the express consent of the Engineer-in-charge.
- 1.6.3 Automatic and semi-autom atic welding proce sses shall be employed only with the express approval of the Engineer-in-charge. The welding procedure adopted and consumables used shall be specifically approved.
- 1.6.4 A combination of different welding processes or a could be employed for a particular joint only after duly qualifying the welding procedure as per the requirements of code of fabrication to be adopted and obtaining the approval of the Engineer-in-charge.


1.7' . 9bX'DfYdUFU]cb

1.7.1' . 9bX'DfYdUFU]cb

The edges to be welded shall be prepared to meet the joint design requirements by gas cutting, machining or grinding method. After gas cutting, oxides shall be removed by chipping or grinding.

1.7.2' . 7YUb]b[

- a) The ends to be welded shall be properly cleaned to remove paint, oil, greases, rust, oxides, sand, earth and other foreign matter. The ends shall be

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	D=D-B; : 56F =75H-CB '5B8' 9F 97H-CB'	DOCUMENT NO. BR/TS/38 '	Page 21 of 61
			REVISION : 0
			EDITION : 1

completely dry before the welding commences.

- b) On completion of each run, craters, welding irregularities, slag etc., shall be removed by grinding and chiseling. Wire brushes used for cleaning stainless steel joints shall have stainless steel wires and the grinding wheels used for grinding stainless steel shall be of a suitable type. Separate grinding wheels and wire brushes should be used for carbon steels and stainless steels.

1.8' 5'[ba YbhUbX'GdUM]b[

- a) Prior to alignment, the contractor shall inspect the pipe ends inside and outside for damage, dents, laminations etc. Pipe for welding shall be set up correctly spaced. Temporary attachment of any kind shall not be welded. Every effort shall be made to reduce misalignment by the use of clamp and rotation of pipes to the best fit. For pipes of same nominal wall thickness, the offset should not exceed 1.6mm. Any branch connections sleeve shall be at least 150mm from any other weld. The welds for fitting shall be so located that top of the weld shall not come within 50mm of any other weld. The use of internal line up clamps is mandatory for diameters 10 and above. However, in case where it is impossible to use internal line up clamp, external line up clamp may be used.
- b) Tack welds, for maintaining the alignment, of pipe joints shall be made only by qualified welders using approved WPS. Since the tack welds become part of the final weldment they shall be executed carefully and shall be free from defects. Defective tack welds must be removed prior to the actual welding of the joints.

1.9' K YUH Yf'7cbX]hcbg


1.9.1 The parts being welded and the welding personnel should be protected from rain and strong winds. In the absence of such a protection no welding shall be carried out.

1.9.2 During field welding using GTAW process, particular care shall be exercised to prevent any air current affecting the welding process.

1.10' K Y'X]b[

1.10.1' F cchDUgg

- a) Root pass shall be made with electrodes/ filler wires recommended in the welding specification chart. The preferable size of the electrode is 2.5mm diameter (12 SWG) but in no case greater than 3.25mm (10 SWG).
- b) Uphill welding shall be adopted for welding pipes weld fixed with its axis horizontal. Downward technique of welding shall not be used for welding of pipes in horizontal position, unless specifically permitted by Engineer-in-charge for a particular case.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 'H97<B=75@GD97= =75H-CB ''		
	C=@/ ' ; 5G'		
TITLE	D=D=B; ' : 56F =75H-CB '5B8 ' 9F 97H-CB'	DOCUMENT NO. BR/TS/38 '	Page 22 of 61
			REVISION : 0
			EDITION : 1


- c) The root pass of butt joints should be executed properly so as to achieve full penetration with complete fusion of the root edges. Weld projection inside the pipe shall not exceed .4mm wherever not specified by the applicable code.
- d) Any deviations desired from the recommended welding technique and electrodes indicated in the welding specification chart should be adopted only after obtaining express approval of the Engineer-in-charge.
- e) Welding shall be continuous & uninterrupted during a pass.
- f) On completion of each run, craters, welding irregularities, slag etc., shall be removed by grinding and chiselling.
- g) While the welding is in progress care should be taken to avoid any kind of movement of components, to prevent occurrence of weld cracks.
- h) Fillet welds shall be made by shielded metal arc/ GTAW welding process irrespective of the thickness and class of piping.
- i) Peening shall not be used unless specified in the welding specification chart.

1.10.2' >c]bh7ca d'Yh]cb

- a) Joint shall be completed using the class of filler wires/ electrodes, recommended in the welding specification chart. Size of the electrode shall not exceed 4 mm in diameter for stainless steels and alloy steels used for low temperature applications.
- b) Two weld beads shall not be started at the same point in different layers.
- b) Butt joints shall be completed with a cover layer that would effect good cover at the joint edge and a gradual notch free surface.
- d) Each weld joints should have a workman like finish.
- e) Weld identification mark shall be stamped clearly at each joint, just adjacent to the weld. Metal stamping shall not be used on the thin wall pipe. Suitable paint shall be used on thin wall pipes for identification.
- f) No painting shall be done until the weld joint has been hydrostatically tested.

1.10.3 8]gg]a]Uf'K Y'Xg'

Where welds are to be produced between carbon steels and alloy steels, preheat and post weld heat treatment requirements shall be those specified for corresponding alloy steels and filler wire / electrodes shall correspond to ER 70 S-G or AWS E-7016/7018 type. For welds between two dissimilar Cr-Mo low alloy steels, preheat and post weld

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97<B=75@GD97=75H-CB		
	C=@/ ; 5G		
TITLE	D=D-B; : 56F=75H-CB 5B8 9F 97H-CB	DOCUMENT NO. BR/TS/38	Page 23 of 61
			REVISION : 0
			EDITION : 1

heat treatments shall be those specified for higher alloy steel and electrodes used shall correspond to those specified for steel of lower alloy content. For carbon steel or alloy steel to stainless welds, use of filler wire / electrodes E/ER-309/E-310/E NiCr Fe-3 shall be made. The welding procedure, electrodes / filler wires to be used shall be approved by the Engineer-in-Charge.

1.11 < YUHFYUha Ybh

1.11.1 DfY\ YUhb[


- Preheating requirements for the various materials shall be as per the welding specification chart attached. No welding shall be carried out without preheating the joint to 10 C (50 F) when the ambient temperature is below 10 degree.
- Preheating shall be performed using resistance or induction heating methods. Preheating by gas burners, utilising any acetylene or oxy-propane gas mixtures, with neutral flame may also be carried out when permitted by the Engineer-in-charge.
- Preheating shall extend uniformly to atleast three times the thickness of the joint, but not less than 50mm, on both sides of the weld.
- Preheating temperature shall be maintained over the whole length of the joint during welding. Temperature indicating crayons or other temperature indicating devices shall be provided by the contractor to check the temperature.
- Preheating temperature shall be maintained over the whole length of the joint during welding. Temperature recorders shall be provided by the Contractor to record the temperature.

1.11.2 Dcgh< YUhb[

In case of alloy steel materials such as Cr -Mo steels, if the post weld heat treatment is not performed immediately after welding, the weld joint and adjacent portion of pipe, at least 50 mm on either side of weld, shall be uniformly heated to 300 c. This temperature shall be maintained for half an hour minimum, and then wrapped with mineral wool before allowing it to cool to room temperature. If the Post Heating temperature specified in the Welding Specification Charts exceeds 300 C, the same shall be followed. Similarly, if the welding specification chart specifies post-heat time, the same shall be applicable. Post weld heat treatment as specified in the Welding Specification Chart shall be carried out later on.


1.11.3 Dcghk Y'X'< YUHFYUha Ybh

- Post weld heat treatment, wherever required for joints between pipes, pipes and fittings, pipe body and supports shall be carried out as per the relevant specifications, applicable standards and the instructions of the Engineer-in-charge. In this regard procedure qualification to be done before carrying out

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97<B=75@GD97= =75H-CB "		
	C=@/ ; 5G		
TITLE	D=D-B; : 56F=75H-CB '5B8' 9F 97H-CB "	DOCUMENT NO. BR/TS/38	Page 24 of 61
			REVISION : 0
			EDITION : 1

PWHT in production welds.

- b) The heat treatment of welded joints shall be carried out as per the requirements laid down in ANSI B31.8 and welding specification chart.
- c) The contractor shall submit for the approval of the Engineer-in-charge, the details of the post weld heat treatment procedure, as per **9 \Mh T6fi** attached, that the propose to adopt for each of the materials/ assembly/ part involved, well before carrying out actual heat treatment.
- d) Post weld heat treatment shall be done by using an electric resistance or induction heating equipment as decided by the Engineer-in-charge.
- e) While carrying out local post weld heat treatment, technique of application of heat must ensure uniform temperature attainment at all points of the portion being heat treated. Care shall be taken to ensure that width of treated band over which specified post weld heat treatment is carried out, the temperature attained is atleast as that specified in the relevant applicable standards/ codes.
- f) Throughout the cycle of heat treatment, the portion outside the heated band shall be suitably wrapped under insulation so as to avoid any harmful temperature gradient at the exposed surface of pipe . For this purpose temperature at the exposed surface of the pipes should not be allowed to exceed 400°C.
- g) The temperature attained by the portion under heat treatment shall be recorded by means of thermocouple pyrometers. Adequate number of thermocouples should be attached to the pipe directly at the equally spaced location along the periphery of the pipe joint. The minimum number of thermocouples attached per joint shall be 1 upto 6 dia, 2 upto 10 dia and 3 upto 12 and above. However the Engineer-in-charge can increase the required minimum number of thermocouples to be attached if found necessary.
- h) Automatic temperature recorders which have been duly calibrated should be employed. The calibration chart of each recorder should be submitted to the Engineer-in-charge prior to starting the heat treatment operation and his approval should be obtained.
- i) Immediately on completion of the heat treatment, the post weld heat treatment charts/ records alongwith the hardness test results on the weld joints (whenever required as per the welding specification chart), shall be submitted to Engineer-in-charge for his approval.
- j) Each joint shall bear an identification number which shall be maintained in the piping sketch to be prepared by the contractor. The joint identification number should appear on the corresponding post weld heat treatment charts. The same identification numbers shall also be followed for identification for corresponding radiographic films. The chart containing the identification

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 'H97<B=75@GD97= =75H-CB ''		
	C=@/ ' ; 5G'		
TITLE	D=D-B; ' : 56F =75H-CB '5B8 ' 9F 97H-CB'	DOCUMENT NO. BR/TS/38 '	Page 25 of 61
			REVISION : 0
			EDITION : 1

numbers and piping sketch shall be submitted to the Engineer-in-charge in suitable folders.

- k) The hardness of the heat affected zone as well as of the weld metal, after heat treatment, shall be measured using suitable hardness tester and shall not exceed the maximum hardness specified in the welding specification chart. The weld joint shall be subjected to re-heat treatment when hardness measured exceeds the specified limit, at the contractors own expenses.
- l) The contractor shall arrange for the hardness testing and shall maintain the records of all joints tested. These records shall be checked by the plant Owner's inspector.

1.12' ' 7'YUbb['cZH\Y'K Y'X'>c]bhg

All weld joints shall be free from adherent weld spatter, slag, dirt or foreign matter. This can be achieved by brushing.


1.13' ' =bgdYVb]cb/ 'HYgh]b[

1.13.1' ' ; YbYfU

- a) The owners inspector shall have free access to all concerned areas, where the actual work is being performed. The contractor shall also offer the Owner's inspector all means and facilities necessary for carrying out inspection.
- b) The owner is entitled to depute his own inspector to the shop or field where pre-fabrication and erection of pipelines are being done with (but not limited to) the following objectives :-
 - i. To check the conformance to relevant standards and suitability of various welding equipments and the welding performance.
 - ii. To supervise the welding procedure qualification.
 - iii. To supervise the welder performance qualifications.
- c) Contractor shall intimate sufficiently in advance the commencement of qualification tests welding works and acceptance tests, to enable the plant owners inspector to be present to supervise them.

1.13.2' ' K Y'X]b['DfcWXi fY'E i U']ZVb]cbg

- a) Welding Procedure qualification shall be carried out in accordance with the relevant requirements of API 1104/ ASME Sec-IX or other applicable codes and other job requirements by the contractor at his expense. The contractor shall submit the welding procedure specifications in format as per 9 \M]H7' (attached) immediately after the receipt of the order.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97<B=75@GD97= =75H-CB ''		
	C=@/ ; 5G'		
TITLE	D=D=B; ; 56F =75H-CB '5B8' 9F 97H-CB'	DOCUMENT NO. BR/TS/38	Page 26 of 61
			REVISION : 0
			EDITION : 1


- b) COMPANYS inspector will review, check and approve the welding procedure submitted and shall release the procedure for procedure qualification tests. The procedure qualification test shall be carried out by the Contractor under field conditions at this own expense. A complete set of test results in format as per 9 \JH 8' (attached) shall be submitted to the COMPANYS inspector for approval immediately after completing the procedure qualification test and atleast 2 weeks before the commencement of actual work. Standard tests as specified in the code shall be carried out in all cases. In addition to these tests, other tests like radiography, macro/ micro examination, hardness testers, dye penetrant examination, Charpy V-notch etc. shall be carried out on specimens. It shall be the responsibility of the contractor to carry out all the tests required to the satisfaction of the COMPANYS Inspector. The destructive testing of welded joints shall be as per 5bbYI i fY! & and ASME Sec-IX.

1.13.3 K YXYffgE i U]ZVMHcb

- a) Welders shall be qualified in accordance with the API 1104/ ASME IX and other applicable codes by the contractor at his expense. The butt weld test pieces of the qualification test shall meet the radiographic tests requirements as mentioned in this specification. The COMPANYS inspector shall witness the test and certify the qualification of each welder separately. Only those welders who have been approved by the COMPANYS inspector shall be employed for welding. Contractor shall submit the welder qualification test reports in the standard format and obtain express approval, before commencement of the work. No welder shall be permitted to work without the possession of the identify card. It shall be the responsibility of contractor to carry out ualification tests of welders.
- b) The welders shall always have in their possession the identification card as shown in 9 \JH 9 and shall produce it on demand by the COMPANYS Inspector. It shall be the responsibility, of the Contractor to issue the identify cards after it has been duly certified by the COMPANY. If a welder is found to perform a type of welding for which he is not qualified, he shall be debarred from doing any further work. All welds performed by an unqualified welder shall be cut and redone by a qualified welder at the expense of the Contractor.

1.13.4 J Jgi U'=bgdYVMcb

Inspection of all welds shall be carried out by COMPANY as per the latest editions of the applicable codes and specifications. All finished welds shall be visually inspected for parallel and axial alignment of the work, excessive reinforcement, concavity of welds, shrinkage, cracks, under cuts, dimensions of the weld, surface porosity and other surface defects. Under-cutting adjacent to the completed weld shall not exceed the limits specified in the applicable standard/ code.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ `; 5G`		
TITLE	D=D-B; `: 56F =75H-CB '5B8` 9F 97H-CB`	DOCUMENT NO. BR/TS/38	Page 27 of 61
			REVISION : 0
			EDITION : 1

1.13.5'' Bcb!XYgfi Vlj Y'9 Ua]bU]cb

The non destructive examination shall mainly consist of examination using x-ray radiography as detailed in **5bbYI i fY! ("**

Radiographic examination of one hundred percent (100 %) girth welds will be required by the COMPANY . Welds shall meet the standards of accept ability as set forth in API 1104 and as per the requirements laid in subsequent paragraphs.

The CONTRACTOR shall make all the arrangements for the radiographic examination of work covered by this specification at his expense.

The COMPANY will review all the radiographs of welds and inform the CONTRACTOR regarding unacceptable welds. The decision of the COMPANY shall be final and binding in this regard.


All requirements mentioned in the specification shall be arranged and executed by the CONTRACTOR through his own resources. In addition, for pipes with wall thickness 9.5mm and above, ultrasonic inspection is required in the following cases as per **5bbYI i fY!'** of this specification.

- On the first 100 welded joints corresponding to each automatic (GTAW/ GMAW) welding procedure used.
- When 20mm or more are cut from the pipe end as supplied, the ends shall be ultrasonically inspected for an additional length of 20mm to ensure no lamination exist.
- When welds are repaired.
- When in the opinion of COMPANY, ultrasonic inspection is required to confirm or clarify defects indicated by radiography.
- When automatic procedure is used at least 10cm on each weld shall be ultrasonically inspected at COMPANY's discretion.

In addition, ultrasonic inspection may be required for certain critical weldings of the pipeline (i.e. tie-ins, welding of valves, flanges) randomly selected at COMPANY's discretion. All fillet and groove welds other than that radiographed shall be subjected to dye penetrant/ MP inspection. The non destructive test system used for inspecting welds must be approved by the COMPANY .

Weld quality is judged on the basis of the acceptability criteria mentioned below :

Any weld which as a result of radiographic and / or ultrasonic examination in the opinion of COMPANY **YI \M]hg** imperfections greater than the limits stated in API-1104 latest edition or as superseded in this article shall be considered defective and shall so be marked with an identification paint marker.


BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	D=D=B; ; 56F =75H-CB '5B8' 9F 97H-CB'	DOCUMENT NO. BR/TS/38	Page 28 of 61
			REVISION : 0
			EDITION : 1

In addition to the API-1104 requirements, the welds containing cracks including crater cracks regardless of size of location are unacceptable.

- i. Any amount of inadequate penetration of the root bead as defined by API-1104 is unacceptable.
- ii. Any amount of incomplete fusion between the root and bevel as defined by API-1104 is unacceptable.
- iii. Unrepaired burn through areas are unacceptable.

Contractor shall appoint agency for carrying out the radiography works at site from the list of agency (ies) enclosed in the bid document.

- The Radiographic Examination procedures to be adopted shall be submitted by the contractor as per **ASME Sec.V** and shall be got approved from the Owner's Inspector prior to employment. A person qualified to ASNT Level-II or ASNT Level-III in Radiographic testing shall prepare the procedure. The Radiography Procedure shall be established to demonstrate that the required sensitivity can be consistently achieved under the most unfavorable parameters (e.g. source to film distance, geometric unsharpness, thickness etc.). The radiographic technique and procedure adopted shall conform of the requirements mentioned in Article 2 as well as Article 22 of ASME Sec.V. The II sensitivity obtained shall be equal to or better than the requirements mentioned in Article 2 of ASME Sec.V. Source side penetrometer shall be used in establishing radiographic procedure / technique. The acceptance criteria shall be as per the relevant codes of Fabrication and over riding requirements if mentioned elsewhere in the technical specifications of the contract. The Contractor shall be responsible for carrying out Radiography rectification of defects and re-radiography of welds repaired/rectified at his cost.
- The extent of Radiography shall be as per specifications to be supplied to the Contractor. For welds between dissimilar materials, the extent of Radiographic Examination shall be the more stringent of the two recommended for the materials being welded. Wherever random Radiography is called for, in a particular piping class, the dissimilar materials weld joints shall essentially be included.
- Type of Radiation source and film to be used shall be as per **ASME Sec.V** for carrying out radiographic examination. However if specifications (as given elsewhere in the contract) for some critical material require usage of X-Radiation, then Radiography shall be done using X-Rays only.
- The Contractor shall fulfill all the statutory and owners safety requirements while handling X-ray and Gamma-ray equipments.


BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 'H97<B=75@GD97= =75H-CB ''		
	C=@/ ' ; 5G'		
TITLE	D=D-B; ' : 56F =75H-CB '5B8 ' 9F 97H-CB'	DOCUMENT NO. BR/TS/38	Page 29 of 61
			REVISION : 0
			EDITION : 1

- In case of random radiography, the joints for Radiography shall be selected by the Owner's Inspector and the Radiography shall be performed in his presence, if he instructs the contractor to do so. The contractor shall furnish all the radiographs, to the Owner's Inspector immediately after processing along with evaluation by a person qualified to ASNT Level-II in Radiographic testing, inline with Article 2 of ASME Sec.V. The certificate of ASNT / ISNT Level II qualification of the NDT personnel shall be submitted to owner's inspector for his approval prior to start of job.
- The Contractor shall provide the Owner's Inspector, all the necessary facilities at site such as a dark room with controlled temperature, illuminator (viewer) suitable for varying densities, a duly calibrated electronic densitometer with batteries, magnifying glass, tracing papers, ruler, marking pencils etc. to enable him to review the radiographs.
- Where random radiography is specified, the first weld of each welder shall be completely radiographed. In the case of pipe of size 6 and below, the first two welds shall be completely radiographed.
- For each weld performed by a welder found unacceptable, two additional checks shall be carried out on welds performed by the same welder. This operation is iterative and the of two additional welds for each weld deemed unsatisfactory shall be continued till such time that two consecutive welds of satisfactory quality are found for every defective weld.
- The Contractor shall carry out these additional radiographic testing at his own expense. To avoid the possibility of too many defective welds by a single welder remaining undetected for a long period to time, the Contractor shall promptly arrange for Radiographic Examination so that there is no accumulation of defective joints.
- Contractor shall quote rates for X-ray as well as Gamma Ray for joints indicated to be radiographed by X-ray in Table of 9 \ JH <''

1.13.6

7\ VW' g' chg'

- (a) Owner / Engineer- in- charge or his representative shall select 5 of the total joints radiographed on a day for check shots. Contractor shall carry out check shots as directed.
- (b) Weld profiles of check shots shall be compared with weld profile observed in the earlier Radiographs. In the event of anyone variation in the check shots and earlier Radiographs, contractor shall re-shoot the entire lot of joints radiographed by particular Radiography agency on the particular date. All the re-shot films shall be compared with the originally submitted films.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 'H97< B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	D=D-B; : 56F =75H-CB '5B8' 9F 97H-CB'	DOCUMENT NO. BR/TS/38 '	Page 30 of 61
			REVISION : 0
			EDITION : 1

1.13.7'' A U[bYh]MDUrh]WV/ @ei]X'DYbYhfUbh'9l Ua]bU]cb

- a) Whenever such tests are specified, the tests shall be carried out on joints chosen by the Owner's inspector, as per ASME Section V article 6 and 7 respectively. The tests are to be performed by a person possessing a valid ASNT / ISNT Level-II qualification in the method being used.
- (b) For austenitic stainless steels and other nonmagnetic materials, liquid (dye) penetrant test shall be carried out. For carrying out this test, the materials shall be brought within a temperature limit of 15° to 50° C.

1.13.8' <UfXbYgg'HVgh


Hardness requirements for welds shall be as per the Welding Specification Chart / Non Destructive Examination Specification attached elsewhere in the contract. Hardness testing shall be carried out by Vickers Hardness Tester during welding procedure qualification and shall be cross sectional. For production welds, hardness testing shall be carried out by portable digital hardness testers. Poldi hardness tester shall not be permitted. Contractor shall produce documentary evidence/calibration certificate to the Owner's Inspector and obtain approval of the hardness testing equipment.

1.13.9'' DfccZHYgh

Hydrostatic and pneumatic tests shall be performed as per the requirements laid down in the respective flushing & testing specification/ applicable codes to demonstrate the soundness of the welds. The tests shall be conducted only after fulfilling the requirements of visual examination, radiography etc. and after the entire work has been certified by the Owner's inspector, as fit for subjecting to such test.

1.14' FYdUJfg'cZK Y'Xg

- a) Defects ascertained, through the inspection methods, which are beyond acceptable limits shall be removed from the joint completely by the process of chipping and grinding.
- b) When an entire joint is judged unacceptable, the welding shall be completely cut and the edges be suitably prepared as per required alignment tolerances. The welded joint shall again be examined following standard practices.
- c) No repair shall be carried out without prior permission of the Owner's inspector.
- d) Where random radiography is specified, the test welds of each welder shall be completely radiographed. In the case of pipes of sizes 6" and below, the first two welds shall be completely radiographed.
- e) For each weld found unacceptable due to a welders fault, two additional checks should be carried out on welds performed by the same welder. This operation is interactive and the procedure of radiographing two additional

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	D=D-B; : 56F =75H-CB '5B8' 9F 97H-CB'	DOCUMENT NO. BR/TS/38 '	Page 31 of 61
			REVISION : 0
			EDITION : 1

welds for each weld deemed unsatisfactory shall be continued till such time that the two consecutive welds of satisfactory quality are found for every defective weld.

The contractor shall carry out these additional radiographic testing.

To avoid the possibility of too many defective welds by a single welder remaining undetected for a long period of time, the Contractor shall promptly arrange for radiographic examination so that there is no accumulation of defective joints.

1.15' @a JHjcbg'cb F YdUJfg


Only one attempt at repair of any region is permitted. Repairs are limited to a maximum 30' of the weld length. For internal or external repairs which open the weld root, only 20' of the weld length may be repaired. Repairs opening the root must only be carried out in the presence of COMPANY. The minimum length of a repaired area shall be 100mm as measured over the recapped length. Welds containing cracks shall be cut out and rebevelled to make a joint, COMPANY shall authorise all repairs.

1.16' K YXFY'VMX Vm5WW/a i Ujcb'cZ8YZVMg

Where a weld is rejected by the accumulation of defect clause, as defined by API-1104 and this specification, repairs within these limitations are permitted. Defects in the filling and capping passes shall be repaired preferentially.

1.17' 8C7I A 9BHGH'C 69'G 6A =H98'6M7CBHF 57HCF f('7CD=9G'957<E'

- Electrode and Welding Consumable qualification Records as per 9 \JH 5Z'or the Welding Consumables tested and approved for the work.
- Batch Test Certificates, for the Electrodes used, obtained from the Electrode Manufacturers.
- Proposed Heat Treatment Procedure as per 9 \JH 6''
- Heat Treatment Charts.
- Weld joint hardness test results.
- Welding Procedure Specifications as per 9 \JH 7 immediately after receipt of the order.
- Welding Procedure qualification records as per 9 \JH 8''
- Welder Performance qualification records as per 9 \JH 9' immediately after conducting Welder qualification Tests.
- Radiography Procedure as per 9 \JH: 'and other NDT procedures.
- Radiographic test Report along with Radiographs and other NDT reports.
- Piping Sketch (Isometric) giving all the details regarding the pipe specifications, welded joints, joints radiographed magnetic particle, tested, ultrasonic tested, penetrant tested, joints heat treated, WPS used, welders identification number, etc.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8`H97<B=75@GD97= =75H-CB`		
	C=@/ `; 5G`		
TITLE	D=D=B; `: 56F =75H-CB`5B8` 9F 97H-CB`	DOCUMENT NO. BR/TS/38	Page 32 of 61
			REVISION : 0
			EDITION : 1

9L<=6=H5


Sheet 1 of 4

9@97HFC89EI 5@= =75H-CBGH9GHF 97CF 8

A : Tested at (Site Name) Date :
Test Period :

Manufacturer s Name :
Brand Name :
Batch Number & si e Tested :
Classification & Code :
Intended for Welding in positions :
In combination with (if any) :
Code of Reference (used for testing) :
Special requirements (if any) :

B : 5`!`K Y`X`HYbgj`Y`HYgh
Base Material used :
Pre-heat temperature :
Postweld Heat Treatment Details :
Visual Examination :
Radiographic Examination Results :

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8`H97<B=75@GD97= =75H-CB`		
	C=@/ `; 5G`		
TITLE	D=D=B; `: 56F =75H-CB`5B8` 9F 97H-CB`	DOCUMENT NO. BR/TS/38`	Page 33 of 61
			REVISION : 0
			EDITION : 1

Sheet 2 of 4

Tensile Test Results :

Sl. No.	Identification Number	U.T.S.	ield Point	Elongation	Remarks
---------	-----------------------	--------	------------	------------	---------

C : ' =a dUMHYghFYgi`hg

Test Temperature : Notch in :

Type of Specimens (Impd, Charpy) : Sie of Specimens :


Specimen No.	Impact Value	Average
1.		
2.		
3.		
4.		
5.		

D : ' 7\Ya JM'5bUnglgFYgi`h

Electrode sie used :

Batch No.

C	S	P	Si	Mn	Cr	Ni	Mo

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8`H97<B=75@GD97= =75H-CB`		
	C=@/ `; 5G`		
TITLE	D=D=B; `: 56F =75H-CB`5B8` 9F 97H-CB`	DOCUMENT NO. BR/TS/38	Page 34 of 61
			REVISION : 0
			EDITION : 1

Sheet 3 of 4

E : ' : J`YhK YX'HYghFYgj`hg

Welding Positions :

Base Materials :

Si e of electrode used :

Visual Inspection Results : 1)
2)
3)

Micro Test Results

Fracture Test Results :

Remarks :

F : ' CH.Yf'HYghFYgj`hg

i) Transverse Tensile Test :

In Combination with :

Base Material used :


Position of Welding :

P reheat Temperature :

P ostweld Heat Treatment :

Radiography :

Identification No.	U.T.S.	Fracture in	Remarks

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8`H97<B=75@GD97= =75H-CB`		
	C=@/ ` ; 5G`		
TITLE	D=D=B; ` : 56F =75H-CB`5B8` 9F 97H-CB`	DOCUMENT NO. BR/TS/38	Page 35 of 61
			REVISION : 0
			EDITION : 1

Sheet 4 of 4


2. ; i jXY'6YbX'HVgh

Position	ID No.	Root, Face or Side Bend	Remarks
	1		
	2		
	3		
	4		
	5		

3. 5bmch\Yf'HVghg

7cbW gjcbg

Approved By :

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 'H97<B=75@GD97= =75H-CB''		
	C=@/ ' ; 5G''		
TITLE	D=D=B; ' : 56F =75H-CB '5B8' 9F 97H-CB'	DOCUMENT NO. BR/TS/38	Page 36 of 61
			REVISION : 0
			EDITION : 1

9L<=6=H6
Sheet 1 of 2

GHF 9GGF 9@=9. <95HHF 95HA 9BHDF C798I F 9'GD97= =75H-CB

Name of the Heat - Treatment :

Name of the Project :Specification

Reference No.

1. ; YbYfU'8YHJ]g

Name of the Equipment :

Name of the Assembly/ Part :

Assembly/ Part Drawing No. :

Material :

2. : i fbUW'8YHJ]g

Type of Heating : Gas/ Oil/ Elec. Res./ Induction (Tick Mark)

Capacity (size) :

Maximum Temp. (°C)

Method of temp. measurement :

Atmosphere Control :

3. <YUhfYUha Ybh7nW'8YHJ]g

Charging Temp. °C :


Rate of Heating, °C/Hr :

Soaking Temp., °C :

Soaking Time, Hrs. :


Rate of Cooling, °C/Hr :

Mode of Cooling :

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8`H97<B=75@GD97= =75H-CB`		
	C=@/ `; 5G`		
TITLE	D=D=B; `: 56F =75H-CB`5B8` 9F 97H-CB`	DOCUMENT NO. BR/TS/38 `	Page 37 of 61
			REVISION : 0
			EDITION : 1

Sheet 2 of 2

4. Other Details, if any :
5. The following documents are to be furnished :
along with these specification :
 - i) Material Test Certificates
 - ii) Assembly/ Part Details

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97< B=75@GD97= 75H-CB "		
	C=@/ ' ; 5G'		
TITLE	D=D-B; ' : 56F =75H-CB '5B8 ' 9F 97H-CB '	DOCUMENT NO. BR/TS/38	Page 38 of 61
			REVISION : 0
			EDITION : 1

9L < =6-H7
Sheet 1 of 2

G-5B85F 8 DF C798I F 9GD97 = 75H-CB 'BC"

for Welding of Pipe and Fittings

Process & type (Details of special machines).

Material (Pipes to which the procedure applied, grade of steel, type of pipe, Reference Specification).

Diameter and wall thickness (Series of dia and thickness to which procedure is applicable)

Joint Design

Filler Metal and Number of Beads

Electrical or Flame Characteristics

Position

Direction of Weldings (Uphill, Downhill, Mixed)

Number of Welders

Time Lapse between passes

Type of Line-up Clamp

Removal of Line-up Clamp (Minimum percentage of welding carried out before removal of clamps)

Cleaning

Preheat, Stress Relief


Shielding Flux

Speed of Travel

Sketches and Tabulations (to be attached)

Wire Speed (rate of wire speed and variation range)

Minimum No. of passes which must be completed before discontinuing weld.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8`H97<B=75@GD97= =75H-CB`		
	C=@/ `; 5G`		
TITLE	D=D=B; `: 56F =75H-CB`5B8` 9F 97H-CB`	DOCUMENT NO. BR/TS/38 `	Page 39 of 61
			REVISION : 0
			EDITION : 1


Sheet 2 of 2

Minimum No. of welders required for the first pass and second pass :

Tested : Welder

Approved : Welding Supt.

Accepted : Chief Engineer

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97 < B=75@GD97 = 75H-CB		
	C=@/ ; 5G		
TITLE	D=D-B; : 56F =75H-CB 5B8 9F 97H-CB	DOCUMENT NO. BR/TS/38	Page 40 of 61
			REVISION : 0
			EDITION : 1

9L < =6+18
Sheet 1 of 2

7CI DCB H9GHF 97CF 8

Location
Date State Roll Weld Fixed position
weld welder Mark
..... Welding Time Time of day
..... M. Temperature F. Weather Condition
..... Wing break used Voltage
..... Amperage Type of welding machine
..... Si e Filler Metal
..... Si e of reinforcement
..... Pipe kind and Grade
..... Wall thickness
..... Dia O.D.

1 2 3 4 5 6 7

Bead No. Si e of electrode
..... No. of electrode
.....

1 2 3 4 5 6 7


Coupon Stenciled Original
Dimension of Plate Original area of plate
(inch²) Maximum Load
..... Tensile S/ in. plate area
..... Fracture Location
.....

Procedure Welder
Qualifying Test Line Test
Qualified Disqualified

Max. tensile strength min. tensile strength

Avg. tensile strength Remarks on tensile strength

1.
2.
3.
4.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 'H97< B=75@GD97= =75H-CB''		
	C=@/ ` ; 5G'		
TITLE	D=D=B; ` : 56F =75H-CB '5B8' 9F 97H-CB'	DOCUMENT NO. BR/TS/38 `	Page 41 of 61
			REVISION : 0
			EDITION : 1

Sheet 2 of 2

Remarks on Bend Tests


1.
2.
3.
4.

Remarks on Nick Tests

1.
2.
3.
4.

Other Tests

(Use back for additional remarks)

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8`H97<B=75@GD97= =75H-CB`		
	C=@/ `; 5G`		
TITLE	D=D=B; `: 56F =75H-CB`5B8` 9F 97H-CB`	DOCUMENT NO. BR/TS/38	Page 42 of 61
			REVISION : 0
			EDITION : 1

9L<=6-H9

K 9@89F 75=89BH= =75H-CB 75F 8

Name :

Identification :

Date of Testing :

Valid Unit :

Approval of Welding :


Welding Position :

Material :

Diameter :

Wall Thickness :

Type of Welding Consumable :

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 'H97<B=75@GD97= =75H-CB''		
	C=@/ `; 5G`		
TITLE	D=D=B; `: 56F =75H-CB '5B8` 9F 97H-CB`	DOCUMENT NO. BR/TS/38 `	Page 43 of 61
			REVISION : 0
			EDITION : 1


9L<=6-H:
Sheet 1 of 1

F 58-C; F 5D<=7 DF C798I F 9': CF D=D9'K 9@B-B;

1. Location
2. Date of Testing
3. Name of Supervised Contractor
4. Material
5. Dia. & Thickness
6. Type of Weld joint
7. Radiation Source (X-ray, gamma ray)
8. Type of equipment (external/ internal)
9. Intensifying screens and material
10. Filter type and placement mask, diaphragm lead screen etc. adjacent to radiation sources or specimen.
11. Geometric relationship (source local spot size, max and min source strength, object to film distance, radiation angle with respect to weld and film).
12. Limit of film coverage
13. Film type and make
14. Exposure Time
15. Processing (time temperature for development stop bath or rinse , fixation, washing, drying etc.)
16. Density
17. Sensitivity
18. Type of penetrometer

Approval of the COMPAN

Signature of CONTRACTOR
with seal

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8`H97<B=75@GD97= =75H-CB`		
	C=@/ `; 5G`		
TITLE	D=D-B; `: 56F =75H-CB`5B8` 9F 97H-CB`	DOCUMENT NO. BR/TS/38`	Page 44 of 61
			REVISION : 0
			EDITION : 1

.....K 9@8-B; 'GD97= =75H-CB '7< 5F H'

9L< =6-H;
Sheet 1 of 2

Class :

A UHfJU' GdVMZWHcb :

Pipes : API 5L Gr. X 60, API 5L Gr. B API 5L Gr. X 42

Fittings : A 105, A234 Gr. WPB. MSS-SP-75, Gr. WPH 42, MSS-S

Flanges : A 105, MSS-SP-44 Gr. F42, MSS-SP as Gr. WPH 60

Other : _____ 44 Gr. F6C

Base Metal of NCL :

Welding Processes : Groove oints : Butt

Root Pass SMAW Filler Pass SMAW Root Pass SMAW Filler Pass SMAW Filler oints/ Socket oints : SMAW

Welding Materials : Groove oints : Butt

Root Pass E6010G/ E7010G Filler Pass F7010G/ E8010G/ E8818G

Root Pass E7010/ E7018G/ E8018G Filler Pass F7016/ E7018G/ E80118G

Filler oints/ Socket oints : E7016/ E7018/ E7018G/ E8018G

Backing Page _____ Consumable :

Gases : Purging _____ Sheilding

Gas Composition : Purging _____ Sheilding

Preheating : 10 min for all welds, 100°C Post heating

Post weld heat treatment :

Holding temp. : 595-650 C

Rate of heating : 200 C/hr max.


Method of cooling : Controlled

Holding Time : 1 Hr. per inch thk

Min holding time : 1 hr.

Rate of cooling : 200°C/hr max.

Mechanical property requirements :


BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 'H97<B=75@GD97= =75H-CB''		
	C=@/ `; 5G'		
TITLE	D=D=B; `: 56F =75H-CB '5B8' 9F 97H-CB'	DOCUMENT NO. BR/TS/38 '	Page 45 of 61
			REVISION : 0
			EDITION : 1

Sheet 2 of 2

Charpy V notch impact test valve :

Normal : 22
 Average : 27
 At temperature : 0 °C
 Hardness : 300 HV10 (for weld & HA)

Code of fabrication : ANSI B31.8 API 1104 and welding specifications.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97< B=75@GD97= 75H-CB		
	C=@/ ; 5G		
TITLE	D=D-B; : 56F=75H-CB 5B8 9F 97H-CB	DOCUMENT NO. BR/TS/38	Page 46 of 61
			REVISION : 0
			EDITION : 1

H97 < B=75@BCH9G

1. Welding, heat treatment and non destructive testing shall be carried out in accordance with the requirement of ANSI B31.8/ AP I-1104 and additional requirement specified in the specification. In case of conflict between code and specification more stringent conditions shall be applicable.
2. No welding shall be carried out without preheating the joint to 10°C (50 °F) when the ambient temperature is below 10°C (50 °F).
3. Preheat shall be applied while welding the following material as detailed below :


API 5L Gr. B : Thickness upto 100 °F min.
and inclusive of 12mm

A 105 :
MSS-SP-44 Gr. F60 : Thickness beyond 200 °F
A 234 Gr. WPB : 12 mm
MSS-SP-75-WPH 60

4. For fillet welds complete welding may be carried out using the electrodes recommended for filler passes.
5. All weldments & HA shall meet the hardness requirements of 300 HV10 during procedure qualification. If the hardness exceeds 300 HV10 the joints shall be heat treated at temp. 1100-1250 °F for one hour. The heating and cooling rates shall be decided during procedure qualification subject to a maximum of 200 °C/Hr. Hardness testing shall be carried out by Vickers hardness tester during welding procedure qualification test only. No hardness test is required for production welds.
6. The electrodes used shall meet the following additional requirement :

<u>Specification</u>	<u>UTS (Min.) (As welded)</u>	<u>Impact (As welded)</u>
E7018-G	52.7 kg/mm ²	20 ft. lb. at 0°C
E7018-I	52.7 kg/mm ²	-
E6010	-	-
E6018	-	20 ft. lb. at 0°C

7. All the weldments & HA shall meet the impact test requirement of 20 ft. lb at 0°C.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	D=D-B; : 56F =75H-CB '5B8' 9F 97H-CB'	DOCUMENT NO. BR/TS/38	Page 47 of 61
			REVISION : 0
			EDITION : 1

5BB9LI F9!&

1.0' **89GHFI 7H-J 9'H9GH-B; 'C: 'K 9@898'>C-BH! '6I HHK 9@8G**

1.1' **DfYdUFUjcb**

Having passed the visual and the non destructive inspection, the test weld shall be subjected to mechanical test.

After satisfactory completion of all visual and non destructive testing the procedure test weld shall be set aside for a period not less than 24 hours. No further work on the test weld and no cutting of test specimens from the weld be performed till a period of at least 24 hours has expired.


Weld specimens, for pipe diameter greater than or equal to 12.3/4 shall be taken from the positions indicated in Fig. 1 of this specification from areas as free from defects as possible. For this reason it is necessary to take the previous non destructive tests into account. The minimum no. of tests to be carried out is given in Table-I of this specification.

The test shall be carried out at laboratories approved by COMPAN . The specimens shall be prepared in accordance with the figure given in the paragraphs which refer to the individual test.

HUVY!=

HMD9'5B8'BI A 69F 'C: 'H9GH'GD97=A 9BG': CF''
DF C798I F 9'EI 5@= =75H-CB 'H9GH

Pipe Size, Out-side diameter Inches	Number of Specimens									
	Tensile API	Tensile ISO	Nick Break	Root Bend	Face Bend	Side Bend	Macro	Hard- ness	Impact	Total
Wall Thickness inch (12.7mm) and under										
Under 2 3/8	0	0 2 2	0 0 0 0	0 4						
2 3/8 to 4 incl.	0	0 2 2	0 0 0 0	0 4						
Over 4 less than 12 3/4	2	0 2 2	2 0 2 2						12	24
12 3/4 and over	2	2 4 4	4 0 2 2						24	44
Wall Thickness inch (12.7mm)										
4 and smaller	0	2 0 0	0 2 0 0	0 4						
Over 4 less than 12 3/4	2	0 2 2	2 0 2 2						12	24
12 3/4 and over	2	2 4 0	0 8 2 2						24	44

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97 < B=75@GD97 = 75H-CB		
	C=@/ ; 5G		
TITLE	D=D-B; : 56F =75H-CB 5B8 9F 97H-CB	DOCUMENT NO. BR/TS/38	Page 48 of 61
			REVISION : 0
			EDITION : 1

1.2 HYBGJ Y GHFYb[H

Specimens for pipe diameter over 12 3/4 shall be taken from the position indicated in Fig. 1 of this specification. Two API type specimen shall be taken for pipe diameter greater than or equal to 12 3/4 .

1.3 BJW! 6fYU_ HYgh

1.3.1 DFYdUFUH]cb

Specimens for nick-break test with notches thus worked can break in the base metal, instead of in the fusion one therefore an alternative test piece may be used after authorisation by the COMPAN with a notch cut in the reinforcement of outside weld bead to a maximum depth of 1.5mm measured from the surface of the weld bead.

1.4 A UfYcgMzd]W-bgdYV]cb

1.4.1 DFYdUFUH]cb

Specimens shall be taken from the positions indicated in Fig. 1 of this specification and shall be prepared in accordance with ASTM E2 and E3.

The width of the macrosection has to be at least three times the width of the weld. The section is to be prepared by grinding or polishing and etching to clearly reveal the weld metal and heat effected one.

1.4.2 A YH cX

Specimens shall be carefully examined under the microscope with a magnification of at least 25 times. The COMPAN may ask for a macrograph with 5 times magnification for documentation purposes.


1.4.3 FYei]fYa Ybhg

Under macroscopic examination, the welded joints shall show good penetration and fusion, without any defect exceeding the limits stated in the evaluation criteria of the nick break test.

1.5 < UfXbYgg'HYgh

1.5.1 DFYdUFUH]cb

The prepared macrosection is to be used for hardness testing using the Vickers method with 100 N (10 kg) load. Indentations are to be made along traverses each approximately 1mm below the surface at both side of the weld.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97< B=75@GD97= 75H-CB		
	C=@/ ; 5G		
TITLE	D=D-B; : 56F=75H-CB 5B8 9F 97H-CB	DOCUMENT NO. BR/TS/38	Page 49 of 61
			REVISION : 0
			EDITION : 1

In the weld metal a minimum of 6 indentations equally spaced along the traverses are to be made. The HA indentations are to be made along the traverses for approximately 0.5mm each into unaffected material, and starting as close to the fusion line as possible.

One indentation at each side of the weld along each traverse has to be made on parent metal. Reference is made to fig. 3 of this specification. The indentation are to be made in the adjacent region as well as on the opposite side of the macrosection along the specified traverses.

1.5.2 A YH cX

The test shall be carried out in accordance with Recommendation ISO R81, Vickers hardness, using laboratory type machine controlled as per-recommendation of ISO R 146 and using a diamond pyramid penetrator set at 2.37 rad. (136) with a load of 100 N (10 kg).

1.5.3 F Yei JfYa Ybhg

Hardness value shall not exceed 300 H V10 . In case of a single reading slightly (10 HV) higher than the specified limit, further indentations should be made to check if the high value was an isolated case.

All the hardness values obtained from the heat effected one shall not exceed 100 HV with respect to the average hardness of the values obtained for the base metal.


If these additional tests mentioned above give a hardness within the specification limit, the slightly higher value may be accepted.

1.6 7\ UfdnHJ ! bchW =a dUMH Ygh

1.6.1 Specimens shall be taken from the position indicated in Fig. 1 of this specification. The test specimens will be prepared in accordance with ISO R 148. Charpy V-notch specimens shall have dimensions as given in Fig. 3 of the specification.

Three test specimens shall be taken from each sample and they shall be cut and worked so that their length is transversal and perpendicular to the weld bead with the notch position as shown in Fig. 4 of this specification. The notch shall be perpendicular to the roller surface. The test specimens width shall depend upon the pipe wall nominal thickness as following :

Nominal wall thickness in mm	Test Specimens width in mm
12	12
9.5 and ≤ 12	7.5

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97< B=75@GD97= 75H-CB		
	C=@/ ; 5G		
TITLE	D=D-B; : 56F=75H-CB 5B8 9F 97H-CB	DOCUMENT NO. BR/TS/38	Page 50 of 61
			REVISION : 0
			EDITION : 1

≥ 7 and ≤ 9.5	5
7	2.5

1.6.2 HghA Yh cX

The test shall be carried out as indicated in ISO R 148 Beam Impact Test V-notch.

Test pieces shall be immersed in a thermostat bath and maintained at the test temperature for at least 15 minutes. They shall then be placed in the testing machine and broken within 5 seconds of their removal from the bath.

1.6.3 FYei JfYa Ybhg

The impact energy shall be greater or equal to :-

mm	Test Specimens in T	Average of three specimens oules (min) (Note-2)	Minimum Single Value oules (Note 1)
	10	27	22
7.5	21.5		17.5
5	18.5		15.0
2.5	10.0		8.0

BchY:

- Only one value is permitted to be lower than average upto the value specified.


1.7 6YbX HghF Yei JfYa Ybhg

The bend test specimens shall be made and tested as per the requirements of API-1104 sixteenth edition - May, 1983 except that the dimensions of fig for guided bend test fig. 5 para 2.6 API-1104 shall be modified as follows :

Radius of the plunger	°A	2 t
Radius of the die	°B	3 t 1.6mm
Width of the die	°C	50.8

The acceptance criteria shall however be as per para 2.643 and 2.653 of API-1104 sixteenth edition - May, 1983.

Note t Thickness of Specimen (nominal)

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	D=D=B; : 56F =75H-CB '5B8' 9F 97H-CB'	DOCUMENT NO. BR/TS/38 '	Page 51 of 61
			REVISION : 0
			EDITION : 1

5BB9LI F 9I'

1.0' · **I @F 5GCB=7' =BGD97H-CB**

In addition to the radiographic inspection ultrasonic inspection is required as per conditions mentioned in **5bbYI i fY!** %of this specification.

This section concerns manual ultrasonic inspection. However ultrasonic inspection by automatic equipment may be used if approved by the COMPAN .

1.1' · **9ei Jda YbhUbX' CdYfUrcfg**

The CONTRACTOR who carries out the ultrasonic inspection shall have sufficient qualified personnel, equipment and instrument at his disposal to be able to effect the tests without hindering or delaying the pipeline assembly operations.

- Calibrate the equipment
- Perform an operational test under production conditions
- Interpret the screen picture
- Evaluate the size and location of reflectors
- Interpret the type of defects detected.

The COMPAN has the option of checking the ability of personnel employed for ultrasonic testing by means of qualification tests.

The CONTRACTOR appointed to carry out UT inspection shall supply the instruments necessary for their execution on site.


1.2' · **GdYVZVWhcb Zcf' I' hfUgcbJWHYghb['DfcWXi fY**

'Ei UJZVWhion

Before work begins the CONTRACTOR shall present a specification describing the proposed U.T. procedure qualification.

This specification shall be state, as an indication only but not limited to the following information :

- Type of U.T. equipment used
- Type and dimensions of transducers
- Frequency range
- Details for calibration
- Coupling medium
- Inspection technique
- Record details
- Reference to the welding procedure where it is intended to adopt the specification.
- Temperature range of the joints to be inspected.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ `; 5G`		
TITLE	D=D=B; `: 56F=75H-CB`5B8` 9F 97H-CB`	DOCUMENT NO. BR/TS/38 `	Page 52 of 61
			REVISION : 0
			EDITION : 1

1.3 Ultrasonic Inspection Procedure

The ultrasonic inspection procedure shall be approved by the COMPANY. Before inspection begins, the COMPANY may require the qualification test of the ultrasonic inspection procedure. This specification test consists in testing (under normal operating conditions) some CONTRACTOR welds made according to the same production procedure, when there are typical defects the test intends to detect.

1.4 Circumferential Weld Inspection

Circumferential weld shall be inspected from both sides using angled. Probes.

The surface with which the probe comes into contact shall be free of metal spatter, dirt, iron oxide and scales of any type: therefore it shall be necessary to clean a strip at least 50mm wide on both sides of the weld with steel - wire brushes and anyhow the cleaned strip must be atleast wide enough to allow full skip examination.

If during the test, echoes of doubtful origin appear, it shall be necessary to inspect a convenient area on the pipe surface, close to the weld, with a straight beam transducer in order to check whether any manufacturing defects are present which could have interfered with the ultrasonic beam.

By way of an example, the equipment shall include but not be limited to the following :


- Ultrasonic equipment and coupling medium
- Sample sections for calibration of instruments.
- Equipment for cleaning of surface to be examined.
- Rulers calibrated in centimeters for exact location of the position of defects.

The characteristics of the above-listed instruments and equipment shall guarantee:

- a) that the required standards of the inspection procedure, as previously established and approved by the COMPANY, are satisfied.
- b) continuous operation

All the instruments and equipment shall be approved by the COMPANY before being used. The COMPANY has the authority to reject any item which is considered unsuitable. The decision of the COMPANY is final. The CONTRACTOR appointed to carry out ultrasonic inspection shall also ensure the operational efficiency and maintenance of the instruments and equipment, and shall immediately substitute any item rejected by the COMPANY.

All the instrument and equipment necessary for carrying out ultrasonic inspection on site shall satisfy the requirements laid down by the public board of institutions which regulate safety at work.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	D=D-B; ; 56F =75H-CB' 5B89F 97H-CB'	DOCUMENT NO. BR/TS/38 '	Page 53 of 61
			REVISION : 0
			EDITION : 1

1.5' I`hfUgcb]M^bgfhi a Ybhg

The ultrasonic instruments :

Shall be each pulse type, able to generate, receive and display, on the screen a cathode ray tube (CRT) pulse, at frequencies between 1 and 6 mh . The useful part of the CRT screen shall be at least 70m wide and at least 50mm high.

Shall have various amplification, with steps of 1 or 2 dB over a range of a least 60 dB.

The regulation control shall be accurate to within 1 dB and this accuracy shall be certified by the instrument manufacturer.

May be powered by a battery or an electric generator. In the first case, the autonomy of operation (endurance) of the instrument shall be sufficient to carry on working without frequent interruptions, and the instrument shall be equipped with an automatic switch which switches it off when the battery runs down, in the second case, there must be a voltage stabilising device with a tolerance of 2 volts.

1.6' DfcVYg

The probes used shall have dimensions, frequencies, and a refraction angle suited to the type of steel, the diameter the thickness of the pipeline and to the joint design.

1.7' FYZfybW'GUa d'Y'DJYWG


The efficiency of the equipment used, the effective refraction angle of the probe, and the beam output points, shall be checked using a V₁ and V₂ sample block, IIW type or the calibration block ASTM E-428.

For the calibration of runs and the regulation of detection sensitivity during the test, a calibration piece be used. This piece shall be taken from the production material, and will be at least 150mm long (measured in the direction of the axis), and at least 50mm wide (measured in the direction of the circumference), (see Fig. 4 of this specification).

In the middle of the inside and the outside surface of the calibration piece a groove shall be made. The groove will have a rectangular cross-section, a flat bottom and the following dimensions :-

Depth : 1 /- 0.1mm
 Breadth (measured parallel to the 150mm side) : 1 /- 0.1mm
 Length (measured parallel to the 50mm side) not less than 30mm.

In addition, the calibration piece shall have a hole, 2mm in diameter, passing through its thickness and positioned so that during calibration the echoes returning from the two grooves do not interfere with those returning from the hole.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 'H97<B=75@GD97= =75H-CB ''		
	C=@/ ' ; 5G'		
TITLE	D=D=B; ' : 56F =75H-CB '5B8 ' 9F 97H-CB '	DOCUMENT NO. BR/TS/38 '	Page 54 of 61
			REVISION : 0
			EDITION : 1

1.6 7U]VfUjcb

For a precise check of the sound paths necessary for a full inspection of the weld joint, the probe shall be moved (half skip and full skip distance) until internal and external notches on the test piece are detected (see Fig. 5 of this specification).

The relevant defect limits the path lengths on the time base. The calibration of reference sensitivity is obtained by utilising the through drilled test hole in the thickness of the reference block to draw the distance amplitude correction curve relevant to the test probe.

Calibration shall be carried out according to the following procedure : place its internal vertex until the maximum height of echo is displayed on the screen this echo is adjusted to 80 of full screen height by means of the sensitivity adjuster set in dB. Without varying the amplification, the probe placed at full skip distance from the hole is moved to detect the external vertex the hole until the maximum height of echo is obtained. The straight line connecting the peaks of the two echoes obtained by the above procedure, represents the 100 reference level, while the one connecting the two points at half height of the same echoes represents 50 reference level .

The two straight lines shall be marked on the screen with a pen. Calibration shall be repeated each time tests are re-started at intervals not longer than 30 minutes during normal operations each time the conditions fixed in advance are altered. This calibration is applicable provided that the crystal of the probe is 8 x 9mm si e. Should this si e of the crystal be different, the value of the sensitivity obtained from the calibration by a crystal of a different si e shall be brought to the value of sensitivity obtained from the calibration by a 8 x 9mm crystal. The sensitivities of the two different si e probes shall be compared through the echoes obtained on the notch of the test piece with the probe position at half skip of the distance.

1.9 FY[i`Ujcb`cZ5a d`j]VfUjcb`Xi f]b[`DfcXi Vjcb`HYgh]b[


The amplification during production testing shall be obtained by adding 2- 6 dB (according to the surface condition of the pipe and its cleanness) to the reference amplification.

1.10 Ei U]VfUjcb`cZi`hfUgcb]VfUgh]b[`CdYfUhcfg

Before the inspection begins or during the same inspection, the COMPANY may require a qualification test for the ultrasonic equipment operators.

1.11 9j Ui Ujcb`cZ=bX]VfUjcbg[`j Yb Vm[`hfUgcb]VfUghg

Each time that echoes from the weld bead appear during production testing, the instrument amplification shall be altered to coincide with the reference amplifications and the probe shall be moved until maximum respond is obtained paying attention all the time to the probetube coupling.


BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 'H97<B=75@GD97=75H-CB''		
	C=@/'; 5G'		
TITLE	D=D=B;': 56F=75H-CB'5B8' 9F 97H-CB'	DOCUMENT NO. BR/TS/38'	Page 55 of 61
			REVISION : 0
			EDITION : 1

If, under these conditions, the height of the defer echo is equal to or greater than that of the reference echo , the defect shall b e evaluated. If t he defect has also been detected by the radiographic and or visu al examination, the dimensions shall be judged according to the type of ex amination which dete cts the greater defects. Returns which are less than 50 of the reference echo, will not be considered. It returns are above 50 but lower than 100 of the reference echo, and if the operator has good reasons to su spect that the returns are caused by unfavorably oriented cracks, he shall inform the COMPAN . Moreover, when there is a defect to be repaired such defect shall be remov ed for a lengt h corresponding to the one where no more return echo is given.

1.12 CH\Yf'9ei Jda Ybh

The use of rules calibrated in centimeters, attached if possible to the probe, for the precise location of the position of welding defects, it recommended. Defect location is effected by measuring the projection distance between the probe output and the reflecting surface.

The operators carrying out the tests shall have besides the probing instrument, tools for cleaning the pipe surface (files, brushes, etc.) as well as the coupling liquid or paste appropriate for the temperature of the section to be examined.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97 < B=75@GD97 = 75H-CB "		
	C=@/ ; 5G		
TITLE	D=D-B; : 56F =75H-CB '5B8' 9F 97H-CB "	DOCUMENT NO. BR/TS/38 "	Page 56 of 61
			REVISION : 0
			EDITION : 1

5BB9LI F 9(

F 58-C; F 5D<M

1.0 **G7CD9**

This annexure covers the radiographic inspection of all types of welded joints of the main pipeline. The welded joints shall include the following :

- i) Full girth welds on the mainline construction including double jointing of pipe, if adopted.
- ii) Welds for installation of block valves, insulating joints and other appurtenances and tie-ins.
- iii) Welds at scraper launching and receiving barrels
- iv) Terminal Piping.

2.0 **5DD@=756@9'GH5B85F 8G**

This specification shall apply in conjunction with the following (all latest edition) :


- i) API 1104, Standard for welding pipelines and related facilities.
- ii) ANSI B31.8, code for Gas Transmission and Distribution Piping Systems.
- iii) ANSI B31.4, Code for Liquid Petroleum Transportation Piping System.
- iv) ASTM E94, Recommended practice for Radiographic Testing.
- v) ASTM, E 142, Standard Method for Controlling quality of Radiographic Testing.
- vi) The American Society for non-destructive Testing. Recommended Practice No. SNT-TC-1A Supplement-A.

3.0 **DFC798I F 9**


3.1 The radiographic examination procedure to be adopted shall be submitted by the CONTRACTOR as per **9 \ J\JH: "**

3.2 The procedure of radiographic examination shall be qualified to the entire satisfaction of COMPAN prior to use. It shall include but not be limited to the following requirements.


- i) Lead foil intensifying screens, at the rear of the film shall be used in all exposures.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97< B=75@GD97= =75H-CB		
	C=@/ ; 5G		
TITLE	D=D-B; : 56F =75H-CB 5B8 9F 97H-CB	DOCUMENT NO. BR/TS/38	Page 57 of 61
			REVISION : 0
			EDITION : 1

- ii) Type 2 and 3 films as per ASTM E-94 shall be used.
- iii) A densitometer shall be used to determine film density. The transmitted film density shall be 2.0 and 3.5 through out the weld. The unexposed base density of the film shall not exceed 0.30.
- iv) Radiographic identification system and documentation for radiographic interpretation reports and their recording system.
- 3.3 The CONTRACTOR shall qualify each procedure in the presence of the COMPANY prior to use.
- 3.4 The procedure of radiographic examination shall produce radiographs of sufficient density, clarity and contrast so that defects in the weld or in the pipe adjacent to the weld, and the outline and holes of the penetrometer are clearly discernible.
- 3.5 All the girth welds of mainline shall be subjected to 100 radiographic examination. The CONTRACTOR shall furnish all the radiographs to the COMPANY, immediately after processing them, together with the corresponding interpretation reports on approved format. The details of the radiographs alongwith the joint identification number shall be duly entered in a register and signed by the CONTRACTOR and submitted to the COMPANY for approval.
- 3.6 When the radiation source and the film are both on the outside of the weld and located diametrically opposite each other, the maximum acceptable length of film for each exposure shall not exceed the values given in Table 4 of API 1104. The minimum film overlap, in such cases, shall be 40mm. The ellipse exposure technique may be used on nominal pipe sizes of 2 inch and smaller provided that the source to film distance used is a minimum of 12 inches.
- 3.7 Three copies of each acceptable radiographic procedure (as outlined in Specification no. MEC/S/O5/62/02) and three copies of radiographic qualification records, shall be supplied to COMPANY. One set of the qualifying radiographs on the job shall be kept by the CONTRACTOR's authorised representative to be used as a standard for the quality of production radiographs during the job. The other two sets shall be retained by COMPANY for its permanent record.
- 3.8 Three copies of the exposure charts relating to material thickness, kilovoltage, source to film distance and exposure time shall also be made available to a COMPANY by the CONTRACTOR.
- 3.9 The CONTRACTOR shall, on a daily basis, record for each radiograph (1) radiography number (2) approximate chainage of weld location, (3) whether or not the welds meet the specified acceptance standards and (4) the nature and approximate location of unacceptable defects observed. It must be possible to relate to a particular butt weld and welder on piping drawing and pipeline alignment drawing.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	D=D-B; : 56F =75H-CB '5B8' 9F 97H-CB'	DOCUMENT NO. BR/TS/38	Page 58 of 61
			REVISION : 0
			EDITION : 1

- 3.10 Each day's production of processed radiographs shall be properly packaged separately, identified by at least the (1) date, (2) radiographic unit, (3) job locations, (4) starting and ending progress survey stations and (5) shall include original and three copies of the daily radiographic record. The package shall be submitted to the COMPANY daily when possible, but in no event later than noon of the following day.
- 3.11 The CONTRACTOR shall provide all the necessary facilities at site, such as a dark room with controlled temperature, film viewer etc. to enable the COMPANY to examine the radiographs.
- 3.12 The CONTRACTOR, if found necessary, may modify the procedure of radiographic examination suiting the local conditions prevailing. This shall, however, be subject to the approval of the COMPANY .
- 3.13 COMPANY shall have free access to all the CONTRACTOR's work facilities in the field.
- 3.14 Any approval granted by the COMPANY shall not relieve the CONTRACTOR of his responsibilities and guarantees.
- 4.0 **F 58=5H-CB GCI F 79**
- 4.1 Radiographic examination shall be carried out using x- radiations. Radiographic examination by Gamma rays may be allowed, at the discretion of the COMPANY , in case of inaccessible joints.
- 4.2 Whenever possible, pipeline welds will be inspected by placing the radiation source inside the pipe, on the pipeline axis, with a radiation of 6.28 rad. (360°).
- If it is impossible to place the radiation source inside the pipe, the weld will be inspected with the source on the outside. An overlap of at least 40mm at the ends of each film shall be required to ensure that the first and last location increment numbers are common to successive films and to establish that no part of a weld has been omitted.
- 5.0 **@9J 9@C: EI 5@HM**
- The quality level of radiographic sensitivity required for radiographic inspection shall be at least equivalent to the values in Figure-6.
- 6.0 **D9B 9H-F 5A 9H9F G**
- 6.1 The image quality indicator (abbreviation : II) shall be used for the qualification of the welding procedure and during normal line production. Radiographic sensitivity shall be measured with the wire image quality indicator (Penetrameter). The penetrameter shall be selected according to DIN 54109 or ISO 1027. For radiographs made with the source on the outside, a penetrameter shall be placed on each side of the film with the smaller wire of the penetrameter turned towards the end of the film itself. When a complete weld is radiographed in a single exposure using a source inside the piping,

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	D=D=B; : 56F =75H-CB '5B8' 9F 97H-CB'	DOCUMENT NO. BR/TS/38	Page 59 of 61
			REVISION : 0
			EDITION : 1

four penetrameters approximately equally spaced around the circumference shall be used. During the procedure qualification, II shall be placed both on the source side and on the film side. The sensitivity obtained with II on the source side shall not be less than the values shown in Fig. 6 of this specification.

The sensitivity limit may be considered to have been reached when the outline of the II, its identification number and the wire of the required diameter show up clearly on the radiographs.

The COMPANY may authorise use of types of II other than those planned, provided that they conform with recognised standards and only if the CONTRACTOR is able to demonstrate that the minimum sensitivity level required is obtained. Forth is demonstration, a test shall be carried out comparing the II specified and the CONTRACTOR s to show up the identification number and other details of the proposed II, which must be visible in the test radiograph.

7.0' : =@A '89BH= =75H-CB 'A 5F?9FG

All films shall be clearly identified by lead numbers, letters, and/ or markers. The image of the markers shall appear on the films, without interfering with the interpretation. These markers positions shall also be marked on the part to be radiographed and shall be maintained during radiography.

8.0' DF CH97H-CB '5B8 '75F 9'C: : =@A

8.1 All unexposed films shall protected and stored properly as per the requirements of API 1104 standard and ASTM E 94.

8.2 The exposed and une xposed film shall be protected from heat, light, dust and moisture. Sufficient shielding shall be supplied to prevent exposure of film to damaging radiation prior to and following the use of the film for radiographic exposure.


9.0' F9F 58=C; F 5D<M

9.1 The weld joints shall be re-radiographed in case of unsatisfactory quality of the radiographs, at the expense of the CONTRACTOR.

9.2 All the repaired weld joints shall be r e-radiographed at no extra cost to the COMPANY in the same manner as that followed for the original welds. In addition, the repaired weld area shall be identified with the original identification number plus the letter R to indicate the repair.

9.3 When evaluating repair film, radiographers shall compare each section (exposure) of the weld with the original film to assure repair was correctly marked and original defect removed.

9.4 The COMPANY will review prior to any repair of welds, all the radiographs of welds which contain, according to the CONTRACTOR s interpretation, unacceptable defects.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 'H97<B=75@GD97= =75H-CB''		
	C=@/ ' ; 5G'		
TITLE	D=D-B; ' : 56F =75H-CB '5B8' 9F 97H-CB'	DOCUMENT NO. BR/TS/38 '	Page 60 of 61
			REVISION : 0
			EDITION : 1

The final disposition of all unacceptable welds shall be decided by the COMPAN .

10.0' · **EI 5@=75H-CB'C: F 58=C; F 5D< 9F G**

10.1 Pipeline radiographers shall be qualified in according with the requirement of API 1104 and to the full satisfaction of COMPANY .

10.2 Certification of all the radiographers, qualified as per 10.1 above, shall be furnished by the CONTRACTOR to the COMPANY before a radiographer will be permitted to perform production radiography. The certificate record shall include :

- i) Background and experience record
- ii) Training course record
- iii) Technical examination record
- iv) Doctor s report on radiographer s Oaecuer 0-1 acquity eye test.
- v) Date of qualification.

10.3 The radiographers shall be required to qualify with each radiographic procedure they use, prior to performing the work assigned to him in accordance with the specification.

11.0' · **DF 9G9F J 5H-CB'C: F 58=C; F 5D< G**

11.1 The radiographs shall be processed to allow storage of films without any discoloration for at least three years. All the radiographers shall be presented in suitable folders for preservation alongwith necessary documentation.

11.2 All radiographs shall become property of the COMPANY .

12.0' · **9EI =DA 9BH'5B8 '5779GGCF =9G**


12.1 CONTRACTOR shall make necessary arrangement at his own expense, for providing the radiographic equipment, radiographic films and the accessories for carrying out the radiographic examination for satisfactory and timely completion of the job.

12.2 For carrying out the mainline radiographic examination the CONTRACTOR shall be equipped with suitable mobile / stationary type with rooms. These shall have all the required facilities for film processing. Film viewer used shall be equipped with the film illuminator that has a light source of sufficient intensity and can be suitably controlled to allow viewing film densities upto 4.0 without damaging the film.

13.0' · **F 58=5H-CB' DF CH97H-CB**

13.1 CONTRACTOR shall be responsible for the protection and personal monitoring of every man with or near radiation sources.

13.2 The protection and monitoring shall comply with local regulations.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8'H97< B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	D=D-B; : 56F =75H-CB '5B8' 9F 97H-CB'	DOCUMENT NO. BR/TS/38 '	Page 61 of 61
			REVISION : 0
			EDITION : 1

- 13.3 In view of visual haards in the handling of radioactive source of material, CONTRACTOR shall be solely responsible for complying with all rules and regulations set forth by Atomic Energy Commission or any other Government agencies of India in this regard and COMPAN shall not be responsible and shall be kept indemnified by the CONTRACTOR for default(s) of whatever nature by the Contractor. Safety equipment as considered adequate by the COMPANY for all necessary personnel shall be made available for use and maintained for immediate and proper use by the CONTRACTOR.
- 14.0' 8-GD@5MC: G5: 9HM-BGFI 7H-CBG
- 14.1 The safety provisions shall be brought to the notice of all concerned by display on a notice board at prominent place at the work spot. The person responsible for the safety shall be named by the CONTRACTOR.
- 15.0' 9B: CF 79A 9BH: CF G5: 9HMF 9, I @5H-CBG
- 15.1 To ensure effective enforcement of the rules and regulations relating to safety precautions, the arrangement made by the CONTRACTOR shall be open to inspection by COMPANY or its representatives.
- 16.0' : =FGH'5-8 =B8I GHF =5@=B> F =9G
- 16.1 CONTRACTOR shall maintain first aid facilities for its employees and those of its sub-contractors.
- 16.2 CONTRACTOR shall make outside arrangements for ambulance service and for treatment of industrial injuries. Names of those providing these services shall be furnished to COMPANY prior to start of work and their telephone no. shall be posted prominently in CONTRACTOR's field office.
- 16.3 All critical industrial injuries shall be reported promptly to the COMPANY and a copy of CONTRACTOR's report covering each personal injury requiring the attention of physician shall be furnished to the COMPANY.
- 17.0' BC 9L 9A DH-CB
- 17.1 Notwithstanding the above there is nothing in these clauses to exempt the CONTRACTOR from the operation of any other act or rules in force.

GD97 = 75HCB

: CF


G<CD/ : =9@8'D5=BH-B;

GD97 = 75HCB "BC". BR/TS/39



fC=@/ ; 5Gt

**Bridge And Roof Company(I)
Ltd.**

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97<B=75@GD97= =75HCB		
	C=@/ ; 5G		
TITLE	G<CD/ : =9@B D5=BH-B; .	DOCUMENT NO. BR/TS/39	Page 1 of 1
			REVISION : 0
			EDITION : 1


7CBH9BHG

G@BC

89G7F=DHCB

- 1.0 GENERAL
- 2.0 SCOPE
- 3.0 CODES & STANDARDS
- 4.0 EQUIPMENT
- 5.0 SURFACE PREPARATION
- 6.0 PAINT MATERIALS
- 7.0 PAINTING SYSTEMS
- 7.1 PRE-ERECTION/ PRE-FABRICATION AND SHOP PRIMING FOR CARBON STEEL, LOW TEMPERATURE CARBON STEEL & LOW ALLOY STEEL, STEEL STRUCTURES, PIPING AND EQUIPMENT ETC.
- 7.2 REPAIR OF PRE-ERECTION/ FABRICATION AND SHOP PRIMING AFTER ERECTION/ WELDING FOR CARBON STEEL, LOW TEMPERATURE CARBON STEEL & LOW ALLOY STEEL, ITEMS IN ALL ENVIRONMENTS.
- 8.0 FIELD PAINT SYSTEM FOR NORMAL CORROSIVE ENVIRONMENT (FOR CARBON STEEL, LOW TEMPERATURE CARBON STEEL & LOW ALLOY STEEL)
- 9.0 FIELD PAINT SYSTEM FOR CORROSIVE ENVIRONMENT (FOR CARBON STEEL, LOW TEMPERATURE CARBON STEEL AND LOW ALLOY STEEL)
- 10.0 FIELD PAINT SYSTEM FOR HIGHLY CORROSIVE AREA (FOR CARBON STEEL, LOW ALLOY STEEL) EXTERNAL SURFACE OF UNINSULATED COLUMNS, VESSELS, HEAT EXCHANGERS, BLOERS, PIPING, PUMPS, TOWERS, COMPRESSORS, FLARE LINES, STRUCTURAL STEEL ETC.
- 11.0 FIELD PAINT SYSTEM FOR CARBON STEEL STORAGE TANKS (EXTERNAL) FOR ALL ENVIRONMENTS
- 12.0 FIELD PAINT SYSTEM FOR CARBON STEEL AND LOW ALLOY STEEL STORAGE TANK (INTERNAL)
- 13.0 COATING SYSTEM FOR EXTRNAL SIDE OF UNDERGROUND CARBON STEEL, PLANT PIPING AND TANKS.
- 14.0 PAINTING UNDER INSULATION FOR (HOT, COLD & SAFETY) CARBON STEEL LOW TEMPERATURE CARBON STEEL & STAINLESS STEEL PIPING AND EQUIPMENT IN ALL ENVIRONMENT
- 15.0 INTERNAL PROTECTION OF CARBON STEEL WATER BOXES AND TUBE SHEETS OF COOLERS/ CONDENSERS.
- 16.0 FIELD PAINTING SYSTEM FOR GI TOWERS/ NON-FERROUS TUBE SHEET
- 17.0 STORAGE
- 18.0 COLOURS CODE FOR PIPING
- 19.0 IDENTIFICATION OF VESSELS, PIPING ETC.
- 20.0 PAINTING FOR CIVIL DEFENCE REQUIREMENTS
- 21.0 INSPECTION AND TESTING
- 22.0 GUARANTEE
- 23.0 QUALIFICATION CRITERIA O PAINTING CONTRACTOR.
- 24.0 PROCEDURE FOR APPROVAL OF NEW PAINT MANUFACTURERS.
- ANNEXURE-I- LIST OF RECOMMENDED MANUFACTURES
- ANNEXURE-II- LIST OF RECOMMENDED MANUFACTURE'S PRODUCTS.

DF 9D5F 98 6M	7<97?98 6M	5DDF CJ 98 6M	=GGI 9'85H9
fDSML	fCKL	fSTL	July"&\$24

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ' ; 5G'		
TITLE	G<CD/ ' : =9@8'D5-BH-B; '	DOCUMENT NO. BR/TS/39 '	Page 1 of 54
			REVISION : 0
			EDITION : 1

1.0 GENERAL

1.1 These technical specifications shall be applicable for the work covered by the contract, and without prejudice to the various codes of practice, standard specifications etc. it is understood that contractor shall complete the work in all respects with the best quality of materials and workmanship and in accordance with the best engineering practice and instructions of Engineer-in-charge.

1.2 Wherever it is stated in the specification that a specific material is to be supplied or a specific work is to be done it shall be deemed that the same shall be supplied or carried out by the contractor.

Any deviation from this standard without within deviation permit from appropriate authority will result in rejection to job.

2.0 SCOPE


Scope of work covered in the specification shall include, but not limited to the following.

2.1 This specification defines the requirements for surface preparation, selection and application of paint on external surfaces of equipment, vessels, machinery, piping, ducts, steel structures, external & internal protection of storage tanks for all services RCC Chimney & M S Chimney with or without refractory lining and flare lines etc.

2.2 **Extent of Works**

2.2.1 The following surface and materials shall require shop, pre-erection and field painting.

- All uninsulated C. S. & A. S. equipment like columns, vessels, drums, storage tanks, heat exchangers, pumps, compressors, electrical panels and motors etc.
- All uninsulated carbon and low alloy piping fitting and valves (including painting of identification marks), furnace, ducts and stacks.
- All items contained in a package unit as necessary.
- All structural steel work, pipe, structural steel supports, walkways, handrails, ladders, platforms etc.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ' ; 5G'		
TITLE	G<CD/ ' : =9@8 'D5-BH-B; '	DOCUMENT NO. BR/TS/39 '	Page 2 of 54
			REVISION : 0
			EDITION : 1

- e. RCC/ MS chimneys with or without refractory lining & Flare lines.
- f. Identification colour bands on all piping as required including insulated aluminium clad, galvanised, SS and non-ferrous piping.
- g. Identification lettering/ numbering on all painted surface of equipment/ piping insulated aluminium clad, galvanised, SS and non-ferrous piping.
- h. Marking/ identification signs on painted surfaces of equipment/ piping for hazardous service.
- i. Supply of all primers, paints and all other Materials required for painting other than owner's supply.
- j. Over insulation surface of equipments and pipes wherever required.
- k. Painting under insulation for carbon steel and stainless steel as specified.
- l. Repair work of damaged/ preerection/ fabrication shop primer and weld joints at field.


2.2.2 The following surface and materials shall not be painted unless otherwise specified:

- a. Uninsulated austentic stainless steel.
- b. Plastic and/ or plastic coated materials.
- c. Non ferrous materials like aluminium, galvanised "piping", "gratings" and "handrails" etc. except G. I. Towers.

2.3 Documents

2.3.1 The contractor shall perform the work in accordance with the following documents issued to him for executions of work.

- a. Bill of quantities for piping, equipment, machinery and structure etc.
- b. Piping line list.
- c. Painting specifications including special civil defence requirement.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	G<CD/ : =9@8 D5-BH-B; '	DOCUMENT NO. BR/TS/39 '	Page 3 of 54
			REVISION : 0
			EDITION : 1

2.4 Unless otherwise instructed final painting on pre-erection/ shop primed pipes and equipments shall be painted in the field, only after mechanical completion and testing on system are completed as well as, after completion of steam purging wherever required.

2.5 Changes and deviations required for any specific job due to clients requirement or otherwise shall be referred to B&R for deviation permit.

3.0 CODES & STANDARDS

3.1 Without prejudice to the provision of clause 1.1 above and the detailed specifications of the contract, the following codes and standards shall be followed for the work covered by this contract.


IS:5	:	Colour coding
IS-101 and	:	Methods of test for ready mixed paint enamels.
IS-2379:1990	:	Indian standard for pipe line Identification –Colour code.
ASTM Vol. 6.01 and 6.03	:	American standard test methods for Paints and coatings.
ANSI A 13.1-1981	:	Scheme for Identification of piping systems American National Standard Institution.

3.2 Surface Preparation Standards:

Following standards shall be followed for surface preparations:

3.2.1 Swedish Standard : SIS-05 5900-1967/ ISO-8501-1-1998
(Surface preparation standards for painting steel surfaces).

This standard contains photographs of the various standards on four different degrees of rusted steel and as such is preferable for inspection purpose by the Engineer-in-Charge.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	G<CD/ : =9@B D5=BH-B; '	DOCUMENT NO. BR/TS/39 '	Page 4 of 54
			REVISION : 0
			EDITION : 1

- 3.2.2 Steel structure painting Council, U.S.A (surface preparations specifications (SSPC-SP).
- 3.2.3 British standard (surface finish or Blast-cleaned for painting) BS:4232
- 3.2.4 National Associations of Corrosion Engineers, U.S.A. (NACE)
- 3.2.5 Various International Standards equivalent to Swedish Standard for surface preparation are given in Table-I.
- 3.3 The contractor shall arrange, at his own cost, to keep a set of latest edition of any one of the above standards and codes at site.
- 3.4 The paint manufacturer's instructions shall be followed as far as practicable at all times. Particular attention shall be paid to the following:
- Instructions for storage to avoid exposure as well as extremes of temperature.
 - Surface preparations prior to painting.
 - Mixing and thinning.
 - Application of paints and the recommended limit on time intervals between coats.


4.0 EQUIPMENT

- 4.1 All tools, brushes, rollers, spray guns, abrasive materials hand/ power tools for leaning and all equipments, scaffolding materials, shot / wet abrasive blasting, water blasting equipments & air compressors etc. required to be used shall be suitable for the work and all in good order and shall be arranged by the contractor at site and in sufficient quantity.

Mechanical mixing shall be used for paint mixing operations in case of two pack systems except that the Engineer-in-Charge may allow the hand mixing of small quantities at his discretion.

5.0 SURFACE PREPARATION, SHOP COAT, COATING APPLICATION & REPAIR AND DOCUMENTATION

5.1 General

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97 < B=75@GD97 = 75H-CB ''		
	C=@/ ' ; 5G'		
TITLE	G< CD/ ' : =9@8 'D5-BH-B; ' .	DOCUMENT NO. BR/TS/39 ' .	Page 5 of 54
			REVISION : 0
			EDITION : 1

5.1.1 In order to achieve the maximum durability, one or more of following methods of surface preparation shall be followed, depending on condition of steel surface and as instructed by Engineer-in-Charge. Adhesion of the paint film to surface depends largely on the degree of cleanliness of the metal surface. Proper surface preparation contributes more to the success of the paint protective system:

- a. Manual or hand tools cleaning.
- b. Mechanical or power tool cleaning.
- c. Blast cleaning.

5.1.2 Mill scale, rust, rust scale and foreign matter shall be removed fully to ensure that a clean and dry surface is obtained. The minimum acceptable standard in case of manual or hand tool cleaning shall be St. 2 or equivalent, in case of mechanical or power tool cleaning it shall be St. 3 or equivalent, in case of blast cleaning it shall be Sa 2½ or equivalent as per Swedish Standard SIS-055900- 1967/ I SO-8501-1-1988. Where highly corrosive condition exists, then blast cleaning shall be Sa3 as per Swedish Standard.


Remove all other contaminants, oil, grease etc. by use of an aromatic solvent prior to surface cleaning.

5.1.3 Blast cleaning shall not be performed where dust can contaminate surfaces undergoing such cleaning or during humid weather conditions having humidity exceeding 85%.

5.1.4 Irrespective of the method of surface preparation, the first coat of primer must be applied on dry surface. This should be done immediately and in any case within 4 hours of cleaning of surface. However, at times of unfavourable weather conditions, the Engineer-in-Charge shall have the liberty to control the time period, at his sole discretion and / or to insist on recleaning, as may be required, before primer application is taken up. In general, during unfavourable weather conditions, blasting and painting shall be avoided as far as practicable.

5.1.5 The external surface of R. C.C. chimney to be painted be dry and clean. Any loose particle of sand, cement, aggregate etc. shall be removed by rubbing with soft wire brush if necessary, acid etching with 10-15% HCL solution about 15 minutes shall be carried out and surface must be thoroughly washed with water to remove acid & loose particles then dry completely before application of paint.

5.2 Procedure of Surface Preparation.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	G#5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	G<CD/ : =9@8 D5=BH#B; .	DOCUMENT NO. BR/TS/39 .	Page 6 of 54
			REVISION : 0
			EDITION : 1

5.2.1 Blast Cleaning

5.2.1.1 Air Blast Cleaning

The surface shall be blast cleaned using one of the abrasives: AL₂O₃ particles chilled casts iron or malleable iron and steel at pressure of 7k g. Cm² at appropriate distance and angle depending on nozzle size maintaining constant velocity and pressure. Chilled cast iron, malleable iron and steel shall be in the form of shot or grit of size not greater than 0.055" maximum in case of steel and malleable iron and 0.04" maximum in case of chilled iron. Compressed air shall be free from moisture and oil. The blasting nozzles should be venturi style with tungsten carbide or boron carbide as the material for liners. Nozzles orifice may vary from 3/16" to 3/4". On completion of blasting operation, the blasted surface shall be clean and free from any scale or rust and must show a grey white metallic lustre. Primer or first coat of paint shall be applied within 4 hours of surface preparation. Blast cleaning shall not be done out doors in bad weather without adequate protection or when there is dew on the metal which is to be cleaned, surface profile shall be uniform to provide good key to the paint adhesion (i.e. 35 to 50 μ). If possible vacuum collect or shall be installed for collecting the abrasive and recycling.


5.2.1.2 Water Blast cleaning

Environmental, health and safety problems associated with abrasive blast cleaning limit the application of air blast cleaning in many installations. In such case water blast cleaning is resorted to.

Water blast cleaning can be applied with or without abrasive and high-pressure water blasting. The water used shall be inhibited with sodium chromate/ phosphate. The blast cleaned surface shall be washed thoroughly with detergents and wiped solvent and dried with compressed Air. For effective cleaning abrasives are used. The most commonly used pressure for high pressure water blast cleaning for maintenance surface preparation is 3000 to 6000 psi at 35-45 liters/ minute water volume and pressure upto 10000 psi and water volume of 45 liters/ minute provide maximum cleaning.

The water blast cleaned surface shall be comparable to SSPC-SP-12/ NACE No. 5. The operation shall be carried out as per SSPC guidelines for water blast cleaning. The indicative values for sand injection is

Air : 300 to 400 Cu.ft/ min.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GHB85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	G<CD/ : =9@8 D5-BHB; '	DOCUMENT NO. BR/TS/39 '	Page 7 of 54
			REVISION : 0
			EDITION : 1

Water : 5-10 liter/ min. with corrosion inhibitor
Sand : 200-400 lbs/ hr.
Nozzle : 0.5 to 1" dia

Special equipments for water blast cleaning with abrasives now available shall be used.

5.2.2 Mechanical of Power tool cleaning

Power tool cleaning shall be done m echanical striking tools, chipping hammers, griding wheels or rotating steels wire-brushes. Excessive burnish of surface shall be avoided as it can r educe paint adhesion. On completion of cleaning , the detached rust mill scale etc. shall be removed by clean rags and/ or washed by water or stream and t horoughly dried with compressed air jet before application of paint.

5.2.3 Manual or hand tool cleaning

Manual or hand tool cleaning is used only where safety problems limit the application of other surface preparation procedure and hence does not appear in the specifications of paint systems.


Hand tool cleaning normally consists of the following:

- Hand descaling and/ or hammering
- Hand scraping
- Hand wire brushing

Rust, mill scale spatters, old coating and other foreign matter, shall be removed by ham mering, scr apping t ools, em ery paper cleaning , w ire br ushing or combination of the above methods. On completion of cleaning, loose materials shall be removed from the sur face by clean r ags and t he sur face shall be brushed, swept, deducted and blown off with compressed air/ steam to remove all loose m atter. Finally t he sur face m ay be washed with water and dried for effective cleaning.


5.3 Non compatible shop coat primer

The compatibility of finishing coat should be confirmed from the paint manufacturer. In t he event of use of primer such as zinc rich epoxy, inorganic zinc silicate etc. as shop coat the pant system shall depend on condition of shop coat, if shop coat is in satisfactory condition showing no major defects, the shop

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	G<CD/': =9@8'D5-BH-B; '	DOCUMENT NO. BR/TS/39'	Page 8 of 54
			REVISION : 0
			EDITION : 1

coat shall not be removed. The touch up primer and finishing coat(s) shall be identified for application by Engineer-in-Charge.

- 5.4 Shop coated (coated with primer & finishing coat) equipment should not be repainted unless paint is damaged.
- 5.5 Shop primed equipment and surface will only be 'spot cleaned' in damaged areas by means of power tool brush cleaning and then spot primed before applying one coat of filed primer unless otherwise specified. If shop primer is not compatible with field primer then shop coated primer should be completely removed before applications of selected paints system for particular environment.
- 5.6 For packaged units/ equipment, shop primer should be as per the paint system given in this specification. However, manufacturer's standard can be followed after review.
- 5.7 **Coating Procedure and Application:**
- 5.7.1 Surface shall not be coated in rain, wind or in environment where injurious airborne elements exists, when the steel surface temperature is less than 5° F above dew point when the relative humidity is greater than 85% or when the temperature is below 40° F.
- 5.7.2 Blast cleaned surface shall be coated with one complete application of primer as soon as practicable but in no case later than 4 hrs. the same day.
- 5.7.3 To the maximum extent practicable, each coat of material shall be applied as a continuous film uniform thickness free of probes. Any spots or areas missed in application shall be recoated and permitted to dry before the next coat is applied. Applied paint should have the desired wet film thickness.
- 5.7.4 Each coat shall be proper state of cure or dryness before the application of succeeding coat. Material shall be considered dry for recoating when an additional coat can be applied without the development of any detrimental film irregularities such as lifting or loose of adhesion of the under coat. Manufacturer instruction shall be followed for intercoat interval.
- 5.7.5 When the successive coat of the same colour have been specified, alternate coat shall be tinted, when practical, sufficiently to produce enough contrast to indicate complete coverage of the surface. The tinting material shall be compatible with the material and not detrimental to its service life.


BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ' ; 5G'		
TITLE	G<CD/ ' : =9@8 D5-BH-B; '	DOCUMENT NO. BR/TS/39 '	Page 9 of 54
			REVISION : 0
			EDITION : 1

5.7.6

Air spray application shall be in accordance with the following:

- a. The equipment used shall be suit able for the intended purpose, shall be capable of properly atomizing the paint to be applied, and shall be equipped with suitable pressure regulators and gauges. The air caps, nozzles, and needles shall be those recommended by the manufacturer of the equipment for the material beign sprayed. The equipment shall be kept in satisfactory condition to permit proper paint application.
- b. Traps or separators shall be provided to remove oil and condensed water from the air . These traps or separators must be of adequate size and must be drained periodically during operations. The air from the spray gun impinging against the surface shall show condensed water or oil.
- c. **Ingredients shall be kept properly mixed in the spray pots or containers during application by continuous mechanical agitation.**
- d. The pressure on the material in the pot and of the air at the gun shall be adjusted for optimum spraying effectiveness. The pressure on the material in the pot shall be adjusted when necessary for change in elevation of the gun above the pot. The atomizing air pressure at the gun shall be high enough to properly atomize the paint but not so high as to cause excessive fogging of paint , excessive evaporation of solvent, or less by overspray.
- e. Spray equipment shall be kept sufficiently clean so that dirt, dried paint, and other foreign materials are not deposited in the paint film.

Any solvents left in the equipment shall be completely removed before applying paint to the surface begin painted.
- f. Paint shall be applied in a uniform layer, with overlapping at the edge of the spray pattern. The spray patterns shall be adjusted so that the paint is deposited uniformly. During application the gun shall be held perpendicular to the surface and at a distance which will ensure that a wet layer of paint is deposited on the surface. The trigger of the gun should be released at the end of each stroke.
- g. All runs and sags shall be brushed out immediately or the paint shall be removed and the surface repainted.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	G<CD/ : =9@8 D5-BH-B; '	DOCUMENT NO. BR/TS/39 '	Page 10 of 54
			REVISION : 0
			EDITION : 1

- h. Areas inaccessible to the spray gun shall be painted by brush: if not accessible by brush, daubers or sheepking shall be used.
- i. All nameplates, manufacturer's identification tags, machined surface instrument glass, finished flange faces, control valve items and similar items shall be masked to prohibit coating disposition. If these surface are coated, the component shall be cleaned and restored to its original condition.
- j. Edges of structural shapes and irregular coated surface shall be coated first and an extra pass made later.
- k. If spray gun shown choking, immediately dechoking procedure shall be followed.

5.7.7

Airless spray application shall be in accordance with the following procedure: as per steel structure paint manual vol. 1 & v ol. 2. By SSPC, U.S.A., Air less spray relies on hydraulic pressure rather than air atomization to produce the desired spray. An air compressor or electric motor is used to operate a pump to produce pressures of 1,000 to 6. 000 psi. Paint is delivered to the spray gun at this pressure through a single hose within the gun, a single paint stream is divided into separate streams, which are forced through a small orifice resulting in atomization of paint without the use of air. This result in more repaid coverage with less overspray. Airless spray usually is faster, cleaner, more economical and easier to use than conventional airspray.


Airless spray equipment is mounted on wheels, and paint is aspirated in a hose that sucks paint from any container, including drums. The unit shall have in built agitator that keep t he paint uniformly mixed during the spraying. The unit shall consists of in built strainer. Usually very small quantities of thinning is r equired before spray. Incase of High Build epox y coating (two pack), 30: 1 pump ratios and 0.020-0.023" tip size will provide a g ood spray pattern. Ideally f luid hoses should no be less than 3/ 8" I D and not longer than 50ft to obtain optimum results.

In case of gun choking, decoking steps shall be followed immediately.

5.7.8

Brush application of paint shall be in accordance with the following:

- a. Brushes shall be of a style and q uality that will enable proper application of paint

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	G<CD/ : =9@8 'D5-BH-B; '	DOCUMENT NO. BR/TS/39 '	Page 11 of 54
			REVISION : 0
			EDITION : 1

- b. Round or oval brushes are most suitable for rivets, bolts, irregular surfaces and rough or pitted steel. Wide flat brushes are suitable for large flat areas, but they shall not have width over five inches.
- c. Paints shall be applied into all corners.
- d. Any runs or sags shall be brushed out.
- e. There shall be minimum of brush marks left in the applied paint
- f. Surface not accessible to brushes shall be painted by spray, duubers, or sheepkin.

5.7.9 Manual application by sling (where 6 O ' clock position of pipe is not approachable)


A canvas strip (alternatively a t inplate strip) about 450mm wide and 1.5m long is hold under the pipe by two men. Liquid coating poured on t he sling at each side of the pipe. The men holding this sling move it up and down and walk slowly forward while fresh coating is poured on t he pipe and they manipulate the sling so that an even coating is obtained all round the bottom. This work shall be done very carefully and by experienced personnel. There shall bot be any formation of "Whiskers" and holes in the coating. The coating film shall be inspected by mirror.

5.7.10 For each coat the painter should know the W FT corresponding to the specified DFT and standardise the paint application technique to achieve the desired WFT. This is to be ensured in the qualification trial.

5.8 Drying of Coated Surface

5.8.1 No coat shall be applied unit the preceding coat has dried. The material shall be considered dry for re-coating when another coat can be applied without the development of any film irregularities such as lifting or loss of adhesion of undercoats. Drying time of the applied coat should not exced maximum specified for it as a first coat; if it exceeds the paint material has possible det eriorated or mixing is faulty.

5.8.2 No paint shall be force dried under condition which will cause checking, wrinkling blistering formation of pores, or detrimentally after the condition of the paint.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/'; 5G		
TITLE	G<CD/': =9@8'D5-BH-B;'	DOCUMENT NO. BR/TS/39'	Page 12 of 54
			REVISION : 0
			EDITION : 1

No drier shall be added to a paint on the job unless specifically called for in the manufacturer's specification for the paint.

Paint shall be protected from rain, condensation, contamination snow and freezing until dry to the fullest extent practicable.

5.9 **Repair of damaged paint surface.**

5.9.1. Where paint has been damaged in handling and in transportation, the repair of damaged coating of pre-creation/ fabrication shall be as given below.

5.9.2. Repair of damaged inorganic zinc silicate primer after erection/ welding:

Quickly remove the primer from damaged area by mechanical scraping and emery paper to expose the white metal. Blast clean the surfaces possible. Feather the primer over the intact adjacent surface surrounding the damaged area by emery paper.

5.9.3 Repair of damaged pre-erection and shop priming in the design temperature of 90° C to 500° C.

- Surface preparation shall be done as per procedure 5.9.2
- One coat of F- 9 shall be applied wherever damaged was observed on pre-erection/ pre-fabrication/ shop primer of inorganic zinc silicate coating (F-9) shall not be applied if damaged area is not more than 5 x 5 cm.

5.10 **PAINT APPLICATION**


5.10.1 Shop priming/ pre-erection priming with F9 of F12 shall be done only on blasted surface.

5.10.2 Shop priming/ pre-erection priming with F- 9 or F- 12 shall be done only with airless spray.

5.10.3 For large flat surface field painting shall be done by airless spray otherwise brush can be used.

5.11 **Assessment of Painting Requirement**

The paint system to be applied for a specific job shall be arrived as sequentially as given below :

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 'H97<B=75@GD97= =75H-CB''		
	C=@/ ' ; 5G'		
TITLE	G<CD/ ' : =9@8'D5-BH-B; '	DOCUMENT NO. AR/TS/39'	Page 13 of 54
			REVISION : 0
			EDITION : 1

- Identify the environment from area classification details and choose the appropriate table.
- Identify the design temperature from the technical documents.
- Identify the specific field paint system and surface preparation requirement from the above identified table and temperature range.
- Identify the shop priming requirement from Table 7. 1 based on compatibility of the above paint system.
- Identify the need of repair of shop primer and execute as per Table 7.2.

5.12

Documentation.

A written quality plan with procedure for qualification trials and for the actual work.

Daily progress report with details of weather condition, particular of application no of coats and type of materials applied, anomalies, progress of work versus programme.


Result of measurement of temperature relative humidity, surface profile, film thickness, holiday detection, adhesion tests with signature of appropriate authority.

Particular of surface preparation and paint application during trials and during the work.

Details of non-compliance, rejects and repairs.

Type of testing equipments and calibration.

Code and batch numbers of paint material used.

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97<B=75@GD97= =75H-CB ''		
	C=@/ ' ; 5G'		
TITLE	G<CD/ ' : =9@8 D5-BH-B; '	DOCUMENT NO. BR/TS/39	Page 14 of 54
			REVISION : 0
			EDITION : 1

**TABLE-I (for clause 5.0)
SURFACE PREPARATION STANDARDS**

Si. NO.	DESCRIPTION	VARIOUS INTERNATIONAL STANDARDS (EQUIVALENT)				REMARK
		SWEDISH STANDARD SIS-05-5900 1967	SSPC-SP- USA	NACE USA	BRITISH STANDARD BS-4232: 1967	
1.	MANUAL OR HAND TOOL CLEANING REMOVAL OF LOOSE RUST LOOSE MILL SCALE AND LOOSE PAINT, CHIPPING, SCRAPING, SANDING AND WIRE BRUSHING, SURFACE SHOULD HAVE A FAINT METALLIC SHEEN.	ST.2	SSPC-SP- 2	--		THIS METHOD IS APPLIED WHEN THE SURFACE IS EXPOSED TO NORMAL ATMOSPHERIC CONDITION WHEN OTHER METHODS CANNOT BE ADOPTED AND ALSO FOR SPOT CLEANING DURING MAINTENANCE PAINTING.
2.	MECHANICAL OR POWER TOOL CLEANING REMOVAL OF LOOSE RUST, LOOSE MILL SCALE AND LOOSE PAINT TO DEGREE SPECIFIED BY POWER TOOL CHIPPING, DESCALING, SANDING, WIRE BRUSHING AND GRINDIN, AFTER REMOVAL OF DUST, SURFACE SHOULD HAVE A PRONOUNCED METALLIC SHEEN.	ST.3	SSPC-SP- 3	--		-DO-


BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 1H97<B=75@GD97= =75H-CB ''		
	C=@/ ; 5G'		
TITLE	G<CD/ ' : =9@8 D5-BH-B; '	DOCUMENT NO. BR/TS/39'	Page 15 of 54
			REVISION : 0
			EDITION : 1

TABLE-I (for clause 5.0)
SURFACE PREPARATION STANDARDS

Si. NO.	DESCRIPTION	VARIOUS INTERNATIONAL STANDARDS (EQUIVALENT)				REMARKS
		SWEDISH STANDARD SIS-05-5900 1967	SSPC-SP USA	NACE USA	BRITISH STANDARD BS-4232: 1967	
3.	BLAST CLEANING (AIR & WATER) THERE ARE FOUR COMMON GRADES OF BLAST CLEANING					
3.1 W	HITE METAL BLAST CLEANING TO WHITE METAL CLEANLINESS REMOVAL OF ALL VISIBLE RUST, MILL SCALE PAINT & FOREIGN MATTER 100% CLEANLINESS WITH DESIRED SURFACE PROFILE.	SA-3	SSPC-SP- 5	NACE#1	FIRST QUALITY	WHERE EXTREMELY CLEAN SURFACE CAN BE EXPECTED FOR PROLONG LIFE OF PAINT SYSTEMS.
3.2	NEAR WHITE METAL BLAST CLEANING TO NEAR WHITE METAL CLEANLINESS, UNIT AT LEAST 95% OF EACH ELEMENTS OF SURFACE AREA IS FREE OF ALL VISIBLE RESIDUES WITH DESIRED SURFACE PROFILE.	SA 2 ½	SSPC-SP- 10	NACE #2	SECOND QUALITY	THE MINIMUM REQUIREMENT FOR CHEMICALLY RESISTANT PAINT SYSTEM SUCH AS EPOXY, VINYL, POLYURETHANE BASED AND INORGANIC ZINC SILICATE PAINTS, ALSO FOR CONVENTIONAL PAINT SYSTEM USED UNDER FAIRLY CORROSIVE CONDITIONS TO OBTAIN DESIRED LIFE OF PAINT SYSTEM.



BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	G<CD/ ' : =9@8 D5-BH-B; ' .	DOCUMENT NO. BR/TS/39'	Page 16 of 54
			REVISION : 0
			EDITION : 1

TABLE-I (for clause 5.0)
SURFACE PREPARATION STANDARDS


Si. NO.	DESCRIPTION	VARIOUS INTERNATIONAL STANDARDS (EQUIVALENT)				REMARKS
		SWEDISH STANDARD SIS-05- 5900 1967	SSPC-SP USA	NACE USA	BRITISH STANDARD BS-4232: 1967	
3.3 CO	MMERCIAL BLAST BLAST CLEANING UNIT AT LEAST TWO—THIRD OF EACH ELEMENT OF SURFACE AREA IS FREE OF ALL VISIBLE RESIDUES WITH DESIRED SURFACE PROFILE.	SA-2 SSPC-	SP-6	No. 3	THIRD QUALITY	FOR STEEL REQUIRED TO BE PAINTED WITH CONVENTIONAL PAINTS FOR EXPOSURE TO MILDLY CORROSIVE ATMOSPHERE FOR LONGER LIFE OF THE PAINT SYSTEMS.
3.4 BRUSH-	OFF BLAST BLAST CLEANING TO WHITE METAL CLEANLINESS, REMOVAL OF ALL VISIBLE RUST, MILL SCALE , PAINT & FOREIGN MATTER, SURFACE PROFILE IS NOT SO IMPORTANT.	SA-1 SSPC-	SP-7	No. 4		

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GHB85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	G<CD/ : =9@B D5-BH-B; .	DOCUMENT NO. BR/TS/39'	Page 17 of 54
			REVISION : 0
			EDITION : 1

6.0


PAINT MATERIALS

Paint manufacturers shall furnish all the characteristics of paint material on printed literature, alongwith the test certificate for all the specified characteristics given in this specifications. All the paint materials shall be of first quality and conform to the following general characteristics as per the table 6.1, 6.2 and 6.3.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB ''		
	C=@/ 'GAS		
TITLE	G<CD/ ': =9@8 D5-BH-B; '	DOCUMENT NO. BR/TS/39	Page 18 of 54
			REVISION : 0
			EDITION : 1


PAINT MATERIALS
TABLE NO.: 6.1 PRIMERS

S. No.	DESCRIPTION	P-2 P-	4 P-	6
1.	Technical Name	Chlorinated rubber Zinc Phosphpate primer	Etch primer/ wash primer	Epoxy zinc phosphate primer
2.	Type and composition	Single pack, air drying chlorinated rubber based medium plasticised with unsaponifiable plasticizer, plgmented with Zic phosphate.	Two pack polyvinyl butyral resin medium cured with phosphoric acid solution pogmented with zic tetroxy choromate.	Two component polyamide cured epoxy resin medium, pigmented with zinc phosphate.
3.	Volume solids (approx)	40%	7-8%	40%
4.	DFT (Dry dilml thickness) per coat (approx)	40-50μ 8-	10μ 40-	50μ
5.	Theoretical covering capacity in M2/ coat/ litre (approx)	8-10 8-	10 8-	10
6.	Weight per litre in kgs/ litre (approx)	1.3	1.2	1.4
7.	Touch dry at 30° C (approx)	30 minutes	2 hrs.	After 30 mins.
8.	Hard dry at 30° C (approx)	Min.: 8 hrs. Max.: no limitation	Min.: 2 hrs. Max.: 24 hrs.	Min.: 8 hrs. Max.: 3-6 months
9.	Over Coating Interval (approx.)	Min : 8 hrs Max : No limitation	Min : 4.6 hrs Max : 24 hrs	Min : 8 hrs Max : 3-6 months
10.	Pot life (approx) at 30° C for two component paints (approx).	Not applicable	Not applicable	8 hrs.
11.	Temperature Resistance	60°C	Not applicable	80°C

BRIDGE AND ROOF CO. (I) LTD.	GHB85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	G<CD/ ' : =9@8 D5-BHB; '	DOCUMENT NO. BR/TS/39	Page 19 of 54
			REVISION : 0
			EDITION : 1


PAINT MATERIALS
TABLE NO.: 6.2FINISH PAINT

S. No	DESCRIPTION F-	2	F-3	F-6	F-7
1.	Technical Name	Acrylic polyurethane finish paint	Chlorinated rubber based finish paint	Epoxy-High build finish paint	High build coaltar epoxy coating.
2.	Type and composition	Two-pack aliphatic isocyanate cured acrylic finish paint	Single pack plasticised chlorinated rubber based medium with chemical and weather resistant pigments.	Tow- pack polyamide/ ployamine cured epoxy resin medium suitable pigmented.	Tow pack polyamide cured epoxy resin blended with coal/ tar medium, suitably pigmented.
3.	Volume solids (approx)	40%	40%	62%	65%
4.	DFT (Dry film thickness) per coat (approx)	30-40μ 40-	50μ 100-	125μ 100-	125μ
5.	Theoretical covering capacity in M2/ coat/ litre (approx)	10-13 8-	10	5-6	5-2-6.5
6.	Weight per litre in kgs/ litre (approx)	1.3 1.	2	1.4	1.5
7.	Touch dry at 30° C (approx)	1 hrs.	30 minutes	3 hrs.	4 hrs.
8.	Hard dry at 30° C (approx)	Overnight	8 hrs.	Overnight	48 hrs.
9.	Overcoating interval (approx)	Min.: Overnight (12) hrs. Max.: Unlimited	Min.: Overnight Max.: Unlimited	Min.: Overnight Max.: 5 day	Min.: 24 hrs. Max.: 5 day
10.	Pot life at 30° C for two component paints (approx).	6-8 hrs.	Not applicable	4-6 hrs.	4-6 hrs.
11.	Temperature Resistance	80°C	60°C	80°C	125°C

BRIDGE AND ROOF CO. (I) LTD.	GHB85F 8 H97 < B=75@GD97 = 75H-CB ''		
	C=@/ ; 5G'		
TITLE	G<CD/ : =9@8 D5-BH-B; '	DOCUMENT NO. BR/TS/39'	Page 20 of 54
			REVISION : 0
			EDITION : 1

PAINT MATERIALS
TABLE NO.: 6.3 FINISH PAINTS

S. No	DESCRIPTION F	-8	F-9	F-11	F-12
1.	Technical Name	Self priming type surface tolerant high build epoxy coating (Complete rust control coating)	Inorganic Zinc Silicate coating	Heat resistant synthetic medium based two pack aluminum paint suitable upto 250°C dry temperature	Heat resistant silicone aluminum paint suitable upto 500° C temperature
2.	Type and composition	Two-pack epoxy resin based suitable pigmented and capable pigmented and capable of adhering to manually prepared surface and old coating	A two-pack air drying self-curing solvent based inorganic zinc silicate coating.	Heat resistant synthetic medium based two pack aluminum paint suitable upto 250°C	Single pack silicone resin based medium with aluminum flakes.
3.	Volume solids (approx)	72%	60%	25%	20%
4.	DFT (Dry film thickness) per coat (approx)	100-125µ 65-	75µ 20-	25µ 20-	25µ
5.	Theoretical covering capacity in M2/ coat/ litre	6.0-7.2 8-	9	10-12	8-10
6.	Weight per litre in kgs/ litre (approx)	1.4	2.3 1.2 1.1		
7.	Touch dry at 30° C (approx)	3 hrs.	30 min.	3 hrs.	30 min.
8.	Hard dry at 30° C (approx)	24 hrs.	12 hrs.	12 hrs.	24 hrs.
9.	Overcoating interval (approx)	Min.: 10 hrs. Max.: 6 months	Min.: 8 hrs. at 20°C and 50% RH. Max.: Unlimited	Min.: 16 hrs. Max.: Unlimited	Min.: 16 hrs. Max.: Unlimited


BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 'H97<B=75@GD97= =75H-CB ''		
	C=@/ ' ; 5G'		
TITLE	G<CD/ ' : =9@8 'D5-BH-B; ' .	DOCUMENT NO. BR/TS/39'	Page 21 of 54
			REVISION : 0
			EDITION : 1

S. No	DESCRIPTION F	-8	F-9	F-11	F-12
10.	Pot life (approx) at 30° C for two component paints (approx).	90 min.	4-6 hrs.	Not applicable	Not applicable
11.	Temperature resistance	80°C	400°C	250° C	500° C

F-14: Specially for mulated polyamine cured coal tal epoxy suitable for-45°C to 125°C for application under insulation


F-15: Two pack cold curved epoxy phenolic coating suitable for 45°C to 125°C for application under insulation

F-16: Eoxy siloxane anser coat 738

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	G<CD/ ' : =9@8 D5-BHB; ' .	DOCUMENT NO. BR/TS/39'	Page 22 of 54
			REVISION : 0
			EDITION : 1

PAINT MATERIALS
TABLE NO. 6.4 FINISH PAINTS

Sl. No.	Description	F-14 F	-15	F-16 F	-17
1.	Technical name	Polyamine cured coal tar epoxy	Two-component Epoxy phenolic coating cured with polyamine adduct hardner system (primer + intermediate coat + finish paint)	Ambient temperature curing Poly Siloxane coating / High build cold applied inorganic copolymer based aluminum coating suitable for under insulation coating of CS and SS piping for high temperature service.	Two component solvent free type high build epoxy phenolic / novalac epoxy phenolic coating cured with Polyamine adduct hardner system.
2.	Type & composition	Specially formulated polyamine cured coaltar epoxy suitable for application under insulation	Two pack ambient temperature curing epoxy phenolic coating system suitable for application under insulation of CS / SS piping.	Amercoat 738 from Ameron Products, USA / Berger 938 from Berger Paints Ltd., or Intertherm 751 CSA from Akzo Nobel coating. Note : 6	Two component solvent free type high build epoxy phenolic / novalac epoxy phenolic coating cured with Polyamine adduct hardner system.
3.	Volume Solids (minimum)	70% 65% 60% 98-			100%
4.	DFT (Dry Film thickness) per coat (minimum)	125 µm	75 - 100 µm	75 - 100 µm 125-	150 µm
5.	Theoretical covering capacity in M ² /coat / litre (minimum)	5.5	6.5-8.5 6.0-	8.0 6.5-	8.0
6.	Weight per liter in kgs/litre (max paint) (minimum)	1.5 1.7 1.3 1.7			
7.	Touch dry at 30°C (maximum)	4 hrs.	2 hrs.	1 hr.	2 hrs.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB''		
	C=@/ ; 5G'		
TITLE	G<CD/ : =9@8 D5-BH-B; '	DOCUMENT NO. BR/TS/39'	Page 23 of 54
			REVISION : 0
			EDITION : 1

Sl. No.	Description	F-14 F	-15	F-16 F	-17
8.	Hard dry at 30°C (maximum) Full cure 30°C (for immersion / high temp. service)	24 hrs. 168 hrs.(7 days)	24 hrs. 168 hrs.(7 days)	16 hrs. -	24 hrs. 168 hrs.(7 days)
9. O	ver-coating interval	Min. 6 hrs. Max. 5 days	Min. 36 hrs. Max. 21 days	Min. 16 hrs. Max. Not applicable	Min. 16 hrs. Max. 21 days.
10.	Pot life at 30°C for two component paints (minimum)	4 hrs.	1.5 hrs.	1 hr.	1 hr.
11. T	Temperature Resistance (min.)	-45°C to 125°C under insulation	-45°C to 125°C under insulation (Note : 5)	Up to 400°C f or CS & SS under insulation	-45°C to 150°C for immersion service

Notes:


- Covering capacity and DFT depends on method of application. Covering capacity specified above are theoretical. Allowing the loose during the application, minimum specified DFT should be maintained.
- All primers and finish coats should be cold cured and air drying unless otherwise specified.
- All paints shall be applied in accordance with manufacturer's instruction for surface preparation, intervals, curing and application. The surface preparation, quality and workmanship should be ensured.
- Technical data sheets for all paints shall be supplied at the time of submission of quotations.

6.4 List of recommended manufacturers

The paint shall conform to the specifications given above and the best quality in their products range of the manufacturers listed in Annexure-I.

7.0 PAINT SYSTEM

The paint system should vary with type of environment envisaged in and around the plants. Three types of environment as given below are considered for selection of paint system. The paint system is also given for specific requirements.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	G<CD/': =9@8'D5-BH-B; '	DOCUMENT NO. BR/TS/39'	Page 24 of 54
			REVISION : 0
			EDITION : 1

Primers & finish coats covered in table nos. 7.0 to 15.0

PRIMERS

- P-2 : Chlorinated Rubber Zinc Phosphate Primer
- P-4 : Etch Primer/ Wash Primer
- P-6 : Epoxy Zic Phosphate Primer

FINISH COATS/ PAINTS

- F-2 : Acrylic- Polyurethane finish paint
- F-3 : Chlorinated Rubber Finish Paint
- F-6 : High Build Epoxy finish coating
- F-7 : High Build Coal Tar epoxy coating
- F-8 : Self-priming surface tolerant high build epoxy coating
- F-9 : Inorganic Zinc Silicate Coating.
- F-11 : Heat resistant Synthetic medium based Aluminum paint.
- F-12 : Heat resistant Silicone Aluminum paint.
- F-14 : Specially formulated polyamine-cured coal for Epoxy coating
- F-15 : Epoxy phenolic coating
- F-16 : Epoxy Siloxane Coating : Amercoat 738
- F-17 : Two component solvent free type high build epoxy phenolic / novalac epoxy phenolic coating cured with polyamine.


BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97 =75H-CB ''		
	C=@/ ' ; 5G'		
TITLE	G<CD/ ' : =9@8 D5-BH-B; ' .	DOCUMENT NO. BR/TS/39'	Page 25 of 54
			REVISION : 0
			EDITION : 1

TABLE 7.1: PRE-ERECTION/ PRE-FABRICATION AND SHOP PRIMING FOR CARBON STEEL, LOW TEMPERATURE CARBON STEEL & LOW ALLOY STEEL, STEEL STRUCTURE, PIPING AND EQUIPMENT ETC.

S. No.	DESIGN TEMPERATURE IN °C	SURFACE PREPARATION	PAINT SYSTEM	TOTAL DFT IN MICRONS (MIN.)	REMARKS
7.1.1	-90 TO 400	SSPC-SP-10	1 COAT OF F-9	65-75	No overcoating is to be done
7.1.2	401 To 500	SSPC-SP-10	1 COAT OF F-12	40-50	Finish Coat at Site
7.1.3	-40 to 150 f or Structures, hand rails and Grating only	SSPC-SP-3	1 COAT OF F-9 OR 2 COATS OF P-7 @ 40μ DFT / COAT	65-75 OF F-9 OR 80 (P-7)	For Dam aged Area of more than 5 x5 cm2.

TABLE 7.2: REPAIR OF PRE-ERECTION/ PRE- FABRICATION AND SHOP PRIMING AFTER ERECTION/ WELDING FOR CARBON STEEL LOW TEMPERATURE CARBON STEEL & LOW ALLOY STEEL, ITEMS IN ALL ENVIRONMENT.

S. No.	DESIGN TEMPERATURE IN °C	SURFACE PREPARATION	PAINT SYSTEM	TOTAL DFT IN MICRONS (MIN.)	REMARKS
7.2.1	-90 TO 400	SSPC-SP-3 (FOR REPAIR ONLY) SSPC-SP-10	1 COAT OF F-9	65-75	FOR DAMAGED AREA OF MORE THAN 5X5 CM.
7.2.2	401 TO 550	SSPC-SP-3	1 COAT OF F-12	20	FOR DAMAGED AREA OF MORE THAN 5X5 CM.



BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB "		
	C=@/ ' ; 5G		
TITLE	G<CD/ ' : =9@8 D5=BH-B; "	DOCUMENT NO. BR/TS/39	Page 26 of 54
			REVISION : 0
			EDITION : 1

TABLE 8.0: FIELD PAINT SYSTEM FOR NORMAL CORROSIVE ENVIRONMENT (FOR CARBON STEEL, LOW TEMPERATURE CARBON STEEL & LOW ALLOY STEEL)

ALL NORMAL CORROSIVE AREAS SUCH AS OFF SITES EXTERNAL SURFACE OF UNINSULATED COLUMNS, VESSELS, HEAT EXCHANGERS, BLOWERS, PIPING, PUMPS, TOWERS, COMPRESSORS, STRUCTURAL STEEL WORKS, RCC CHIMNEY WITH OR WITHOUT REFRACTORY LINE INSIDE CHIMNEY (ALL ENVIRONMENTS), EXCLUDING TANK TOPS, FLARE LINES, D.M. PLANTS, INTERIOR OF TANKS ETC. FLARE LINES FOR NORMAL CORROSIVE ENVIRONMENT ALSO TO BE PAINTED AS PER TABLE 9.0

S. NO.	DESIGN TEMPERATURE IN C	SURFACE PREPARATION	PAINT SYSTEM		TOTAL DFT IN MICRONS (MIN.)	REMARKS
			<u>FIELD PRIMER</u>	FINISH PAINT		
8.1	-90 TO -15	SSPC-SP-10	REPAIR OF PRE-FABRICATION PRIMER 1 COAT OF F-9 @65- 75μ DFT/ COAT	NONE	65-75	No over coating to be done follow repair procedure only on damaged areas of pre-erection/ pre-fabrication primer/ coating F-9
8.2	-14 TO 60	SSPC-SP-10	REPAIR OF PRE-FABRICATION PRIMER 1 COAT OF F-9 @ 65- 75μ DFT/ COAT + 2 COATS OF P-2 @ 40μ DFT/ COAT 2 X 40 = 80	2 COATS OF F-3 @ 40 μ DFT/ COAT 2 X 40 = 80	225	
8.3	61 TO 80	SSPC-SP-10	REPAIR OF PRE-FABRICATION PRIMER 1 COAT OF F-9 @ 65- 75μ DFT/ COAT + 2 COATS OF P-6 @ 40μ DFT/ COAT 2 X 40 = 80	1 COATS OF F-6 @ 100 μ DFT/ COAT	245	

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/'; 5G'		
TITLE	G<CD/': =9@8 D5=BH-B;'	DOCUMENT NO. BR/TS/39	Page 27 of 54
			REVISION : 0
			EDITION : 1

S. NO.	DESIGN TEMPERATUR E IN C	SURFACE PREPARATIO N	PAINT SYSTEM		TOTAL DFT IN MICRONS (MIN.)	REMARKS
			<u>FIELD PRIMER</u>	FINISH PAINT		
8.4	81 TO 250	SSPC-SP-10	REPAIR OF PRE-FABRICATION PRIMER 1 CO AT O F F -9 @ 65- 75μ DFT/ COAT	3 COATS OF F-11 @ 20 μ DFT/ COAT 3 X 20 = 60	125	
8.5	251 TO 400	SSPC-SP-10	REPAIR OF PRE-FABRICATION PRIMER 1 CO AT O F F -9 @ 65- 75μ DFT/ COAT	2 COATS OF F-12 @ 20 μ DFT/ COAT 2 X 20 = 40	105	
8.6	401 TO 500	SSPC-SP-10	REPAIR AS PER 7.2.2	2 COATS OF F-12 @ 20 μ DFT/ COAT 2 X 20 = 40	80	

NOTE 1 : FOR MS CHIMNEY OR WITHOUT REFRACTORY LINING 8.3, 8.4 AND 8.5 SHALL BE FOLLOVED.

NOTE 2 : FOR EXTENAL SURFACE OF RCC CHMNEY: 2 COATS OF F-6 @ 100 μ DFT/ COAT TO OBBTAIN 2 X 100=200μ
SHALL BE APPLIED AFTER MAKING SURFACE PREPARATION AS PER GUIDELINES IN 1.5

NOTE 3 : WHEREVER REQUIRED S.NO. 8.3 SHALL BE USED FOR 14°C TO 80°C AND S.NO. 8.2 WILL BE DELETED.


BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB "		
	C=@/ ' ; 5G		
TITLE	G<CD/ ' : =9@8 D5-BH-B; "	DOCUMENT NO. BR/TS/39	Page 28 of 54
			REVISION : 0
			EDITION : 1

TABLE 9.0: FIELD PAINT SYSTEM FOR CORROSIVE ENVIRONMENT (FOR CARBON STEEL, LOW TEMPERATURE CARBON STEEL & LOW ALLOY STEEL)

FOR ALL CORROSIVE AREAS ABOVE GROUND WHERE H₂S, SO₂ FUMES OR SPILLAGE'S OF ACID/ ALKALI/ SALT ARE LIKELY TO COME IN CONTACT WITH SURFACE SUCH AS EXTERNAL SURFACE OF UNINSULATED COLUMNS, VESSELS, HEAT EXCHANGERS, BLOWERS, PIPING, PUMPS, TOWERS, COMPRESSORS, FLARE LINES, STRUCTURAL STEEL ETC.

S. NO.	DESIGN TEMPERATURE IN °C	SURFACE PREPARATION	PAINT SYSTEM		TOTAL DFT IN MICRONS (MIN.)	REMARKS
			FIELD PRIMER	FINISH PAINT		
9.1	-90 TO -15	SSPC-SP-10	REPAIR OF PRE-FABRICATION PRIMER 1 COAT OF F-9 @ 65-75μ DFT/ COAT	NONE	65-75	Repair of pre-erection/ pre fabrication primer shall be done wherever damage is observed.
9.2	-14 TO 80	SSPC-SP-10	REPAIR OF PRE-FABRICATION PRIMER 1 COAT OF F-9 @ 65-75μ DFT/ COAT + 1 COATS OF P-6 @40 μ DFT/ COAT	1 COATS OF F-6 @ 100 μ DFT/ COAT + 1 COAT OF F-2 @ 40 μ DFT/ COAT	225	Surface preparation is required only for repairing of damaged pre-erection/ fabrication primer
9.3	81 TO 400	SSPC-SP-10	REPAIR OF PRE-FABRICATION PRIMER 1 COAT OF F-9 @ 65-75μ DFT/ COAT	2 COATS OF F-12 @ 20 μ DFT / COAT 2 X 20 = 40	105	
9.4	401 TO 500	SSPC-SP-10	REPAIR 2S PER 7.2.2	2 COATS OF F-12 @ 20 μ DFT / COAT	80	


BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB "		
	C=@/ ' ; 5G'		
TITLE	G<CD/ ' : =9@8 D5-BH-B; "	DOCUMENT NO. BR/TS/39	Page 29 of 54
			REVISION : 0
			EDITION : 1

TABLE 10.0: FIELD PAINT SYSTEM FOR HIGHLY CORROSIVE (FOR CARBON STEEL, LOW TEMPERATURE CARBON STEEL & LOW ALLOY STEEL) EXTERNAL SURFACES OF UNINSULATED COLUMNS , VESSELS, HEAT EXCHANGERS, BLOWERS, PIPING PUMPS, TOWERS, COMPRESSORS, FLARE LINES, STRUCTURE STEEL ETC.

EXPOSED TO SPILLAGE OR FUMES OF HCL H₂SO₄, SALTY WATER IMPINGEMENT, CHLORIDE ETC.

S. NO.	DESIGN TEMPERATURE IN °C	SURFACE PREPARATION	PAINT SYSTEM		TOTAL DFT IN MICRONS (MIN.)	REMARKS
			FIELD PRIMER	FINISH PAINT		
10.1	-90 TO -15	SSPC-SP-10	REPAIR OF PRE-FABRICATION PRIMER 1 CO AT O F F -9 65-75μ DFT/ COAT	NONE 65-	75	Repair of pre-erection/ fabrication primer shall be followed. No over coating is allowed
10.2	-14 TO 80	SSPC-SP-10	REPAIR OF PRE-FABRICATION PRIMER 1 CO AT OF F-9 @ 65-75μ DFT/ CO AT + 1 CO ATS OF P-6 @40 μ DFT/ COAT	2 COATS O F F -6 @ 100 μ DFT/ COAT = 2 X 100= 200 + 1 COAT OF F-2 @ 40μ DFT/ COAT	345 Sur	Surface preparation is required only for repairing of dam aged pr e-erection/ fabrication primer.
10.3	81 TO 400	SSPC-SP-10	REPAIR OF PRE-FABRICATION PRIMER 1 CO AT OF F-9 @ 65-75μ DFT/ COAT	2 COATS OF F-12 @ 20 μ DFT / COAT 2 X 20 = 40	105	
10.4	401 TO 500	SSPC-SP-10	REPAIR AS PER 7.2.2	3 COATS OF F-12 @ 20 μ DFT / COAT 2 X 20 = 40	80	


BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ ' ; 5G'		
TITLE	G<CD/ ' : =9@8'D5=BH-B; '		

TABLE 11.0 : FIELD PAINT SYSTEM FOR CARBON STEEL STORAGE TANKS (EXTERNAL) FOR ALL ENVIRONMENTS.

S. NO.	DESIGN TEMPERATURE IN °C	SURFACE PREPARATION	PAINT SYSTEM		TOTAL DFT IN MICRONS (MIN.)	<u>REMARKS</u>
			FILED PRIMER	FINISH PAINT		
1.1 EXTERNAL SHELL. WIND GIRDERS APPARAT USES, ROOF TOPS OF ALL GROUND TANK INCLUDING TOP SIDE OF FLOATING ROOF OF OPEN TANK AS WELL AS COVERED F LOATING ROOF AND ASSOCIATED STRUCTURAL WORK ROLLING AND STATIONARY LADDERS, SPIRAL STAIRWAYS, HAND TAILS FOR ALL ENVIRONMENTS FOR GRUDE OIL, LDO, HSD, ATF KEROSENE, GASOLINE, MOTOR SPIRIT, DM WATER, FIREWATER, RAW WATER, POTABLE WATER, ACIDS, ALKALIS SOLVENTS AND CHEMICALS ETC.						
11.1.1	-14 TO 80	SSPC-SP-10	1 COAT OF F-9 @ 65-75μ DFT / COAT + 1 CO ATS OF P- 6 @40 μ DFT/ COAT 65 X 40 = 105	1 COATS O F F -6 @ 100 μ DFT/ COAT + 2 CO ATS OF F -2 @ 40μ DFT/ COAT 2 X 40 = 80	285	F-6 should be suitable for occasional water immersion
11.1.2	81 TO 500	SSPC-SP-10	1 COAT OF F-9 @ 65-75μ DFT / COAT	2 COATS OF F-12 @ 20 μ DFT / COAT 2 X 20 = 40	105	
11.2 EXTERNAL SURFACE OF BOTTOM PLATE (SOIL SIDE) FOR ALL STORAGE TANKS.						
11.2	-14 TO 80	SSPC-SP-10	1 COAT OF F-9 @ 65-75μ DFT / COAT	3 COATS OF F - 7 @ 100 μ DFT / COAT 3 X 100 = 300	365 F	7 should be suitable for immersion service of the products given.



BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97 = 75H-CB''		
	C=@/ ; 5G'		
TITLE	G<CD/ : =9@8 D5-BH-B; '	DOCUMENT NO. BR/TS/39'	Page 31 of 54
			REVISION : 0
			EDITION : 1

TABLE 12.0 : FIELD PAINT SYSTEM FOR CARBON STEEL AND ALLOY STORAGE TANK: (INTERNAL)

S. NO.	DESIGN TEMPERATURE IN °C	SURFACE PREPARATION	PAINT SYSTEM		TOTAL DFT IN MICRONS (MIN.)	REMARKS
			FILED PRIMER	FINISH PAINT		
INTERNAL SURFACE OF UNDERSIDE OF FLOATING ROOF, INTERNAL STRUCTURAL OF CONE ROOF, BOTTOM PLATE, ROOF STRUCTURE, STEEL, LADDERS SUPPORTS FOR STORING GRUIDE OIL, LDO AND HSD (EXCLUDING WHITE OIL PRODUCTS)						
12.1	-14 TO 80	SSPC-SP-10	1 COAT OF F-9 @ 65-75µ DFT/ COAT	3 COATS OF F-7 @ 100µ DFT/ COAT 3 X 100 = 300	365	F7 should be suitable for immersion service of the products given.
12.2 BARE SHEEL OF INSIDE FLOATING ROOF TANK AND CONE ROOF TANK FOR PRODUCTS MENTIONED IN 12.1						
12.2.1	-14 TO 80	SSPC-SP-10	PHOSPHATING TREATMENT WITH PHOSPHATING CHEMICALS (2 COATS)	2 COATS OF @10 µ 2 X 10 = 20	20	
12.3 FLOATING CONE ROOF TANKS FOR PETROLEUM PRODUCTS SUCH AS ATF, GASOLINE, NAPHTHA, KEROSENE, MOTOR SPIRIT, OF BOTTOM PLATE, UNDERSIDE OF FLOATING ROOF AND SHELL ABOVE MAXIMUM LIQUID LEVEL AND STRUCTURAL STEEL , LADDERS ETC. INSIDE						
12.3.1	-14 TO 80	SSPC-SP-10	1 COAT OF F-9 @ 65-75µ DFT/ COAT	3 COATS OF F-6 @ 100µ DFT/ COAT 3 X 100 = 300	365	F-6 should be suitable for immersion service of petroleum produce like ATF, Kerosene, petrol etc.
12.4 BARE SHELL OF INSIDE OF FLOATING CONE ROOF TANKS FOR PRODUCTS MENTIONED IN 12.3						
12.4.1	-14 TO 80	SSPC-SP-10	1 COAT OF F-9 @ 65-75µ DFT/ COAT	NONE	65-75	No over coating is allowed same as per pre-erection primer, if any
12.5 INTERNAL PROTECTION IF FIXED ROOF TYPE STORAGE TANKS FOR POTABLE WATER: INSIDE OF SHELL, UNDER SIDE OF ROOF AND ROOF STRUCTURE INSIDE SURFACE BOTTOM PLATE AND STRURAL STEEL WORKS, LADDERS, WALKWAYS, PLATFORMS ETC.						
12.5.1	-14 TO 80	SSPC-SP-10	2 COAT OF F-6 @ 40µ DFT/ COAT 2 X 40 = 80	2 COATS OF F-6 @ 100µ DFT/ COAT 2 X 100 = 200	280	F-6 shall be suitable for immersion service.
12.6 D. M. (DEMINERALISED WATER) AND HYDROCHLORIC ACID (HCL): INTERNAL SHELL, BOTTOM PLATE AND ALL ACCESSORIES						
12.6.1	-14 TO 80	SSPC-SP-10	EBONITE RUBBER LINING AS PER SMMS SPECIFICATION 6-06-204			
12.7 EG TANKS (INTERNAL SHELL, BOTTOM PLATE ROOF AND ALL ACCESSORIES)						
12.7.1	ALL	SSPC-SP-10	3 COATS VINYL CHLORIDE CO-POLYMER AMERCOAT 23 @ 75µ / COAT			225

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/'; 5G'		
TITLE	G<CD/': =9@8'D5=BH-B;'	DOCUMENT NO. BR/TS/39	Page 32 of 54
			REVISION : 0
			EDITION : 1

S. NO.	DESIGN TEMPERATURE IN °C	SURFACE PREPARATION	PAINT SYSTEM		TOTAL DFT IN MICRONS (MIN.)	REMARKS
			FILED PRIMER	FINISH PAINT		
12.8	INSIDE PONTOON AND INSIDE OF DOUBLE DECK OF ALL FLOATING ROOFS.					
12.8.1	-14 TO 80	SSPC-SP-3	1 COAT OF F-8 @ 100μ DFT/ COAT	1 COATS OF F-6 @ 100 μ DFT/ COAT 1 X 100 = 100	200	
12.9	INTERNAL SURFACE OF AMINE & SOUR WATER STORAGE TANKS					
12.9.1	-14 TO 80	SSPC-SP-10	1 COAT OF F-9 @ 65-75μ DFT/ COAT 2 X 40 = 80	2 COATS OF F-15 @ 75 μ DFT/ COAT 2 X 75 = 150	215-225	


BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/'; 5G'		
TITLE	G<CD/': =9@8'D5-BH-B; '	DOCUMENT NO. BR/TS/39	Page 33 of 54
			REVISION : 0
			EDITION : 1

TABLE 13.0 : COATING SYSTEM FOR EXTERNAL SIDE OF UNDERGROUND CARBON STEEL PLANT PIPING AND TANKS

S. NO.	DESIGN TEMPERATURE IN °C	SURFACE PREPARATION	PAINT SYSTEM		TOTAL DFT IN MICRONS (MIN.)	REMARKS
			PRIMER FINISH	PAINT		
13.1 CARBON STEEL PLANT PIPING (UNDERGROUND)						
13.1.1 YARD COATING						
13.1.1.1	25 TO 60	SSPC-SP-10	1 COAT OF SYNTHETIC FAST DRYING PRIMER TYPE-B AS PER AWWA-C-203 (1991)	4mm THICK COALTAR COATING WRAPPING AS PER AWWA-C-203 IN 2 LAYER OF EACH 2mm THICKNESS	4mm C	TE coating shall confirm to 120/ 5 as per BS: 4164
13.1.2 OVER THE DITCH COATING						
13.1.2.1	25 To 60	SSPC-SP-10	1 COAT OF SYNTHETIC FAST DRYING PRIMER TYPE-B AS PER AWWA-C-203 (1991)	2 LAYERS OF COALTAR BASED TAPE COATING AS PER AWWA-C-203.	4 mm	
13.2 CARBON STEEL PLANT PIPING (UNDERGROUND)						
13.2.1	61 TO 400	SSPC-SP-10	1 COAT OF F-9 @ 65-75μ DFT/ COAT	NONE	65-75	
13.3 EXTERNAL SIDE OF UNINSULATED UNDERGROUND STORAGE TANKS:						
13.3.1	40 TO 80	SSPC-SP-10	1 COAT OF F-9 @ 65-75μ DFT/ COAT	3 COATS OF F-7 @ 100μ DFT/ COAT 3 X 100 = 300	365	
13.3.2	-90 TO -41 81 TO 400° c	SSPC-SP-10	1 COAT OF F-9 @ 65-75μ DFT/ COAT 1 COAT OF AMERCOAT 738 @ 250μ DFT/ COAT	NONE NONE	65-75 250	



BRIDGE AND ROOF CO. (I) LTD.	G+5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	G<CD/ : =9@8 D5-BH-B; '	DOCUMENT NO. BR/TS/39	Page 34 of 54
			REVISION : 0
			EDITION : 1

TABLE 14.0 : PAINTING UNDER INSULATION FOR INSULATED (HOT COLD) SAFETY CARBON STEEL, LOW ALLOY STEEL, LOW TEMPERATURE CARBON STEEL & STAINLESS STEEL PIPING, STORAGE TANKS EQUIPMENTS IN ALL ENVIRONMENT

S. NO.	DESIGN TEMPERATURE IN °C	SURFACE PREPARATION	PAINT SYSTEM		TOTAL DFT IN MICRONS (MIN.)	REMARKS
			PRIMER FINISH	PAINTS		
14.1 INSULATED CARBON STEEL, LOW ALLOY STEEL AND LTCS PIPING AND EQUIPMENT & TANKS						
14.1.1	-4 TO 125	SSPC-SP-10	REPAIR OF PRE-FABRICATION PRIMER F-9 @ 65-75µ DFT	2 C OATS O F F-14 @ 125µ DFT/ COAT 2 X 125 = 250 O R 3 COATS O F F-15= 3 X 80=240	315	For other temprature ranges no painting is required under insulation.
14.1.2 O	PERATING TEMPERATURE -45 TO 125° C BU T D ESIGN TEMPERATURE 126-400° C	SSPC-SP-10	REPAIR OF PRE-FABRICATION PRIMER F-9 @ 65-75µ DFT	3 C OATS O F F-12 @ 20µ DFT/ COAT 3 X 20 = 60	105-115	
14.2 INSULATED STAINLESS STEEL INCLUDING ALLOY-20- PIPING						
14.2.1	BELOW 0° C T O ALL MINUS TEMPRATURE	ALUMINUM SHEET ING WITH ALUMINUM FOIL AND CHLORIDE FREE MINERAL SEALANT CONTAINING BARIUM CHROMATE SHALL BE APPLIED				If the piping & equipments are already erected then surface shall be prepared by cleaning with emery paper and wash/ flush with chloride free DM water followed by wiping with organic solvent
14.2.2	0 TO 120	SSPC-SP-10 (15-25µ SURFACE PROFILE)	NONE	2 COAT S OF F-1 4 @ 125µ DFT/ COAT 2 X 125 = 250 O R 3 COATS O F F-15= 3 X 80 = 240	250	

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/'; 5G'		
TITLE	G<CD/': =9@8'D5=BH-B; '	DOCUMENT NO. BR/TS/39'	Page 35 of 54
			REVISION : 0
			EDITION : 1

S. NO.	DESIGN TEMPERATURE IN °C	SURFACE PREPARATION	PAINT SYSTEM		TOTAL DFT IN MICRONS (MIN.)	<u>REMARKS</u>
			PRIMER FINISH	PINTS		
14.2.3	121 TO 500	SSPC-SP-10	NONE	3 CO ATS O F F-12 @ 20μ DFT/ COAT 3 X 20 = 60	60	No pre erection primer to be applied
14.2.4	501 TO 1000	SSPC-SP-10	NONE	1 COAT OF AMERCOAT 738 @ 150μ DFT/ COAT	150	Only Amorcoat 738 from Amoron is available for this temperature range.
14.2.5	CYCLIC SERVICE-196 TO 480 EXCEPTING -45 TO 120	SSPC-SP-10	NONE	1 COAT OF AMERCOAT 738 @ 150μ DFT/ COAT	150	
14.3	NO PAINTING REQUIRED FOR INSULATED MONEL, IN COLOY AND NICKEL LINES					



BRIDGE AND ROOF CO. (I) LTD.	GHB85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	G<CD/ : =9@8 D5-BH-B; '	DOCUMENT NO. BR/TS/39	Page 36 of 54
			REVISION : 0
			EDITION : 1

TABLE 15.0 : INTERNAL PROTECTION OF CARBON STEEL WATER BOXES AND TUBE SHEETS OF COOLERS/ CONDENSERS WATER BOXES, CHANNELS, PARTITION PLATES, END COVERS AND TUBE SHEETS ETC.

S. NO.	DESIGN TEMPERATURE IN °C	SURFACE PREPARATION	PAINT SYSTEM		TOTAL DFT IN MICRONS (MIN.)	<u>REMARKS</u>
			PRIMER FINISH	PAINT		
15.1	Upto 65	SSPC-SP-10	1 COATS OF F-6 @ 40 μ DFT/ COAT	2 COATS OF F-7 @ 125 μ DFT/ COAT 2 x 125 = 250	290	For C. S.
15.2	Upto 65 NON FERROUS AND BRASS TUBE SHEETS	SSPC-SP-10	1 COATS OF P-4 @ 8 μ DFT/ COAT 1 COATS OF P-6 @ 40 μ DFT/ COAT	2 COATS OF F-7 @ 125 μ DFT/ COAT 2 x 125 = 250	300 FO	R NON FERROUS SURFACE

TABLE 16.0 FIELD PAINTING SYSTEM FOR GI TOWERS/ NON-FERROUS TUBE SHEET

S. NO.	DESIGN TEMPERATURE IN °C	SURFACE PREPARATION	PAINT SYSTEM		TOTAL DFT IN MICRONS (MIN.)	<u>REMARKS</u>
			FILED PAINT	FINISH PAINT		
16.1	Upto 65	SSPC-SP-10	1 COATS OF P-4 @ 8-10 μ DFT/ COAT + 1 COAT OF P-6 @ 4 μ DFT/ COAT	2 COATS OF F-2 @ 40 μ DFT/ COAT 2 x 40 = 250	130	SHADE AS PER DEFENCE REQUIREMENTS
16.2	Upto 65 NON FERROUS AND BRASS TUBE SHEETS	SSPC-SP-10	1 COATS OF P-4 @ 8 μ DFT/ COAT 1 COATS OF P-6 @ 40 μ DFT/ COAT	2 COATS OF F-7 @ 125 μ DFT/ COAT 2 x 125 = 250	300	

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	G<CD/ : =9@8 D5-BH-B; '	DOCUMENT NO. BR/TS/39'	Page 37 of 54
			REVISION : 0
			EDITION : 1

17.0 STORAGE


- 17.1 All paints and painting materials shall be stored only in rooms to be arranged by contractor and approved by Engineer-in-Charge for the purpose. All necessary precautions shall be taken to prevent fire. The storage building shall preferably be separate from adjacent building. A signboard bearing the words " PAINT STORAGE NO NAKED LIGHT-HIGHLY INFLAMMABLE" shall be clearly displayed outside.

18.0 COLOUR CODE FOR PIPING


For identification of pipeline, the colour code as per Table 18.1 shall be used. Paint material for color-coding shall be as specified in this standard in clause- 6.0.

- 18.1 Colour coding scheme for pipe, equipment, machinery & structure:

SR. NO.	DESCRIPTION	GROUND COLOUR	FIRST COLOUR BAND	SECOND COLOUR BAND
18.1.1	ALL KINDS OF WATER DRINKING WATER DE-MINERALISED WATER COOLING WATER BOILER FEED WATER CONDENSATE QUENCH WATER WASH WATER PROCESS WATER PROCESS WATER FIRE WATER SEA WATER	Sea Gree -do- -do- -do- -do- -do- -do- -do- -do- -do- Fire red Sea Green	French Blue Gulf Red French Blue Gulf Red Light Brown Dark Grey Ganary Yellow Oxide Red Crimson Red White	Signal Red - - - Signal Red - - - - - -
18.1.2 ST	EAM VERY HIGH PRESSURE STEAM (VHP) HIGH PRESSURE STEAM (SH) MEDIUM PRESSURE STEAM (SH) LOW PRESSURE STEAM (SL) DILUTION STEAM/ PURGE STEAM	Aluminiumto IS2339 -do- -do- -do- -do-	Signal Red French Blue Gulf Red Canary Yellow Grey	- - Canary Yellow

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB''		
	C=@/ ' ; 5G'		
TITLE	G<CD/ ' : =9@8 D5-BH-B; ' .	DOCUMENT NO. BR/TS/39'	Page 38 of 54
			REVISION : 0
			EDITION : 1

SR. NO.	DESCRIPTION	GROUND COLOUR	FIRST COLOUR BAND	SECOND COLOUR BAND
18.1.3 CO	MPRESSED AIR PLANT AIR INSTRUMENT AIR NITROGEN OXYGEN CO ₂	Sky Blue -do- -do- Canary Yello -do- -do-	Signal Red Silver Grey French Blue Black White Light Grey	- - - - - -
18.1.4 G	ASES FUEL GAS AND SOUR GAS CHARGE GAS RESIDUE GAS, LPG ACETYLENE SWEET GAS	Canary Yellow -do- -do- -do- -do-	Grey Signal Red Oxide Red Service Brown Grey	Dark Violet French Blue White - -
18.1.5	ACIDS AND CHEMICALS SULFURIC ACID NITRIC ACID HYDROCHLORIC ACID ACETIC ACID CAUSTIC CHLORINE	DARK Violet -do- -do- -do- smoke Grey Canary Yellow	Briliant Green French Blue Signal Red Silver Grey Light Orange Dark Violet	Light Orange -do- -do- -do- - -do-
18.1.6 HY	DRO CARBONS NAPTHAS PROPYLENE PROPYLENE C.G. (LIQ) ETHYLENE GLYCOL ETHYLENE DICHLORIDE BENZENE BUTADIENE ETHANE(LIQ) PROPYLENE(LIQ) ETHYLENE(LIQ) TAR AROMATIC GASOLINE METHANOL (LIQ) PYROLYSIS GASOLINE MIXED C4(LIQ) LPG(LIQ) KEROSENE DIESEL OIL (WHITE) DIESEL OIL (BLACK)	Dark Admiralty Grey -do- -do- -do- -do- -do- -do- Dark Admiralty Grey -do- -do- -do- -do- -do- -do- -do- -do- -do- Light Brown -do- -do-	Brilliant Green -do- -do- -do- Gulf Red Canary Yellow Black Light Grey Signal Red Light Grey Signal Grey Brilliant Green White Brilliant Green Signal Green Brilliant Gren -do- -do- -	Black Smoke Grey Gulf Red - - - - French Blue Black Black Brilliant Green Canary Yellow Gulf Red Black Light Brown Dark Violet - - -

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 'H97<B=75@GD97= =75H-CB''		
	C=@/ ' ; 5G'		
TITLE	G<CD/ ' : =9@8 D5=BH-B; ' .	DOCUMENT NO. BR/TS/39'	Page 39 of 54
			REVISION : 0
			EDITION : 1

18.2 The colour code scheme is intended for identification of the individual group of the pipeline. The system of colour coding of a ground colour and colour bands superimposed on it.

18.3 Ground colours as given in Table 18.1 shall be applied throughout the entire length for uninsulated pipes, on the metal cladding & on surfaces covered by Clause 2.2.2, ground colour coating of minimum 2m length or of adequate length not to be mistaken as colour band shall be applied at places requiring colour bands. Colour band(s) shall be applied at the following location.

- a. At battery limit points
- b. Intersection points & change of direction points in piping ways.
- c. Other points, such as midway of each piping way, near valves, junction joints of services appliances, walls, on either side of pipe culverts.
- d. For zong stretch/ xard piping at 50M interval.
- e. At start and terminating points.

18.4 Identification Sign


18.4.1 Flow direction shall be indicated by an arrow in the location stated in Para a,b,c & d and as directed by Engineer-in-charge.

18.4.2 Colours of arrows shall be black or white and in contrast to the colour on which they are superimposed.

18.4.3 Product names shall be marked at pump inlet, outlet and battery limit in a suitable size as approved by Engineer-in-charge.

18.4.4 Size of arrow shall be either of those given in 18.5.

18.5 Colour Bands

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB''		
	C=@/ ; 5G`		
TITLE	G<CD/ : =9@8 D5-BH-B; .	DOCUMENT NO. BR/TS/39`	Page 40 of 54
			REVISION : 0
			EDITION : 1

- 18.5.1 As a rule minimum width of colour band shall conform to the following table:

Nominal Pipe Size	Width : L(mm)
3" NB and below	25mm
Above 3" NB upto 6" NB	50mm
Above 8" NB upto 12" OD	75mm
Above 12" OD	100mm

Note: For insulated pipes, nominal pipe size means the outside diameter of insulation.

Nominal pipe size figures are to be inches.

- 18.5.2 Colour band(s) shall be arranged in the sequence shown in Table 18.1 and the sequence follows the direction of flow. The relative proportional width of the first colour band to the subsequent bands shall be 4:1, minimum width of any band shall be as per Clause 18.5.1.


- 18.5.3 Whenever it is required by the Engineer-in-charge to indicate that a pipeline carries a hazardous material, a hazard marking of diagonal strips of black and golden yellow as per IS:2379 shall be painted on the ground colour.

- 18.6 Wherever it is required by the Engineer-in-charge to indicate that a pipeline carries a hazardous material, a hazard marking of diagonal strips of black and golden yellow as per IS:2379 shall be painted on the ground colour.

19.0 **IDENTIFICATION OF VESSELS, PIPING ETC.**

- 19.1 Equipment number shall be stencilled in black or white on each vessel, column, equipment & machinery (insulated or uninsulated) after painting. Line number in black or white shall be stencilled on all the pipelines of more than one location as directed by Engineer-in-charge, size of letters printed shall be as below :

Column & Vessels	-	150mm(high)
Pump, Compressor and other machinery	-	50mm (high)
Piping	-	40-150mm

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	G<CD/ : =9@8 D5-BHB; '	DOCUMENT NO. BR/TS/39'	Page 41 of 54
			REVISION : 0
			EDITION : 1

19.2 Identification of storage tanks

The storage tanks shall be marked as detailed in the drawing.

20.0 **PAINTING FOR CIVIL DEFENCE REQUIREMENTS**

20.1 Following items shall be painted for camouflaging if required by the client.

- a. All columns
- b. All tanks in offsites
- c. Large vessels
- d. Spheres

20.2 Two coats of selected finishing paint as per defence requirement shall be applied in a particular pattern as per 20.3 and as per the instructions of Engineer-in-charge.

20.3 **Method of Camouflaging**

20.3.1 Disruptive painting for camouflaging shall be done in three colours in the ratio of 5:3:2 (all matt finish).

Dark Green	Light Green	Dark Medium Brown
5	3	2

20.3.2 The patches should be asymmetrical and irregular.


20.3.3 The patches should be inclined at 30 degree to 60 degree to the horizontal.

20.3.4 The patches should be continuous where two surfaces meet at an angle.

20.3.5 The patches should not coincide with corners.

20.3.6 Slits and holes shall be painted and dark shades.

20.3.7 Width of patches should be 1 to 2 meters.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/'; 5G'		
TITLE	G<CD/': =9@8'D5-BH-B; '	DOCUMENT NO. BR/TS/39'	Page 42 of 54
			REVISION : 0
			EDITION : 1

21.0 INSPECTION AND TESTING

21.1 All painting materials including primers and thinners brought to site by contractor for application shall be procured directly from manufacturers as per specifications and shall be accompanied by manufacturer's test certificates. Paint formulations without certificates are not acceptable.


21.2 Engineer-in-Charge at his discretion, may call for tests for paint formulations. Contractor shall arrange to have such tests performed including batchwise test of wet paints for physical & chemical analysis. All costs there shall be borne by the contractor.

21.3 The painting work shall be subject to inspection by Engineer-in-Charge at all times. In particular, following stagewise inspection will be performed and contractor shall offer the work for inspection and approval of every stage before proceeding with the next stage. The record of inspection shall be maintained in the registers. Stages of inspection are as follows:

- a. Surface preparation
- b. Primer application
- c. Each coat of paint

In addition to above, record should include type of shop primer already applied on equipment e. g. Red oxide zinc chromate or zinc chromate or Red lead primer etc.

Any defect noticed during the various stages of inspection shall be rectified by the contractor to the entire satisfaction of Engineer-in-Charge before proceeding further. Irrespective of the inspection, repair and approval at intermediate stages of work. Contractor shall be responsible for making good any defects found during final inspection/ guarantee period/ defect liability period as defined in general condition of contract. Dry film thickness (DFT) shall be checked and recorded after application of each coat and extra coat of paint should be applied to make-up the DFT specified without any extra cost to owner, the extra cost should have prior approval of Engineer-in-Charge.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB		
	C=@/ ; 5G		
TITLE	G<CD/ : =9@8 D5-BH-B; .	DOCUMENT NO. BR/TS/39	Page 43 of 54
			REVISION : 0
			EDITION : 1

21.4 **Primer Application**

After surface preparation the primer should be applied to cover the crevices, corners, sharp edges etc. in the presence of inspector nominated by Engineer-in-Charge.

21.5 The shades of successive coats should be slightly different in colour in order to ensure application of individual coats, the thickness of each coat and complete coverage should be checked as per provision of this specification. This should be approved by Engineer-in-Charge before application of successive coats.


21.6 The contractor shall provide standard thickness measurement instrument with appropriate ranges(s) for measuring.

Dry film thickness of each coat, surface profile guage for checking of surface profile in case of blast cleaning. Holiday directors and pinhole detector and positector whenever required for checking in case of immersion conditions.

21.7 Prior to application of paints on surface of chimneys the thickness of the individual coat shall be checked by application of each coat of same paint on M.S test panel. The thickness of paint on test panel shall be determined by using guage such as 'Elkomere'. This thickness of each coat shall be checked as per provision of this specification. This shall be approved by Engineer-in-Charge before application of paints on surface of chimney.

21.8 At the discretion of Engineer-in-Charge, the paint manufacturer must provide the expert technical service at site as and when required. This service should be free of cost and without any obligation to the owner, as it would be in the interest of the manufacturer to ensure that both surface preparation and application are carried out as per their recommendations.

21.9 Final inspection shall include measurement of paint dry film thickness. Adhesion Holiday detection check of finish and workmanship. The thickness should be measured at as many points/ locations as decided by Engineer-in-Charge and shall be within + 10% of the dry thickness, specified in the specifications.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ `; 5G`		
TITLE	G<CD/ `: =9@8'D5-BH-B; `	DOCUMENT NO. BR/TS/39`	Page 44 of 54
			REVISION : 0
			EDITION : 1

21.10 The contractor shall arrange for spot checking of paint materials for Sp. Gr., flow time (ford cup) and spreading rate.

22.0 **GUARANTEE**

22.1 The contractor shall guarantee that the chemical and physical properties of paint materials used are in accordance with the specifications contained herein/ to be provided during execution of work.

22.2 The contractor shall produce test report from manufacturer regarding the quality of the particular batch of paint supplied. The Engineer-in-Charge shall have the right the test wet samples of paint at random, for quality of same as stipulated in clause 11 above. Batch test report of manufacturer's for each batch paint supplied shall be made available by the contractor.


23.0 **QUALIFICATION CRITERIA OF PAINTING CONTRACTOR**

Painting contractor who is awarded any job for B&R, projects under this standard must have necessary equipments, machinery, tool and tackles for surface preparation, paint application and inspection. The contractor must have qualified trained and experienced surface preparation, paint applicator, inspector and supervisors. The contractor supervisor, inspector surface perpetrator and paint applicator must be conversant with the standards referred in this specification the contractors capacity, capability and competency requirements for the job shall be quantified in the tender document and shall be assessed by an B&R team before awarding any job.

24.0 **PROCEDURE FOR A PPROVAL OF NE W COATING MATERIALS AND MANUFACTURER'S**

Following procedure is recommended to be followed for approval of new manufacturers.

24.1 The manufacturer should arrange testing of the inorganic zinc silicate coating materials as per the list of tests given in para 24.5 below from one of the reputed Government laboratories.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ' ; 5G'		
TITLE	G<CD/ ' : =9@8 'D5-BH-B; '	DOCUMENT NO. BR/TS/39	Page 45 of 54
			REVISION : 0
			EDITION : 1


24.2 Samples of coating should be submitted to the Gov t. laboratory in sealed containers with batch no. and test certificate on regular format of manufacturer's testing laboratory. The sampling shall be certificate and sealed by a citifying agency.

24.3 All test panels should be prepared by govt. testing agency coloured photographs of test panels should be taken before and after the test should be enclosed alongwith test report.

Sample batch. No. and manufacturer's test certificate should ne enclosed alongwith the report. Test reports contain details of observation and rusting if any, as per the testing code. Suggested government laboratories are:

RRL, Hayderabad
HBTI, Kanpur
DMSRDE, Kanpur
IIT, Mumbai
BIS Laboratory
UDCT, Mumbai
RITES, Calcutta
PDIL


24.4 Manufacturers should intimate the company, details of sample submitted for testing name of Govt. testing agency, date, contact personnel of the Govt. testing agency. At the end of the test the manufacturer should submit the test report to the company for approval. The manufacturer(s) shall be qualified based on the result of these tests and other assessment and the Company's decision in this regard shall be final and binding on the manufacturer.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	G<CD/ ' : =9@8 D5-BHB; '	DOCUMENT NO. BR/TS/39'	Page 46 of 54
			REVISION : 0
			EDITION : 1

24.5 Tests required for evaluation of acceptance of coating materials for offshore application.

Test	ASTM Test Method
Density	D 1475
Dipping properties	D 823
Film Characteristics	
Drying time	D 1640
Flexibility	D 1737/ D 522
Hardness	D 3363
Adhesion	D 2197
Abrasion resistance	D 968/ D 1044
DFT/ Coat	AS PER SSPC GUIDELINES
Storage Stability	D 1849
Resistance to	
Humidity for 2000 hrs.	D 2247
Salt Spray for 2000 hrs.	B 117
Accelerated Weathering	D 822
% Zn in DFT	G 53

24.6 Coating system for panel test shall be decided after discussion with B&R.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	G<CD/ : =9@8 D5-BH-B; '	DOCUMENT NO. BR/TS/39'	Page 47 of 54
			REVISION : 0
			EDITION : 1

ANNEXURE-I

LIST OF RECOMMENDED MANUFACTURERS


Indian Vendors

- 1.0 Asian Paints(I) Ltd.
- 2.0 Berger Paints Ltd.
- 3.0 Goodlass Nerlolac Paints Ltd.
- 4.0 Jenson And Nicholson Paint Ltd & chokuGu Jenson & Nicholson Ltd.
- 5.0 Shalimar Paints Ltd.
- 6.0 Sigma Coating, Mumabai
- 7.0 CDC Carboline Ltd.
- 8.0 Premier Products Ltd.
- 9.0 Coromandel Paints & Chemicals Ltd.
- 10.0 Anupam Enterprises
- 11.0 Grand Polycoats
- 12.0 Bombay Paints Ltd.
- 13.0 Vanaprabha Esters & Glycer, Mumbai
- 14.0 Sunil Paints and Varnishes Pvt. Ltd.
- 15.0 Courtaulds Coating & Sealants India (Pvt.) Ltd.
- 16.0 Mark-chem Incorporated, Mumbai (for phosphating chemicals only)
- 17.0 VCM Polyurethane Paint (for polyurethane Paint only)

FOREIGN VENDORS FOR OVERSEAS PRODUCTS

- 1.0 Sigma Coating, Singapore
- 2.0 Ameron, USA
- 3.0 Kansai Paint, Japan
- 4.0 Hempel Paint, USA
- 5.0 Valspar Corporation, USA
- 6.0 Courtaulds Coating, UK.


Note: This list subjected to revision based fresh approval which will be intimated to PDD/ Vendor Cell.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8`H97<B=75@GD97= =75H-CB`		
	C=@/ `; 5G`		
TITLE	G<CD/ `:=9@8`D5=BH-B; `	DOCUMENT NO. BR/TS/39`	Page 48 of 54
			REVISION : 0
			EDITION : 1


ANNEXURE-II

LIST OF RECOMMENDED MANUFACTURER'S PRODUCTS

S. No.	MANUFACTURER NAME	P2 CHLORINATED RUBBER Zp PRIMER	P4 ETCH PRIMER/ WASH PRIMER	P6 EPOXY ZINC PH. PRIMER	F9 INORGANIC ZINC SILICATE PRIMER/ COATING
1.	ASIAN PAINTS (I) LTD.	ASIOCHL OR HB. ZN.PH PRIMER RO PC 168	APCONYL WP 636 (PC 335)	APCODUR HB. RO.ZP-PC433	APCOCIL 605
2.	BARGER PAINT LTD.	LINSOL HIGH BUILD ZP PRIMER	BISON WASH PRIMER	EPILUX 610	ZINC ANODE 304
3.	AMERON/ GODDLASS NEROLAC PAINTS LTD.	-	AMERCOAT 187	AMERCOAT 71	DIMET COTE-9
4.	JENSON & NICHOSON PAINTS LTD. AND CHOKUGU JENSON NICHOLSON	JENSOLAC CHLORINATED RUBBER HB ZN.PH. PRIMER	J & N ETCH PRIMER	EPILAC ZINC PHOSPHATE PRIMER	-
5.	SHALIMAR PAINTS LTD.	CHIOROKOTE ZINC PHOSPHATE PRIMER GREY	TUFFKOTE ETC PRIMER	EPIGUARD 4 ZINC PHOSPHATE PRIMER GREY	TUFFKOTE ZILICATE TL
6.	SIGMA COATING	SIGMA NUCOL UNICOAT 7321	SIGMA COVER PRIMER (7413)	COLTURE CM PRIMER 7412	SIGMASIL MC (7568)
7.	CDC CARBOLINE LTD.	-	-	CARBOLINE 893	CARBOZINC 11
8.	PRIMER PRODUCTS LTD.	- -		P-15/3A U-16/92	U17/ 92 ETHYL SILICATE INORGANIC ZINC
9.	CORAMANDEL PAINTS CHEMICALS LTD.	COROCLORE CR HB. ZN. PH. PRIMER	CPC WASH PRIMER	COROPEX EPOXY ZH. PH. HIGH BILD PRIMER	-

BRIDGE AND ROOF CO. (I) LTD.	GHB85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ' ; 5G'		
TITLE	G<CD/ ' : =9@8 D5-BH-B; ' .	DOCUMENT NO. BR/TS/39'	Page 49 of 54
			REVISION : 0
			EDITION : 1


S. No.	MANUFACTURER NAME	P2 CHLORINATED RUBBER Zp PRIMER	P4 ETCH PRIMER/ WASH PRIMER	P6 EPOXY ZINC PH. PRIMER	F9 INORGANIC ZINC SILICATE PRIMER/ COATING
10.	ANUPAM ENTERPRISES	ANUCLOR ZP PRIMER	ANUPRIME 291	ANUPAM ANILICOR A-EZP-500	-
11.	GRAND POLYCOATS	GP CHILOROPRIME 601	GP PPRIME 401	-	-
12.	BOMBAY PAINTS LTD. THEMPEL MAKINE PAINTS	HEMPA TEX HIGHBUILD 4633	PENTOLITE WASH PRIMER 8520	HEMPEL'S SHOP PRIMER E-1530	GALVASOL 1570
13.	VANAPRABHA ESTERS & GLYCERIDES,	VEGCHLOR HB PRIMER 1143	VEG WASH PRIMER 1181	VEGPOX 1241 Z/ P	-
14.	SUNIL PAINTS AND VARNISHED PVT. LTD.	SUNCHLOR HB ZINC PHOSPHATE PRIMER	SUN WASH	SUNPOXY ZINC PHOSPHATE PRIMER	-
15.	COURTAULDS COATING LTD.	- -		INTERGARD 251	INTERZINC
16.	MARK-CHEM INCOPORATED, (FOR PHOSPHATING CHEMICAL ONLY)	RUST PREVENTIVE LIQUID DRSAIO			
17.	VCM POLYURETHANE PAINTS (FOR POLY EURETHANE PAINTS ONLY)				
18.	JOTUN PAINTS			EPOXY CQ	JOTACOTE – 2

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB ''		
	C=@/ ' ; 5G'		
TITLE	G<CD/ ' : =9@8 D5=BH-B; .	DOCUMENT NO. BR/TS/39'	Page 50 of 54
			REVISION : 0
			EDITION : 1


S. No.	MANUFACTURER NAME	P2 CHLORINATED RUBBER Zp PRIMER	P4 ETCH PRIMER/ WASH PRIMER	P6 EPOXY ZINC PH. PRIMER	F9 INORGANIC ZINC SILICATE PRIMER/ COATING
				SPECIAL ZINC PHOSPHATE PRIMER	
19.	KCC PRODUCTS (KOREA)				EZ 180(N)

LIST OF RECOMMENDED MANUFACTURER'S PRODUCTS (Contd....)

S. No.	MANUFACTURER NAME	F2 ACRYLIC-POLY YURETHANE FINISH PAINT	F3 CHLORINATED RUBBER FINISH PAINT	F6 HIGH BUILD FINISH PAINT	F7 HIGH BUILD COAL TAR EPOXY COATING
1.	ASIAN PAINTS (I) LTD.	APCOTHANE CF76 (PC 1109)	ASIOCHLOR CF 621 (PC 161)	APCODUR HB COATING 9466	APCODUR CF 300
2.	BARGER PAINT LTD.	BARGER THANE ENAMEL (81)	LINOSOL CHLORINATED RUBBER HB COATING	EPILUX 04 AND 78 HB EPOXY COATING	EPILUX 555
3.	AMERON/ GODDLASS NEROLAC PAINTS LTD.	AMERCOAT 450GL	AMERCOAT 515	AMER COAT 383 HS	AMERCOAT 78 HB
4.	JENSON & NICHOSON PAINTS	J & N 993 HB POLYURETHANE	JENSON HB CHLORINATED	EPILAC 981 ENAMEL	EPILAC SOLVENTLESS COAT


BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB ''		
	C=@/ ' ; 5G'		
TITLE	G<CD/ ' : =9@8 D5=BH-B; ,	DOCUMENT NO. BR/TS/39'	Page 51 of 54
			REVISION : 0
			EDITION : 1

S. No.	MANUFACTURER NAME	F2 ACRYLIC-POLY YURETHANE FINISH PAINT	F3 CHLORINATED RUBBER FINISH PAINT	F6 HIGH BUILD FINISH PAINT	F7 HIGH BUILD COAL TAR EPOXY COATING
	LTD. AND CHOKUGU JENSON NICHOLSON	FINISH PAINT.	RUBBER FINISH PAINT		TAR EPOXY COATING
5.	SHALIMAR PAINTS LTD.	SHALITHANE FINISH	CHLORKOTE FINISH	EPIGARD KL FINISH	BIPIGARD'S BLACK HB COAL TAR EPOXY COATING
6.	SIGMA COATING	SIGMADOUR HS SEMIGLOSS 7530	SIGMA NUCOL FINISH 7308	SIGMA COVER CM 7456	COLTURIET TCN 300
7.	CDC CARBOLINE LTD.	CARBOLINE 132	-	CARBOLINE 191	CARBOMASTIC-14
8.	PRIMER PRODUCTS LTD.	U3/ 92 POLYURETHANE	CR-71 FINISH PAINT	42B/ 4A HIGH BUILD EPOXY	350B/ 3A, COAL TAR EPOXY COATING
9.	CORAMANDEL PAINTS CHEMICALS	- CO	ROCLORE CR FINISHING	COROPEX EPOXY HB COATING	COROPEX EPOXY COAL TAR COATING
10.	ANUPAM ENTERPRISES	ANUTHANE ENAMEL	ANUHLOR HB ENAMEL	DURACOAT-6000 CO	ROGUARD
11.	GRAND POLYCOATS	GP COAT 131, 132 GP BOND 141	GP CHILOROGAURD 631	GP GUARD HP 234	POLYGUARD GE

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 'H97<B=75@GD97= =75H-CB''		
	C=@/ ' ; 5G'		
TITLE	G<CD/ ' : =9@8'D5-BHB; '		


LIST OF RECOMMENDED MANUFACTURER'S PRODUCTS

S. NO.	MANUFACTURER'S NAME	F2 F3		F6	F7
12.	BOMBAY PAINTS LTD./ PAINTS	PENTATHANE FP 4510	HEMPATEX HIBUILD 4633	HEMPADUR HIGH BUILD 5520	HEMPADUR 1510
13.	VANAPRABHA ESTERS & GLYCERIDES,	VEGTHANE FP 3641	VEGCHLOR FP 3140	VEGPOX- 3265 VEGPOX 3562	VEGPOX 4265
14.	SUNIL PAINTS AND VARNISHED PVT. LTD.	SUNTHANE (ALIPHATIC)	SUNCHLOR HB CR COATING	LPOXY HB 'PS 901'	LPOXY BLACK P. S. 551
15.	COURTAULDS COATING LTD.	INTERTHANE -		INTEGARD EM SERIES	INTERTUF JXA 006/ 007/ 010
16.	MARK-CHEM INCOPORATED, (FOR PHOSPHATE PAINTS ONLY)				
17.	VCM POLYURETHANE PAINTS (FOR POLY EURETHANE PAINTS ONLY)	PIPCOTHANE ALIPHATIC POLYURETHANE FINISH PAINT			
18.	JOTUN PAINTS	HARDTOP AS		PENGUARD	JOTAGUARD 85
19.	KCC PRODUCTS (KOREA)			KOPOX TOPCOAT HB ET 5740	EH 173

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB "		
	C=@/ ' ; 5G		
TITLE	G<CD/ ' : =9@8 D5-BH-B; .	DOCUMENT NO. BR/TS/39	Page 53 of 54
			REVISION : 0
			EDITION : 1

LIST OF RECOMMENDED MANUFACTURER'S PRODUCTS

S. NO.	MANUFACTURER'S NAME	F-8 EPOXY MASTIC COATING SURFACE TOLERANT	F-11 HEAT RESISTANCE SYNTHETIC MEDIUM ALUMINUM PAINT	F-12 HEAT RESISTANCE SILICON AL. PAINT
1.	ASIAN PAINTS (I) LTD.	APCODOR CF 640	ASIAN HR ALUMINUM PAINT (PC 300)	HR SILICON ALUMINUM PAINT (PC 189)
2.	BARGER PAINT LTD.	PROTECTOMASTIC FERRO	LOT HR ALUMINUM PANT	BARGER HEAT RISISTANT SILICON ALUMINUM PAINT
3.	AMERON/ GODDLASS NEROLAC PAINTS LTD.	AMERLOCK 400		AMERCOAT 878
4.	JENSON & NICHOSON PAINTS LTD. AND CHOKUGU JENSON NICHOLSON	- FERRO	TECT SYNTHETIC RUBBER H/R ALUMINUM PAINT 4000	FERRLOTECT SILICON HEAT RESISTANCE 1000
5.	SHALIMAR PAINTS LTD.	EPIPLUS 56	HEAT RESISTING LUSTROL ALUMINUM	LUSTOTHERM HIGH TEMP ALUMINUM PAINT
6.	SIGMA COATING	SIGMA ETPC ALUMINUM	HIGH TEMPERATURE RESISTANT EPOXY SUSTEM UPTO 200° C 4062	AROSTA FINISH HR
7.	CDC CARBOLINE LTD.	CARBOMASTIC-15	CARBOLINE 1248	CARBOLINE 4674
8.	PRIMER PRODUCTS LTD.	HB EPOXY MATIC 150B/ 150A		
9.	CORAMANDEL PAINTS CHEMICALS	- S	ILVOTOL HR ALUMINUM PAINT	CPC SILICONE HR ALUMINUM PAINT
10.	ANUPAM ENTERPRISES	ANUMASTIC-102	-	ANUPAM HEAT GUARD

BRIDGE AND ROOF CO. (I) LTD. Kolkata	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	G<CD/': =9@8'D5-BH-B; '	DOCUMENT NO. BR/TS/39'	Page 54 of 54
			REVISION : 0
			EDITION : 1

LIST OF RECOMMENDED MANUFACTURER'S PRODUCTS

S. NO.	MANUFACTURER'S NAME	F8	F11	F12
11.	GRAND POLYCOATS	GP PRIME GUARD 235	-	
12.	BOMBAY PAINTS LTD./ HEMPEL MARINE PAINTS	HEMPADUR 1708	KANGAROO HHR ALUMINUM 4950	HEMPADUR HIGH BUILD 5520
13.	VANAPRABHA ESTERS & GLYCERIDES,	VEGEPOX MASTIC 2255	VEG HR AL PAINT TO IS211339	VEG HHR AL PAINT TO 600°C
14.	SUNIL PAINTS AND VARNISHED PVT. LTD.	LPOXY HIGHBUILD P.S.901	--	
15.	COURT AULDS COATING LTD.	INTERPLUX -		INTERTHERM 50
16.	MARK-CHEM INCOPORATED, (FOR PHOSPHATE PAINTS ONLY)			
17.	VCM POLYURETHANE PAINTS (FOR POLY EURETHANE PAINTS ONLY)	-		
18.	JOTUN PAINTS	JOTUMATIC 87		SOLVELITT HEAT RESISTANT SILICON PAINT
19.	KCC PRODUCTS (KOREA)	EH 4158H		QT 606

GD97 = 75HCB


: CF

F 9D5 = F C: D = D9 @ B 9 7CF F CG = CB 7C5H = B;

GD97 = 75HCB "BC". BR/TS/040



fC = @ / ; 5GL
Bridge and Roof
Co. (I) Ltd.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	F 9D5=F 'C: 'D=D9@B9' 7CFFCG-CB 7C5H-B; '	DOCUMENT NO. BR/TS/040'	Page 1 of 3
			REVISION : 0
			EDITION : 1

1.0 G7CD9 :

This specification covers the minimum requirement of material and equipment, installation procedure and inspection of repair of damaged polyethylene coatings on steel pipes.

- 1.1 The repair shall be carried out using repair patch made of radiation crosslinked Polyolefin backing, coated on the inside with semi-crystalline thermoplastic Adhesive and filler mastic
- 1.2 The repair patch shall have thermal indicators to ensure correct heat is being applied during application.


&'\$ A 5H9F =5@5B8 '9EI =DA 9BH'

- 2.1 CONTRACTOR shall supply all ,equipment and manpower required for a skillful and adequate application in the field in accordance with the specification.
- 2.2 The repair material shall be :
 - Repair patch shall be cross linked polyolefin with semi-crystalline thermoplastic adhesive (PERP 80 patch make of Covalence Raychem or equivalent).
 - Filler mastic : PERPFILLER of make Covalence Raychem or equivalent.
 - PERP melt stick of make Covalence Raychem or equivalent.
 - Certified by DIN to meet the requirement of EN12068 stress class CHT 80.
- 2.3 The material shall not be older than their period of validity at the time of Application by CONTRACTOR. Deteriorated/decomposed materials shall not be used.
- 2.4 Material shall be stored in sheltered storages in the manufacturer s original packing and away from direct sunlight and in accordance with manufacturer s recommendations.

3.0 5DD@=75H-CB 'DF C798I F 9

The application procedure to be followed for Holiday type of damage shall be in accordance with manufacturer's instructions and minimum requirement s specified below whichever is more stringent.

Preparation : Remove coating from damaged area with knife, scraper or power brush. Scrap off the damaged area and adjacent coating to remove oil, grease, ruse dirt and moisture.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ ' ; 5G'		
TITLE	F 9D5=F 'C: 'D=D9@B9' 7CFFCG-CB 7C5H-B; '	DOCUMENT NO. BR/TS/040	Page 2 of 3
			REVISION : 0
			EDITION : 1

Preheating : Preheat the exposed bare metal surface to about 80°C and adjacent pipe coating to about 60°C with a torch moved back and forth over the surface.

Application of the Filler : Plastic filler shall be applied to all exposed metal surface. The mastic is heated and smoothed down with a paint scraper to cover all bare metal in a manner such that all entrapped air is removed.

Application of repair tape : Cut a patch from the tape in a manner such that it extends 50 mm beyond the damaged area, position it over the damaged area, heat until the temperature sensitive paint on the outside of the patch changes colour. It shall be smoothed down to confirm with the contour of lap, and shall be freed of any air bubbles or wrinkles.

For cosmetic type of defects such as minor gauging tearing, scratches which do not indicate holiday during holiday inspection, following procedure shall be adopted :

The defect area shall be roughened to remove loose polyethylene coating, oil grease, dirt etc.

This shall be followed by application of repair patch as described above.


4.0 BD97H-CBZH9GH

A visual inspection shall be carried out for the following :

- Mastic extrusion on ends of the patch shall be examined.
- There shall be no sign of punctures or pin holes or bend failure. The external appearance of the patch shall be smooth, free from dimples, air entrapment or void formation.
- The entire repair patch shall have changed colour uniformly.

5.0 C@-85M-BGD97H-CB

- The holiday detector used shall be checked and calibrated easily with an accurate D.C. Voltmeter. The detector electrode shall be in direct contact with the surface of coating to be inspected.
- The entire surface of the repaired section shall be inspected by means of a full circle holiday detector approved by company set to a DC Voltage of at least 25 V. Inspection of repaired patch shall be conducted only after it has cooled below 50°C.

BRIDGE AND ROOF CO. (I) LTD.	G=5B85F 8`H97<B=75@GD97= =75H-CB`		
	C=@/ `; 5G		
TITLE	F 9D5=F `C: `D=D9@B9` 7CFFCG-CB`7C5H-B;`	DOCUMENT NO. BR/TS/040`	Page 3 of 3
			REVISION : 0
			EDITION : 1

- No repaired point shall be covered or lowered in the trench until it has been approved by the COMPANY .
- Procedure qualification shall be carried out for repair patch. The value for peel strength to pipe surface and to factory coating carried out as per EN 12068 shall be 0.5 N/mm minimum at 60 DEGREE C.

6.0 8C7I A 9BH5H-CB

6.1 Prior to procurement of coating repair materials, Contractor shall furnish four copies of, but not limited to, the following for qualification of the Manufacturer and material :

- i) Complete descriptive technical catalogs describing the materials offered alongwith samples of repair coating materials, its properties and installation instruction as applicable specifically to the project.
- ii) Test certificate and results of previously conducted tests from independent inspection agency.
- iii) Reference list of previous supplies of the similar material indicating the project details such as diameter, quantity, service conditions, year of supply, project name, contact person and feed back on performance.

Once the Company's approval has been given, any change in material or Manufacturer shall be notified to Company, whose approval in writing of all changes shall be obtained before the materials are manufactured.

6.2 Prior to shipment of materials from the Manufacturer's works. Contractor shall furnish six copies of the following :

- i) Test Certificates for each batch of materials.
- ii) Specific installation instruction with pictorial illustrations.
- iii) Specific storage and handling instructions.

6.3 All documents shall be in English Language only.

GD97 = 75HCB


: CF

D=D9@B9A 5F ? 9F G

GD97 = 75HCB "BC". BR/TS/041



fC=@/ ; 5GL
**Bridge and Roof
 Co. (I) Ltd.**

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8`H97<B=75@GD97≡ =75H-CB`		
	C=@/ `; 5G`		
TITLE	D=D9@B9`A 5F?9FG`	DOCUMENT NO. BR/TS/041`	Page 1 of 1
			REVISION : 0
			EDITION : 1

7'C B'H9B'HG'


<u>G@BC''</u>	<u>89G7F =DH-CB'</u>
1.0	SCOPE	
2.0	REFERENCE CODES AND DRAWINGS	
3.0	GENERAL	
4.0	AERIAL MARKERS	
5.0	KILOMETRE MARKERS	
6.0	PIPELINE WARNING SIGN	
7.0	ROW BOUNDARY MARKERS	
8.0	DIRECTION MARKERS	
9.0	NAVIGABLE WATERWAY PIPELINE CROSSING WARNING SIGN	

RE REFERENCE DRAWINGS

ME CON STANDARD DRAWINGS

BR-CGD-STD.-DWG-37	:	TYPICAL ROW BOUNDARY MARKER
BR-CGD-STD.-DWG-38	:	K.M. POST
BR-CGD-STD.-DWG-39	:	PIPELINE WARNING SIGN
BR-CGD-STD.-DWG-40	:	NAVIGABLE WATERWAY PIPELINE CROSSING WARNING SIGN
BR-CGD-STD.-DWG-41	:	AERIAL MARKER
BR-CGD-STD.-DWG-42	:	DIRECTION MARKER

DF 9D5F 98'6M''	7<97?98'6M''	5DDF CJ 98'6M'	=GGI 9'85H9'.
fDSML'	f5KL'	f5TL'	>ULY''&\$24'

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	D=D9@B9'A 5F ? 9F G'	DOCUMENT NO. BR/TS/041'	Page 1 of 3
			REVISION : 0
			EDITION : 1

1.0' · G7CD9

- 1.1 This specification covers the minimum requirements for supply, fabrication and erection of pipeline markers to be installed by CONTRACTOR at various locations along the route of a cross-country pipeline.
- 1.2 This specification shall be read in conjunction with the conditions of all specifications and documents included in the CONTRACT between COMPANY and CONTRACTOR.

2.0' · F 9. 9F 9B79'7C89G

Reference has been made in this specification to the latest revision of the following code :

AP IRP 1109 : Recommended practice for marking liquid petroleum pipeline facilities.

3.0' · ; 9B9F 5@


- 3.1 CONTRACTOR shall supply, fabricate and install the pipeline markers along the pipeline route. The locations of markers as indicated in the approved drawings shall be treated for guidance purposes only and the exact location of the markers shall be based on AS BUILT drainage and as directed by COMPANY.
- 3.2 The pipeline markers shall be fabricated, painted (Painting shall be in accordance with the B&R Standard Specification for Shop & Field Painting) and installed in-accordance with the B&R standard drawings included herein. Before start of fabrication of the markers, CONTRACTOR shall prepare and submit for COMPANYs approval the detailed scheme for the marker plates as applicable for the project.
- 3.3 The pipeline markers shall be installed, as far as possible, at locations such that to cause no hindrance to the regular use of the land or to the traffic.

4.0' · 59F =5@A 5F ? 9F G

Aerial markers shall in general be installed along the pipeline at e very five (5) kilometres intervals and at places specified by COMPANY. Refer B&R Standard Drawing No. BR-CGD-STD.-DWG-41 for details.

5.0' · ?=@CA 9HF 9'A 5F ? 9F G

Kilometre markers shall in general be installed along the pipeline between the aerial markers at every one (1) kilometre interval. Markers shall indicate cumulative distance in kilometres from the reference station, as directed by COMPANY. A kilometre marker is not required if the relative length between its location and any pipeline warning sign is less than 200 metres. Refer B&R Standard Drawing No. BR-CGD-STD.-DWG-38 for details.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB		
	C=@/ ; 5G		
TITLE	D=D9@B9'A 5F ? 9F G	DOCUMENT NO. BR/TS/041	Page 2 of 3
			REVISION : 0
			EDITION : 1

6.0 D=D9@B9'K 5FB-B; G= B

Pipeline Warning Sign shall in general be installed at

National and State Highway Crossings	(2 Nos.)
Other Road Crossings	(1 No.)
Railway Crossings	(2 Nos.)
Minor Water Crossings (less than 15m width)	(1 No.)
Minor Water Crossings (above 15m width)	(2 Nos.)
Major Water Crossings	(2 Nos.)
Valve Station	(1 No.)

And at any other location as shown in the approved drawings and as directed by the COMPANY.

Pipeline Warning Sign shall identify the existence of the pipeline and display the name of the COMPANY, with an emergency telephone number, as shown in B&R Standard Drawing No. BR-CGD-STD.-DWG-39 for details.

7.0 FCK '6CI B85F MA 5F ? 9F G

Right-of-Way boundary markers shall be fabricated and installed as per the drawings at every 250 metres interval along the entire pipeline route. These shall be installed on either side of the pipeline alignment to define the ROW boundary limits. These shall also be installed at pipeline turning points to maintain the continuity of the ROW limits. Refer MECON Standard Drawing No. BR-CGD-STD.-DWG-37 for details.

8.0 8=F 97H-CB 'A 5F ? 9F G


Direction markers as shown in B&R Standard Drawing No. BR-CGD-STD.-DWG-42 shall be installed to identify the significant turning points of the pipeline during aerial traverse. One direction marker shall be installed at each turning point, in addition, two more direction markers shall be installed along the pipeline alignment, one on either side of the turning point at 200m from the turning point.

9.0 GD97=5@A 5F ? 9F G

As directed by Company, Special Marker shall be installed at Location where the following changes takes place :

- Change in pipeline diameter and wall thickness.
- Change in type of pipe.
- Change in class locations for pipeline conveying gas.

The above data may be provided on other types of marker (except RoU boundary marker), if the relative distance between the two does not exceed 100 m.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8`H97< B=75@GD97= =75H-CB ``		
	C=@/ `; 5G		
TITLE	D=D9@B9`A 5F ? 9F G`	DOCUMENT NO. BR/TS/041`	Page 3 of 3
			REVISION : 0
			EDITION : 1

10.0' . B5J = 56@9'K 5H9FK 5MD=D9@B9'7F CGG-B; 'K 5FB-B; 'G= B


The Navigable Waterway Pipeline Crossing Warning Sign shall be fabricated in accordance with B&R Standard Drawing No. BR-CGD-STD.-DWG-40 . Such Warning Sign shall be installed one on each bank of navigable water courses at the pipeline crossing location, in lieu of the Pipeline Warning Sign described in clause 6.0 of this specification.

SPECIFICATION FOR FLUSHING AND TESTING OF PIPING SYSTEMS

SPECIFICATION NO.: BR/TS/042



**(OIL & GAS)
BRIDGE & ROOF CO. (I) LTD.**


BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB "		
	C=@/ ; 5G		
TITLE	: @ G<=B; '5B8 H9GH-B; 'C: ' D=D-B; 'GMGH9A G'	DOCUMENT NO. BR/TS/042	Page 1 of 1
			REVISION : 0
			EDITION : 1

C O N T E N T S

SL. NO. DESCRIPTION

- | | |
|-----|--|
| 1.0 | SCOPE |
| 2.0 | REFERENCES |
| 3.0 | INSPECTION |
| 4.0 | FLUSHING |
| 5.0 | TESTING |
| 5.1 | EXTENT OF TESTING |
| 5.2 | GENERAL REQUIREMENT/TEST PREPARATION FOR TESTING |
| 5.3 | TESTING MEDIA, TEST PRESSURE AND TEST PRESSURE GAUGES. |
| 5.4 | TESTING PROCEDURE |
| 5.5 | COMPLETION OF TESTING |
| 5.6 | TEST RECORDS |

PREPARED BY:	CHECKED BY:	APPROVED BY:	ISSUE DATE :
(SSM)	(SK)	(ST)	JULY. 2024

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ' ; 5G'		
TITLE	: @ G<=B; '5B8 H9GH-B; 'C: ' D=D-B; 'GMGH9A G'	DOCUMENT NO. BR/TS/042	Page 1 of 8
			REVISION : 0
			EDITION : 1

1.0 SCOPE

This specification covers the general requirements for Inspection, flushing and testing of piping systems. However testing of steam lines falling under IBR shall also be governed by Indian Boiler Regulations.

Flushing and testing of all piping system shall be witnessed by the Consultant Representative / Engineer-in- Charge.

2.0 REFERENCE

ASME B31.3-2004 : Process Piping

IBR : Indian Boiler Regulations

3.0 INSPECTION

During various stage and after completion fabrication and erection, the piping system shall be inspected by the Consultant Representative / Engineer- in - Charge to ensure that :

- Proper piping material has been used.
- Piping has been erected as per drawings and the instruction of the engineer- in charge.
- All supports have been installed correctly.
- Test preparations mentioned in this specification have been carried out.


4.0 FLUSHING

Flushing of all lines shall be done before pressure testing.

Flushing shall be done by 'fresh potable water' or 'dry compressed air, wherever water flushing is not desirable' to clean the pipe of all dirt, debris or loose foreign materials.

Required pressure of water, flushing shall meet the fire hydrant pressure or utility water pressure. For air flushing the line, system will be pressurised by compressed air at the required pressure which shall be 50 psi maximum. The pressure shall then be released by quick opening of a valve, already in the line for this purpose. This procedure shall be repeated as many times as required till the inside of the pipe is fully cleaned.

In line instruments like control valves, orifice plates, rotameters, safety valves and other instruments like thermowells which may interfere with flushing shall not be included in the flushing circuit.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 'H97< B=75@GD97= =75H-CB ''		
	C=@/ ' ; 5G'		
TITLE	: @ G<=B; '5B8 'H9GH-B; 'C: ' D=D-B; 'GMGH9A G'	DOCUMENT NO. BR/TS/042 '	Page 2 of 8
			REVISION : 0
			EDITION : 1

From all permanent strainers the screens/meshes shall be removed before flushing. Screens/meshes shall be re- installed after flushing but before testing.

During flushing temporary strainers shall be retained. These shall be removed, cleaned and reinstalled after flushing, but, before testing.

In case an equipment such as column, vessel, exchanger etc. forms part of a piping circuit during flushing, this shall be done with the approval of Engineer- in - Charge. However equipment thus included in the circuit, shall be completely cleaned and dried with compressed air, after flushing is completed.

During flushing discharged water/air shall be drained at the place directed the Engineer- in - Charge. If necessary, proper temporary drainage shall be provided by the contractor.

Care shall be taken during flushing so as not to damage/spoil work of other agencies. Precautions shall also be taken to prevent entry of water/foreign matter into equipment, electric motors, instruments, electrical installations et c. in the vicinity of lines being flushed.

The contractor shall carry out all the activities required before, during and after the flushing operation, arising because of flushing requirements, such as but not limited to the following.

Dropping of valves, specials, distance pieces, online instruments and any other piping part before flushing. The flanges to disengaged for this purpose shall be envisaged by the contractor and approved by the Engineer-in-Charge. These flanges shall be provided with temporary gaskets at the time of flushing.


After flushing is completed and approved, the valve, distance pieces, piping specials etc. shall be re-installed by the contractor with permanent gaskets. However, flanges of equipment nozzles and other places where isolation is required during testing, only temporary gaskets shall be provided.

Records in triplicate shall be prepared and submitted by the Contractor for each piping system for the flushing done in the proforma provided / approved by EIC.

5.0

TESTING

Pressure testing, in general shall be as per clause 345 of ASME B31.3, unless otherwise specified, herein. Lines carrying highly hazardous / poisonous fluids must have a sensitive leak test. For IBR lines, 'IBR Regulations' shall also be followed.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97< B=75@GD97= =75H-CB ``		
	C=@/ `; 5G`		
TITLE	: @ G<=B; `5B8 H9GH-B; `C: `D=D-B; `GMGH9A G`	DOCUMENT NO. BR/TS/042	Page 3 of 8
			REVISION : 0
			EDITION : 1

5.1 Extent of testing

With the exclusion of instrumentation. piping system fabricated or assembled in the field shall be tested irrespective of whether or not they have been pressure tested prior to site welding of fabrication.

To facilitate the testing of piping systems, vessels and other equipments may be included in the system with the prior approval of Engineer-in-charge, if the test pressure specified is equal to or less than that for the vessels and other equipments.

Pumps, compressors and other rotary equipments shall not be subjected to field test pressures.

Lines which are directly open to atmosphere such as vents, drains, safety valves, discharge need not be tested, but all joints shall be visually inspected wherever necessary such lines shall be tested by continuous flow of fluid to eliminate the possibility of block age. However, such lines if provided with block valve shall be pressure tested upto the first block valve.

Seats of all valves shall not be subjected to a pressure in excess of the maximum cold welding pressure of the valve. Test pressure applied to valves shall not be greater than the manufacturer's recommendation nor less than that required by the applicable code. Where desirable set pressure is less than test pressure, test shall be made through an open valve.


Instruments in the system to be tested, shall be excluded from the test by isolation or removal, unless approved otherwise by the Engineer-in-charge. Restrictions which interfere with filling, venting and drawing such as orifice plates etc. shall not be installed unless testing is complete.

Control valves shall not be included in the test system. Where by-passes are provided test shall be performed through the by-pass end/or necessary spool shall be used in place of the control valve.

Pressure gauges which are part of the finished system, but cannot withstand test pressure shall not be installed until the system has been tested. Where piping systems to be tested are directly connected at the battery limits to piping for which the responsibility tests with other agencies, the piping to be tested shall be isolated from such piping by physical disconnection such as valves or blinds.

5.2 General Requirement/Test preparation for Testing

Test shall be carried out with permanent gaskets installed unless specified otherwise or instructed by the Engineer-in-charge.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97< B=75@GD97= =75H-CB "		
	C=@/ ' ; 5G'		
TITLE	: @ G<=B; '5B8 H9GH-B; 'C: ' D=D-B; 'GMGH9A G'	DOCUMENT NO. BR/TS/042	Page 4 of 8
			REVISION : 0
			EDITION : 1

No pressure test shall be carried out against close valve unless approved by the Engineer-in-charge.

The Engineer-in-charge shall be notified in advance by the contractor, of the testing sequence and programme, to enable him to be present for witnessing the test. The contractor shall be fully responsible for making arrangements with the local boiler inspector to witness the tests for steam lines falling under IBR. IBR certificates for these tests shall be obtained in the relevant IBR forms and furnished to the Engineer-in-charge. Before testing, all piping shall be cleaned by flushing to make it free from dist loose scale, debris and other loose foreign materials.

All piping systems to be hydrostatically tested shall be vented at the high points and the systems purged of air before the test pressure is applied.

Wherever in the line any void is existing due to any reasons, for absence of control valve, safety valve, check valves etc. it shall be filled with temporary spools.

All joints welded, screwed or flanged shall be left exposed for examination during the test. Before pressuring the lines, each weld joint shall be cleaned by wire brush to free it from rust and any other foreign matter.


Where a system is to be isolated of a pair of companion flanges, a blank shall be inserted between the companion flanges. Minimum thickness of the blank shall be designed in accordance with applicable design code.

Open ends of piping system where blanks cannot be used, such as pumps, compressors, turbines or wherever equipment or pipe spool have been received or disconnected prior to hydrostatic testing, shall be blinded – off by using standard blind flanges of same rating as the piping system being tested.

Pressure gauges used in testing shall be installed as close as possible to the lowest point in the piping system to be tested, to avoid overstressing of any of the lower portion of the system. For longer lines and vertical lines, two or more pressure gauges shall be installed at locations selected by the Engineer-in-charge. For lines containing check valves any of the following alternatives shall be adopted for pressure testing. Wherever possible pressurise up-stream side of valve.

Replace the valve by a temporary spool and re-install the valve after testing.

Provide blind on valve flanges and test the upstream and downstream of the line separately and remove the blind after testing. All these flanges, temporary gaskets shall be provided during testing and shall be replaced by permanent gaskets subsequently. For check valves in lines 1- 1/2" and below , flapper or seat shall be

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97< B=75@GD97= 75H-CB ..		
	C=@/ ; 5G		
TITLE	: @ G<=B; 5B8 H9GH-B; C: . D=D-B; GVGH9A G	DOCUMENT NO. BR/TS/042	Page 5 of 8
			REVISION : 0
			EDITION : 1

removed during testing (if possible). After completion of testing the flopper/ seat shall be refitted.

Gas lines when hydrostatically tested shall be provided with additional temporary supports during testing as directed by Engineer-in-charge.

Piping which is spring or counter – weight supported shall be temporarily supported, where the weight of the fluid would overload the support. Retaining pins for spring supports shall be removed only after testing is completed and test fluid is completely drained.

When testing any piping system, air or steam of approximately 2 k g/cm² (g) may be used as preliminary test to detect missing gaskets etc. as this avoids the necessity of purging the gas to make repairs. However, this method may not be used for this purpose, if the steam temperature is more than the design temp. of the line.

For jacketed pipes testing of core pipes shall be done on individual pieces where the pipe is continuously packed, before it is jacketed. The outer jacket shall be tested separately as a system for piping with discontinuous jacketing, the core pipe and the jacket shall be tested as separate system.


5.3 Testing Modes, Test pressure and Test Pressure Gauges

5.3.1 Testing Modes

In general all pressure test shall be hydrostatic using iron free water, which is clean and free of silt. Maximum chlorine content in water for hydrostatic testing for MS piping shall be 15-20 ppm. Air shall be used for testing only if water would cause corrosion of the system or overloading of supports etc. in special cases as directed by Engineer-in-charge.

If operating fluid in the line is much lighter than testing fluid, the additional weight of testing fluid may render piping supports (as designed) inadequate. This will call for additional temporary supports. The typical examples are flare and vapor lines. It is preferable that hydrostatic testing is avoided in such systems and instead pneumatic testing may be specified.

Where air/water tests are undesirable substitute fluid such as gas, oil, methanol etc. shall be used as the testing medium, with due consideration to the hazards involved. These test fluids shall be specified in the line list given to the contractor.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ ' ; 5G'		
TITLE	: @ G<=B; '5B8'H9GH-B; 'C: ' D=D-B; 'GMGH9A G'	DOCUMENT NO. BR/TS/042 '	Page 6 of 8
			REVISION : 0
			EDITION : 1

5.3.2 Test Pressure

The hydrostatic/pneumatic test pressure shall be as indicated in the line list or as per the instruction of Engineer-in-charge.

The selection of the piping system for one individual test shall be based on the following :-

Test pressure required as per line list.

Maximum allowable pressure for the material of construction of piping depending upon the above requirements and based on construction progress, maximum length of piping shall be included in each test.

5.3.3 Test Pressure Gauge

All gauge used for field testing shall have suitable range so that the test pressure of the various system falls in 35% to 65% of gauge scale range. Pressure gage shall be minimum of 150 mm. Size of Bourdon shall not be less than 75% of nominal diameter of dial range. Gauge shall be of a good quality and in first class working condition.

Prior to the start of any test or periodically during the field test programmes, all test gauges shall be calibrated using a standard dead weight gauge tester or other suitable approved testing apparatus. Any gauge having an incorrect zero reading or error of more than $\pm 2\%$ of full scale range shall be discarded. The Engineer-in-charge shall check the accuracy of master pressure gauge used for calibration.


5.4 Testing Pressure

5.4.1 Hydrostatic Test

All vents and other connections used as vents shall be kept open while filling the line with test fluid for complete removal of air. For pressurising and depressurising the system, temporary isolating valves shall be provided if valves, vents, drains do not exist in the system.

Pressure shall be applied only after the system/line is ready and approved by the Engineer-in-charge.

Pressure shall be applied by means of a suitable test pump or other pressure source which shall be isolated from the system as the desired test pressure is reached and stabilised in the system.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ' ; 5G'		
TITLE	: @ G<=B; '5B8 H9GH-B; 'C: ' D=D-B; 'GMGH9A G'	DOCUMENT NO. BR/TS/042 '	Page 7 of 8
			REVISION : 0
			EDITION : 1

A pressure gauge shall be provided at the pump discharge for guiding the system to the required pressure.

The pump shall be attended constantly during the test by an authorised person. The pump shall be isolated from the system wherever the pump is to be left unattended.

Test pressure shall be maintained for a sufficient length of time to permit through inspection of all joints for leakage or signs of failure. Any joint found leaking during a pressure test, shall be re-tested to the specified pressure after repair. Test period shall be maintained for a minimum of four hours.

The pump and the piping system to be tested are to be provided with separate pressure indicating test gauges. These gauges are to be checked by the standard test gauge before each pressure test.

Care shall be taken to avoid increase in the pressure due to atmospheric variation during the test.

5.4.2 Air Test

When testing with air, pressure shall be supplied by means of a compressor. The compressor shall be portable type with a receiver after cooler & oil separator.

Piping to be tested by air shall have joints covered with a soap and water solution so that the joints can be examined for leaks.


All other activities shall be same as per hydrotesting procedure (specified above).

5.5 Completion of Testing

After the hydrostatic test has been completed, pressure shall be released in a manner and at a rate so as not to endanger personnel or damage equipments.

All vents and drains shall be opened before the system is to be drained and shall remain open till all draining is complete, so as to prevent formation of vacuum in the system. After draining lines/systems shall be dried by air.

After testing is completed the test blinds shall be removed and equipment/piping isolated during testing shall be connected using the specified gaskets, bolts and nuts. These connections shall be checked for tightness in subsequent pneumatic tests to be carried out by the contractor for complete loop/ circuit including equipments (except rotary equipments).

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 'H97< B=75@GD97= =75H-CB''		
	C=@/ ' ; 5G'		
TITLE	: @ G<=B; '5B8 'H9GH-B; 'C: ' D=D-B; 'GMGH9A G'	DOCUMENT NO. BR/TS/042 '	Page 8 of 8
			REVISION : 0
			EDITION : 1

Pressure tests shall be considered complete only after approved by the Engineer-in-charge. Defects, if any, noticed during testing shall be rectified immediately and retesting of the system/line shall be done by the contractor at his cost.

5.6

Test Records

Records in triplicate shall be prepared and submitted by the contractor for each piping system, for the pressure test done in the proforma provided / approved by the Engineer-in-charge.


SPECIFICATION
FOR
CASING INSULATORS
AND END SEALS

SPECIFICATION NO. BR/TS/043



(PROCESS & PIPING DESIGN SECTION)

BRIDGE & ROOF CO. (I) LTD.

BRIDGE AND ROOF CO. (I) LTD.		PROCESS & PIPING DESIGN SECTION	STANDARD SPECIFICATION	
TITLE	CASING INSULATORS AND END SEALS	SPECIFICATION NO.	PAGE 1 OF 6	
		BR/TS/043	REVISION 0	

C O N T E N T S

PART-A CASING INSULATIONS

1.0 SCOPE

2.0 FUNCTION

3.0 DESIGN

4.0 MATERIAL

5.0 INSPECTION AND TESTING

PART-B CASING END-SEALS

1.0 SCOPE

2.0 FUNCTION


3.0 DESIGN

4.0 MATERIAL

5.0 INSPECTION AND TESTING

PART-C SUPPLEMENTARY REQUIREMENTS

PREPARED BY	CHECKED BY	APPROVED BY
-------------	------------	-------------

BRIDGE AND ROOF CO. (I) LTD.		PROCESS & PIPING DESIGN SECTION	STANDARD SPECIFICATION	
TITLE	CASING INSULATORS AND END SEALS	SPECIFICATION NO.		PAGE 2 OF 6
		BR/TS/043		REVISION 0

PART-A CASING INSULATORS

1.0 SCOPE

This specification covers the minimum requirements of design, material, manufacture and supply of casing insulators intended to be used for cased pipeline crossings.

2.0 FUNCTION

Pipeline insulators shall be used to support the carrier pipe inside the casing pipe and electrically isolate the carrier pipe from the casing pipe at the cased crossings.

The casing insulators shall:


- Resist cold flow and will not soften at design temperature.
- Resist corrosion
- Resist mechanical damage while being pulled into the casing.
- Have high electrical insulating value and low water absorption, thus preventing leakage and maintain electrical isolation between carrier and casing pipes
- Have high compressive strength in order to assure a permanent support to the carrier pipe.

3.0 DESIGN

The arrangement of insulator shall be generally in accordance with Fig. 3.0. It shall be made in segments duly held together with cadmium plated bolts and nuts, to be supplied with casing insulators.

The number of segments shall be two for pipe diameters upto 12" (generally). For larger diameters, the number of segments may be more than two, but their number shall be kept minimum.

The skid height shall be such that it is slightly less than the value obtained by following formula.

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	STANDARD SPECIFICATION	
TITLE	CASING INSULATORS AND END SEALS	SPECIFICATION NO. BR/TS/043	PAGE 3 OF 6 REVISION 0

Casing internal dia-carrier outer dia

2

Manufacturer shall obtain prior approval from COMPANY on casing insulators drawings/designs.

4.0

MATERIAL


Casing insulators shall be made of injection moulded high density polyethylene or other material equivalent or superior as approved by COMPANY and shall meet the following specifications:

<u>Property</u>	<u>Value</u>	<u>ASTM Test Method</u>
Dielectric strength	450-500 Volts/Mil	D-149
Compressive strength	3200 psi	D-695i
Tensile strength	3100-5000	D-638, D-651
Impact strength	4.Oft. 1b./inch of notch	D-256
Water Absorption	0.01%	D-570

5.0

INSPECTION AND TESTING

Manufacturer shall furnish material test certificates of the components used in the assembly of casing insulations as per the requirements of clause 4.0 of this specification.

BRIDGE AND ROOF CO. (I) LTD.		PROCESS & PIPING DESIGN SECTION	STANDARD SPECIFICATION	
TITLE	CASING INSULATORS AND END SEALS	SPECIFICATION NO.		PAGE 4 OF 6
		BR/TS/043		REVISION 0

PART-B CASING END-SEALS

1.0 SCOPE

This specification covers the minimum requirements of design, material, fabrication and supply of casing end-seals intended to be used for pipeline cased crossings.

2.0 FUNCTION

Casing end seals are intended to be used for sealing the annular space between casing pipe and carrier pipe at casing ends so as to prevent ingress of moisture and water.

3.0 DESIGN

The scale shall be suitable for the casing and carrier pipe diameters as applicable for each case.

The casing end-seal shall be flexible to cater for the expansion and contraction of carrier and casing pipes and shall be able to tolerate both angular and concentric misalignment of casing pipe without loss of sealing efficiency.


The design of the casing end-scale shall permit easy installation of the seal to the cased pipeline crossing.

It shall provide moisture-proof seals when installed for the entire anticipated life of the buried pipeline.

Manufacturer Shall obtain prior approval from COMPANY on casing end seals design/drawings.

4.0 MATERIAL

The casing end-scale shall be made of head shrink high density radiation crosslinked polyethylene with an adhesive having a melt point suitable for the pipeline service temperature and ambient temperatures foreseen during construction. End-seals material shall be resistant to heat, cold, vibration, impact, abrasion, corrosive fluids, disbonding, organic and bio-deterioration. Manufacturer shall confirm compatibility of end seals with carrier pipe coating.

BRIDGE AND ROOF CO. (I) LTD.		PROCESS & PIPING DESIGN SECTION	STANDARD SPECIFICATION	
TITLE	CASING INSULATORS AND END SEALS	SPECIFICATION NO.		PAGE 5 OF 6
		BR/TS/043		REVISION 0


Casing end seals shall meet following minimum property requirements:

<u>Property</u>	<u>Minimum Value</u>	<u>Test Method</u>
a) Backing (Sleeve and closure patch)		
Tensile strength	2200 psi	ASTM D-638
Ultimate Elongation	400% ASTM	D-638
Heat Shock flow	No visual cracks, or drips 225°C, 4 hours)	ASTM D-2671
(at		
b) Adhesive		
Ring and Ball softening point	90°C	ASTM E-28
Lap Shear	60°C - 25 psi 23°C - 250 psi	ASTM D-1002
(2	inch/min)	
c) System (as applied)		
Peel strength 5 (To casing and carrier pipe and closure patch)	pli ASTM (10 inch/min.)	D-1000

5.0

INSPECTION AND TESTING

Manufacturer shall furnish material test certificates of the components used in the assembly of casing end-seals as per the requirements of this specification.

BRIDGE AND ROOF CO. (I) LTD.		PROCESS & PIPING DESIGN SECTION	STANDARD SPECIFICATION	
TITLE	CASING INSULATORS AND END SEALS	SPECIFICATION NO.		PAGE 6 OF 6
		BR/TS/043		REVISION 0

PART-C SUPPLEMENTARY REQUIREMENTS


- 1.0 The Manufacturer shall replaces, at no extra cost, any material not conforming to the material and performance requirements of this specification.
- 2.0 Manufacturer shall submit detailed specification of the materials used in the assemblies, along with instructions for handling, use and installation of the material for COMPANY approval prior to procurement.
- 3.0 Manufacturer shall submit all the documents, test reports, records and other information in six copies to the COMPANY for record after approval as per clause 2.0 above.

SPECIFICATION FOR FIELD JOINT COATING (ONSHORE PIPELINES)

SPECIFICATION NO.: BR/TS/044



**(OIL & GAS)
BRIDGE & ROOF CO. (I) LTD.**


BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97< B=75@GD97= =75H-CB "		
	C=@/ `; 5G`		
TITLE	: =9@8`>C=BH7C5H-B; `fCBG< CF 9D=D9@-B9Gk`	DOCUMENT NO. BR/TS/044	Page 1 of 1
			REVISION : 0
			EDITION : 1

C O N T E N T S

SL. NO. DESCRIDTION

- | | |
|-----|------------------------|
| 1.0 | SCOPE |
| 2.0 | REFERENCE DOCUMENTS |
| 3.0 | MATERIAL AND EQUIPMENT |
| 4.0 | APPLICATION PROCEDURE |
| 5.0 | INSPECTION |
| 6.0 | TESTING |
| 7.0 | REPAIRS |
| 8.0 | DOCUMENTATION |

PREPARED BY:	CHECKED BY:	APPROVED BY:	ISSUE DATE :
(SSM)	(SK)	(ST)	July 2024

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97< B=75@GD97= =75H-CB ``		
	C=@/ ; 5G`		
TITLE	: =9@B`>C=BH7C5H-B; `fCBG< CF 9D=D9@-B 9GL`	DOCUMENT NO. BR/TS/044	Page 1 of 13
			REVISION : 0
			EDITION : 1

1.0

SCOPE

This specification covers the minimum requirements of materials, equipment and installation of field joint anti-corrosion coating of underground onshore factory coated pipelines with either three layer polyethylene or fusion bonded epoxy (FBE) coating by heat shrink wraparound sleeves conforming to DIN EN 12068 – “Cathodic Protection – External Organic Coatings for the Corrosion Protection of Buried or Immersed Steel Pipelines used in Conjunction with Cathodic Protection–Tapes and Shrinkable Materials” and the requirements of this specification. Unless modified / replaced by this specification, all requirements of DINEN 12068 shall remain fully applicable and complied with.


This specification shall be read in conjunction with the conditions of all specifications and documents included in the Contract between Company and Contractor. Unless specified otherwise, all sections of this specification shall apply to all specifications referred in this specification.

2.0

REFERENCE DOCUMENTS

Reference has been made to the latest edition (edition enforce at the time of floating the enquiry) of the following standards, codes and specifications:

- a) ASTM D-149 : Standardest Methods of Dielectric Breakdown voltage and Dielectric Strength of solid electrical insulating materials at commercial frequencies.
- b) ASTM D-257 : Standard Test Methods for D-C Resistance or conductance of insulating materials.
- c) ASTM D-570 : Standard Method of Test for Water Absorption of Plastics.
- d) ISO 8502-3 : Preparation of Steel Substrates before Application of Paints and Related Products – Part-3 – Assessment of Dust on Steel Surfaces Prepared for Painting (Pressure Sensitive Tape Method).
- e) ISO:8503-1 : Part-1 : Specification and definitions for ISO surface profile comparator for the assessment of abrasive blast cleaned surfaces.
- f) ISO:8503-4 : Part-4 : Methods for calibration of ISO surface profile comparator and for the determination of surface profile – Stylus instrument procedure.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G''		
TITLE	: =9@8`>C= BH7C5H-B;` fCBG< CF 9'D=D9@-B 9GL'	DOCUMENT NO. BR/TS/044	Page 2 of 13
			REVISION : 0
			EDITION : 1

g) SIS-055900 : Pictorial surface Preparation Standard for Painting Steel Surfaces.

h) SSPC-SP 1 : Steel Structure Painting Council.

In case of conflict between the requirements of this specification and that of above referred documents, the requirements of this specification shall govern.

The Contractor shall be familiar with the requirements of these documents and shall make them readily available at the site to all personnel concerned with carrying out the works specified in this specification.

3.0 **MATERIALS AND EQUIPMENT**

3.1 Contractor shall supply joint coating materials, all equipment and manpower required for a skillful and adequate application of coating in the field in accordance with the specifications.


Contractor shall submit and demonstrate to Company proposed materials and works procedures for applying field coating and repair procedures for same. These proposed procedures and all materials, equipment and tools used in the work shall be subject to Company's approval.

3.2 **Field Joint Corrosion Coating Material**

Field joint anti-corrosion coating material shall be either heat shrinkable wraparound sleeve or cold applied tape suitable for a maximum operating temperature of (+) 65°C (T_{max}) and shall conform to designation EN 12068 – CHT 60 UV. In addition the field joint anti-corrosion coating shall comply the requirements specified in para 3.3 of this specification.

3.2.1 **Heat Shrinkable Wraparound Sleeve**

Heat shrinkable wrap around sleeve shall consist of radiation cross-linked thermally stabilised, ultraviolet resistant semi-rigid polyolefin backing with a uniform thickness of high shear strength thermoplastic/copolymer hot melt adhesive. The joint coating system may consist of a solvent free epoxy primer applied to the pipe surface prior to sleeve application. The backing shall be coated with thermochrome paint which will change colour when the desired heat during shrinking is attained. The wraparound sleeve shall be supplied in pre-cut sizes to suit the diameter and the requirements of overlap.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB "		
	C=@/ ; 5G		
TITLE	: =9@8 '>C= BH7C5H-B; ' fCBG< CF 9'D=D9@-B 9GL	DOCUMENT NO. BR/TS/044	Page 3 of 13
			REVISION : 0
			EDITION : 1

The total thickness of heat shrinkable wraparound sleeve in the as applied condition shall be as follows :

Pipe Size (Specified Outside Diameter)	Thickness (mm)	
	On Pipe Body (Min.)	On Weld Bead (Min.)
4" (114.3 mm) to 10" (273.0 mm)	2.0 mm	1.6 mm
12" (323.9 mm) to 18" (457.2 mm)	2.2 mm	1.8 mm
20" (508.0 mm) to 30" (762.0 mm)	2.5 mm	2.0 mm
≥ 32" (812.8 mm)	3.0 mm	2.5 mm

The heat shrink wraparound sleeve shall have the required adhesive properties when applied on various commercial pipe-coating materials. The pre-heat and application temperatures required for the application of the shrink sleeve shall not cause loss of functional properties of the pipe coating.

Heat shrinkable wraparound field joint coating system manufactured by M/s Covalence and M/s Canusa are acceptable for the supply of field joint coating materials. The Contractor shall propose the specific grade of field joint coating system meeting the requirements of this specification from these manufacturers. In case the Contractor proposes to supply heat shrinkable wraparound sleeve from any other manufacturer, then the Contractor shall propose only those coating systems that have been previously used for pipelines of size same or higher than the size indicated in tender, for a length of 50 km and above in a single project for similar operating conditions.


3.2.2 Cold Applied Tapes

Cold applied tape system shall comprise of primer, an inner wrap and an outer wrap. The inner and outer wraps shall be asymmetric 3-ply tape with co-extruded polyethylene carrier film and butylrubber adhesive layers on both sides. The inner layer of butyl rubber adhesive of inner wrap shall have a thickness of min. 1.0 mm. The inner and outer wraps are to be spirally wrapped with 55% overlap, equivalent to two layers each providing a total minimum thickness of 3.0 mm on the pipe body and 2.5 mm on the weld.

The Contractor shall propose only those cold applied tape coating systems that have been previously used in pipelines of size 16" and above and a length of 50 km and above in a single project for similar operating conditions.

3.3 Functional Requirements of Field Joint Coating

3.3.1 Properties of the PE backing and the as applied joint corrosion coating shall be as follows :

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB		
	C=@/ ; 5G		
TITLE	: =9@8>C=BH7C5H-B; ; fCBG< CF 9D=D9@B 9G<	DOCUMENT NO. BR/TS/044	Page 4 of 13
			REVISION : 0
			EDITION : 1

Sl. No.	Property Unit	t	Requirement	Test Method
i)	Tensile Strength @+25°C N/	mm ²	≥12 DI	N EN 12068
ii)	Ultimate Elongation % @+ 25°C	%	≥250 DI	N EN 12068
iii)	Dielectric withstand KV with 1000 Volts/sec	kv	≥30 AST	M D 149
iv)	Water absorption @+ 25°C for 24 hours	%	≤0.05 AST	M D 570
v)	Volume Resistivity @+25°C Oh	m-cm	≥10 ¹⁵ AST	M D 257
vi)	Resistance to thermal aging at 100°C	% Change in elongation	≤ 250	DIN 30672

3.3.2

Functional Properties of Joint Coating System (As applied)


As applied field joint coating system shall comply the requirements of DIN EN 12068. Table 1 and 2 corresponding to designation DIN EN 12068 – C HT 60 UV, except as modified below :

- Cathodic Disbondment Resistance at T_{max} i. e. 60°C shall be 20mm when tested as per Annexure K of DIN EN 12068. Test shall be carried out at (+) 60°C.
- Peel Strength shall be as follows :

Peel Strength		Unit	Requirement for Mech Resistance Class C (Minimum)	Test Method as per DIN EN 12068
Inner to Inner + Outer to Inner	@23°C N/	mm	1.5	Annexure-B
	@T _{max} N/	mm	0.3	
Outer to Outer	@23°C N/	mm	1.5	
	@T _{max} N/	mm	0.3	
To Pipe Surface	@23°C N/	mm	3.5	Annexure-C
	@T _{max} N/	mm	0.3	
To Factory Coating	@23°C N/	mm	3.5	
	@T _{max} N/	mm	0.3	

Notes

(T_{max} shall be (+) 60°C)

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	: =9@8`>C-BH7C5H-B; ` fCBG< CF 9D=D9@-B 9G<`	DOCUMENT NO. BR/TS/044	Page 5 of 13
			REVISION : 0
			EDITION : 1

Contractor shall obtain prior approval from Company regarding the manufacturer of the joint coating material. Complete technical details alongwith test certificates complying with the requirements of clause 3.2.1 and 3.2.2 shall be submitted to Company for this purpose. The Contractor shall furnish test certificates from an independent DIN recognized / approved laboratory for all the properties required for the specified EN designation of field joint coating and the requirements of this specification.

- 3.3 The materials shall not be older than their period of validity at the time of application by CONTRACTOR. Deteriorated/ decomposed material shall be disposed of and replaced by CONTRACTOR at his own expense.

CONTRACTOR shall ensure that the coating materials supplied by him are properly packed and clearly marked with the following :

- Manufacturer's name
- Material qualification
- Batch number
- Date of manufacturing and date of expiry.


- 3.4 CONTRACTOR shall ensure that the manufacturer has carried out all quality control tests on each batch and manufacturer shall provide test certificates to certify that the supplied materials meet the manufacturer's specifications as indicated in the purchase order and as approved by COMPANY. Certificates and data sheets certifying the qualities of the coating materials shall be submitted by CONTRACTOR to COMPANY prior to application. COMPANY reserves the right to have the materials tested by an independent laboratory.

- 3.5 Materials shall be stored in sheltered storage in the manufacturer's original packing and away from direct sunlight and in accordance with manufacturer's instructions.

- 3.6 CONTRACTOR shall provide and maintain mobile facilities which contains all necessary equipment and its spares for cleaning, coating repairs, inspection and tests.

- 3.7 CONTRACTOR shall furnish sufficient number of the following equipment and the required spares as a minimum for inspection and test purpose for each crew.

- a) Fully automatic full circle adjustable holiday detector with a visible and audible signal system for inspection of coatings.
- b) Thickness gauge for measuring thickness.
- c) Contact type temperature recording thermometer (Digital Pyrometer with flat probe type contact).
- d) Roughness profile measuring (Stylus) instrument

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97< B=75@GD97= =75H-CB ``		
	C=@/ `; 5G`		
TITLE	: =9@8`>C= BH7C5H-B; `fCBG< CF 9'D=D9@-B 9GL`	DOCUMENT NO. BR/TS/044	Page 6 of 13
			REVISION : 0
			EDITION : 1

4.0 **APPLICATION PROCEDURE**

4.1 **General**

4.1.1 The application procedure shall be in accordance with manufacturer's instruction and the minimum requirements specified below whichever are the most stringent and shall be demonstrated to and approved by the Company. Manufacturer's expert shall supervise the application and shall be available at site upon request during qualification of application procedure and during construction at Contractor's cost.


4.1.2 Operators for coating application shall be given necessary instructions and training before start of work, by the Contractor. To verify and qualify the application procedures, all coating applied during the qualification test, shall be removed for destructive testing until the requirements stated in sections "Inspection" and "Testing" of this specification are met.

4.1.3 Oil, grease and salt shall be removed from steel surface by wiping with rags soaked with suitable solvents such as naphtha or benzene. Kerosene shall not be used for this purpose. Solvent cleaning procedure according to SSPC-SP1 shall be followed.

4.1.4 Each field joint shall be blast cleaned using a closed cycle blasting unit or an open expendable blasting equipment. With the first equipment type, steel or chilled shot and iron grit shall be used and Garnet material with the second one (in case the authority having jurisdiction have no objection, the contractor may adopt sand blasting instead of garnet material). During blast cleaning the pipe surface temperature shall be simultaneously more than 5° and more than 3°C above ambient Dew Point, while the ambient Relative Humidity shall not be greater than 85%. Prior to surface cleaning the surface shall be completely dry. The surface shall be cleaned to a grade Sa 2½ in accordance with Swedish Standard SIS-055900 with a roughness profile of 50-70 microns. Surface roughness profile shall be measured using an approved profile comparator in accordance with ISO 8503- 1 and shall be calibrated prior to the start of the work in accordance with ISO:8503-3 or ISO:8503-4. The blast cleanliness shall be checked on every joint and the roughness profile shall be checked 1 every 10 joints.

Dust grit or foreign matter shall be removed from the cleaned surface by an industrial vacuum cleaner. The dust contamination allowed shall be of a rating max 2 as per ISO:8502-3. The frequency of checking for dust contamination shall be 1 every 10 joints.

Blast cleaned field joint shall be coated within 2-4 hours according to the conditions below :

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB "		
	C=@/ ' ; 5G "		
TITLE	: =9@8 '>C= BH7C5H-B; ' fCBG< CF 9'D=D9@-B 9GL "	DOCUMENT NO. BR/TS/044 "	Page 7 of 13
			REVISION : 0
			EDITION : 1

- | | |
|---------------------------------|-----------|
| - Relative Humidity (RH) > 80% | - 2 Hours |
| - Relative Humidity (RH) 70-80% | - 3 Hours |
| - Relative Humidity (RH) < 70% | - 4 Hours |

Pipes delayed beyond this point or pipes showing any visible rust stain shall be blast cleaned again.

4.1.5 The field joint surface shall be inspected immediately after blast cleaning and any feature of the steel surface such as weld spatter, scabs, laminations or other imperfections considered injurious to the coating integrity made visible during blast cleaning shall be reported to the Company Representative and on per mission from Company Representative, such defects shall be removed by filing or grinding. Pipes affected in this manner shall be then re-blast cleaned if the defective area is larger than 50 mm in diameter.

4.1.6 The ends of existing pipe protective coating shall be inspected and chamfered. Unbounded portions of the coating shall be removed and then suitably trimmed. Portions where parent coating is removed shall be thoroughly cleaned as specified. The adjacent chamfered areas of the line pipe coating shall be cleaned and abraded, to expose a clean uniform fresh surface of uncontaminated factory applied coating.

4.1.7 All steel joint surfaces shall be thoroughly examined before the application of the coating in order to ensure the surface are free of soil, grease, rust, mud, earth or any other foreign matter. All these substances shall be removed before coating, to the procedures herein described.


4.1.8 Protection coating shall be applied on the joints immediately after the completion of cleaning operation.

4.2 **Application of Heat Shrink Wraparound Sleeves**

In addition to the general requirements stated above, following shall be taken into account :

4.2.1 The wrap around sleeves shall be of a size such that a minimum overlap of 50mm is ensured (after shrinking) on both sides of yard applied corrosion coating of the pipes.

In cases where carrier pipe is installed by direct boring/jacking, the overlap on the mill coating for the leading edges of the joints shall be minimum 200mm. When this extra overlap is achieved by providing an additional patch of heat shrink tape/wraparound, it shall be applied in such a manner that the square edge of the patch on the joint coating is in the direction opposite to the direction of boring/jacking.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	: =9@8`>C= BH7C5H-B;` fCBG< CF 9'D=D9@-B 9GL'	DOCUMENT NO. BR/TS/044	Page 8 of 13
			REVISION : 0
			EDITION : 1

4.2.2 Before centering the wraparound sleeve, the bare steel surface shall be preheated with torch moved back and forth over the surface or by induction heating. The minimum preheat temperature shall be as recommended by manufacturer and shall be checked by means of contact type temperature recording thermometer (Digital Pyrometer with flat probe type contact) to check this, approved temperature indicates shall be used. Temperature indicating crayons shall not be used. Pre-heat temperature shall be checked on every joint. Care shall be taken to ensure that the entire circumference of the pipe is heated evenly. Temperature measuring instruments shall be calibrated immediately before the start of the works and thereafter at intervals recommended by the manufacturer of the instrument.

4.2.3 Upon pre-heating the pipe surface shall be applied with two pack epoxy primer of wet film thickness 150 microns or as per manufacturer's recommendation whichever is higher, to cover the exposed bare metal of the welded field joint and 10mm min. onto the adjacent pipe coating if recommended by the manufacturer. The wet film thickness of the primer shall be checked on every joint with a wet film thickness gauge prior to installation of sleeve. Thickness gauge shall be calibrated once per shift.


4.2.4 Immediately after application of epoxy primer, the wraparound sleeve shall be entirely wrapped around the pipe within the stipulated time recommended by the manufacturer. Sleeve shall be positioned such that the closure patch is located to one side of the pipe in 10 or 2 O'clock position, with the edge of the underlying layer facing upward and an overlap of min. 50mm. Gently heat by appropriate torch the backing and the adhesive of the closure and press it firmly into place.

4.2.5 A heat shrinking procedure shall be applied to shrink the sleeve in such a manner to start shrinkage of the sleeve beginning from the center of the sleeve and heat circumferentially around the pipe. Continue heating from the center towards one end of the sleeve until recovery is completed. In a similar manner, heat and shrink the remaining side. Shrinking has been completed when the adhesive begins to ooze at the sleeve edges all around the circumference.

The complete shrinking of the entire sleeve shall be obtained without undue heating of existing pipe coating and providing due bonding between pipe, sleeve and pipe coating. The installed sleeve shall not be disturbed until the adhesive has solidified.

The coatings mentioned are for underground installations.

For HDD Joint Coating fiber glass reinforced heat shrinkable sleeve certified to Stress class C60 type CANUSA- TBK or CO VALENCE / DIRAX shall be used. Directional drilling kit, multilayer sleeve system or equivalent to be approved by Owner / Engineer.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB "		
	C=@/ ; 5G		
TITLE	: =9@8 '>C= BH7C5H-B; ' fCBG< CF 9'D=D9@-B 9GL	DOCUMENT NO. BR/TS/044	Page 9 of 13
			REVISION : 0
			EDITION : 1

Only coating material C-60 Class as per EN 12068 and DVGW certified (wrapping tape and heat shrinkable material) will be accepted for all material to be coated.

For the buried valve station (moulded piece, valves, elbows etc) Thermoset plastic coatings may be used. They will be of type S50 certified as per DIN 30671 & DIN 30677.

Underground bare valves if any will be coated with above material.


At the point of transition from the above ground pipe to underground pipe special coating material FIBAROLL or equivalent to be used over the coated part of U.G. pipe and painted part of A.G. Pipe end over lapping shall be at least 500 mm inside the ground and 500 mm on painted AG line. Minimum thickness shall be 1.5 mm. The application of the material will be as per supplier's specification.

Wherever Thrust Boring (Jacking) method is carried out, for mechanical protection of coating of carrier pipe extra layer of hard cold applied tapes C-70 class as per DIN 30675-1 or solvent free PUR (1000 microns) as per DIN 3067712 Ep-50 types shall be applied. Surface preparation (sand blasting) of PE layer shall be appropriate as per applicator's recommendations. The type & thickness of coating must get approved by Owner / Engineer prior to coating.

4.3 Application of Cold Applied Tapes

In addition to general requirements stated above following shall be taken care of:-

- 4.3.1 Cold applied joint protection tapes shall be of the type which can be applied by spirally wrapping on the pipe.
- 4.3.2 Immediately after the completion of surface preparation the approved primer of wet film thickness 150 microns or as per manufacturer's recommendation whichever is higher to cover the exposed bare metal of the welded field joint and 10mm min. onto the adjacent pipe coating if recommended by the manufacturer. Any dirt on the primed surface shall be removed. If the primer is damaged, the damaged area shall be cleaned and re-primed.
- 4.3.3 Approximately 100mm of tape interleaving paper shall be peeled back and tape shall be applied with the adhesive side to the pipe. Whilst continuously removing the interleaving paper, the tape shall be spirally applied to provide a minimum of 55% overlap. Sufficient tension shall be applied to ensure good conformity, avoiding air pockets and also continuously smooth out as the wrapping proceeds. The wrapping shall start and finish to give a minimum of 50mm overlap on to the adjoining yard applied coating. Outer wrap shall also be applied in similar method.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB ..		
	C=@/ ; 5G		
TITLE	: =9@8`>C= BH7C5H-B; . fCBG< CF 9'D=D9@-B 9GL	DOCUMENT NO. BR/TS/044	Page 10 of 13
			REVISION : 0
			EDITION : 1

In the cases where carrier pipe is installed by direct boring/jacking, the overlap on the mill coating for the leading edges of the joints shall be minimum 200mm. The direction of spiral wrapping in these cases shall be such that the square edge of the wrapping with the joint coating is in the direction opposite to the direction of boring/jacking.

4.4 Pre-Qualification of Field Joint Coating System

The field joint coating system materials and the procedures proposed by the Contractor shall be pre-qualified during the sleeve installation start-up phase. Five joints (5) shall be coated with the requirements of this specification and then inspected and tested in accordance with the requirements of this specification with respect to the following :

- i) Surface preparation cleanliness, roughness profile and dust contamination
- ii) Pre-heat temperature (as applicable)
- iii) Primer thickness
- iv) As applied coating thickness
- v) Holiday detection
- vi) Peel test at (+) 23°C & (+) 60°C on pipe surface & factory applied coating and at overlaps (as applicable). If required to achieve the temperature of (+) 60°C, suitable thermal blanket may be used.
- vii) Visual appearance and void after installation on the body, area adjoining the weld and area adjoining the factory applied coating. (To establish voids adjoining the weld and factory coating a strip of 50 mm wide and 200 mm long shall be stripped and examined).


Company Representative shall witness the tests and inspection. Regular application of field joint coating shall commence only upon successful completion of the pre-qualification testing.

After successful completion of the pre-qualification testing as above, the entire field joint coating shall be removed, the pipe surface re-blasted and field joint coating re-applied as per the requirements of this specification.

5.0 INSPECTION

5.1 A visual inspection shall be carried out for the following :

- Mastic extrusion on either ends of the sleeve shall be examined. (applicable for heat shrink wraparounds).
- There shall be no sign of punctures or pinholes or bend failure. The external appearance of the sleeve shall be smooth, free of dimples, air entrapment or void formation.
- Weld bead profile shall be visible through the sleeve.
- The entire closure patch shall have changed colour uniformly (applicable for heat shrink wraparounds).

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB "		
	C=@/ ; 5G		
TITLE	: =9@8'>C= BH7C5H-B; ' fCBG< CF 9'D=D9@-B 9GL'	DOCUMENT NO. BR/TS/044'	Page 11 of 13
			REVISION : 0
			EDITION : 1

5.2 Holiday Inspection

The holiday detector used shall be checked and calibrated daily with an accurate DC voltmeter. The detector electrode shall be in direct contact with the surface of coating to be inspected.

The entire surface of the joint section shall be inspected by means of a full circle holiday detector approved by Company set to a DC voltage of at least 25 kV. Inspection of the sleeves shall be conducted only after the joint has cooled below 50°C.(applicable for heat shrink wraparounds).

5.3 No field joint shall be covered or lowered in the trench until it has been approved by the Company.

5.4 As-applied Coating Thickness


Coating thickness shall be checked by non-destructed methods for each field joint. Average thickness of the as-applied coating on pipe body shall be established based on measurement at min. eight locations i.e. four measurement on either sides of the girth weld at 3, 6, 9, & 12 O'clock positions. To establish the minimum thickness on the girth weld, four measurement shall be taken on apex on the weld at 3, 6, 9 & 12 O'clock positions. All such measurements shall be recorded. Company Representative reserves the right to ask for additional measurement at any location on the field joint coating, whenever doubt arises.

6.0 TESTING

6.1 Company reserves the right to remove and test one out of every 50 joint coatings or one joint coating out of every day's production whichever is stringent. Contractor shall provide all assistance in removing and testing of field joint coatings.

6.2 From each test sleeve, one or more strips of size 250m x 200m shall be cut perpendicular to the pipe axis and slowly peeled off.

The required peel strength shall meet the requirements of clause 3.2.4.2 (ii) as applicable for 23 °C or 60 °C whichever is feasible. This test shall be conducted between wrapping & metal and mill coating & between layers at overlap with joint coating (wherever applicable). After removal of strip the bulk of adhesive shall remain adhered to the pipe showing on bare metal, otherwise, test shall be considered failed. The adhesive layer that remains on the pipe surface shall generally be free of voids resulting from air or gas inclusion. In case the peel strength test at a different temperature than that specified in warranted due to the ambient site conditions, then the peel strength shall comply the recommendation of the manufacturer. Manufacturer

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	: =9@8'>C= BH7C5H-B; ' fCBG< CF 9'D=D9@-B 9GL'	DOCUMENT NO. BR/TS/044'	Page 12 of 13
			REVISION : 0
			EDITION : 1

shall be asked to furnish peel strength values corresponding to various expected temperatures, prior to start of the works.

- 6.3 If the sleeve taken away for test does not meet the requirements of clause 6. 2 the adjacent two sleeves shall also be removed and inspected.

If the adjacent two sleeves are acceptable the test rate shall be increased to one sleeve in every twenty five until Company's Representative is satisfied. The test rate can then be reduced as per clause 6.1.

If either or both of the adjacent two sleeves do not meet the requirements of clause 6.2, the field coating shall be stopped. (Refer clause 7.0).

- 6.4 Company Representative reserve the right of 100% removal of sleeves if he is not convinced that the requirements of clause 6.2 are achieved.

- 6.5 Coating thickness shall be checked by non-destructive methods for each fields joints.

7.0 **REPAIRS**

- 7.1 If a field joint is detected to be unacceptable after testing as per section 6.0 of this specification the Contractor shall, at his own cost :


- determine the cause of the faulty results of the field coating.
- mobilise the expert of manufacturer, if required.
- test to the complete satisfaction of the Company, already completed field coatings.
- stop field coating until remedial measures are taken against the causes of such faults, to the entire satisfaction of the Company.

- 7.2 Contractor shall replace all joint coating found or expected to be unacceptable a per section 6.0 of this specification.

- 7.3 Contractor shall, at his own cost repair all areas where the coating has been removed for testing by the Company.

- 7.4 After the coating work on welded joints, fittings and repairs to the coating have been completed the coating as a whole shall be tested with a spark-tester before lowering or jacking the pipeline.

- 7.5 Company shall be entitled to check the coating on buried pipelines or parts of pipelines with equipment such as the " Pearson Meter" and the resistance meter. If Coating defects are establish, the Contractor shall be responsible for excavations at such points, repairing the coating, spark testing and back filling the excavation without extra charge.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	: =9@8'>C= BH7C5H-B; ' fCBG< CF 9'D=D9@-B 9GL'	DOCUMENT NO. BR/TS/044'	Page 13 of 13
			REVISION : 0
			EDITION : 1

8.0 DOCUMENTATION

8.1 Prior to procurement of coating materials, Contractor shall furnish the following information for qualification of the Manufacturer and material :

- Complete descriptive technical catalogs describing the materials offered along with samples of corrosion coating materials, its properties and application instruction as applicable specifically to the project.
- Test certificates and results of previously conducted tests, for all properties listed in clause 3.2.4 of this specification.
- Reference list of previous supplies, in last 5 years, of the similar material indicating the project details such as diameter, quantity, operating temperature, years of supply, project name, contact person and feed back on performance.

Once the Company's approval has been given, any change in material or Manufacturer shall be notified to Company, whose approval in writing of all changes shall be obtained before the materials are manufactured.

8.2 Prior to shipment of materials from the Manufacturer's Works Contractor shall furnish the following documents :

- Test certificates/ results as per Manufacturer's Quality Control Procedure for each batch of materials.
- Specific application instructions with pictorial illustrations.
- Specific storage and handling instructions.


8.3 All documents shall be in English Language only.

SPECIFICATION FOR VENTS, DRAINS AND WELLS

SPECIFICATION NO.: BR/TS/045



**(OIL & GAS)
BRIDGE & ROOF CO. (I) LTD.**

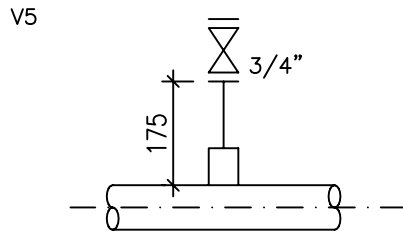
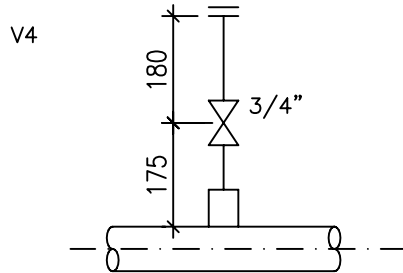
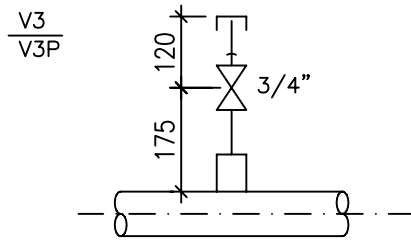
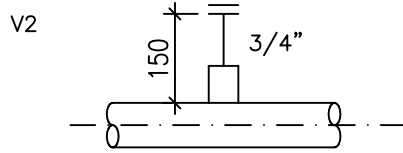
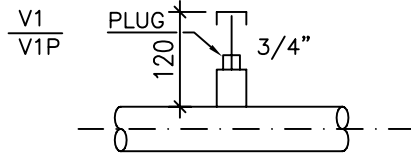
BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8`H97<B=75@GD97≡=75H-CB`		
	C=@/ `; 5G`		
TITLE	J 9BH6Z8F 5-BG5B8 K 9@G`	DOCUMENT NO. BR/TG#\$4)`	Page 1 of 1
			REVISION : 0
			EDITION : 1

C O N T E N T S

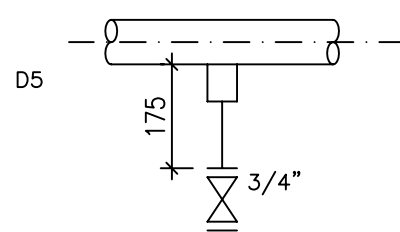
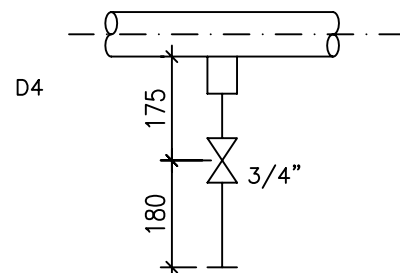
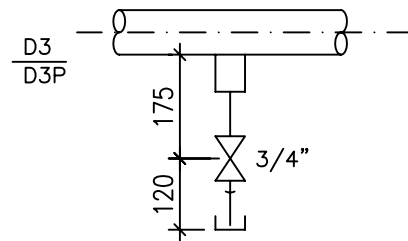
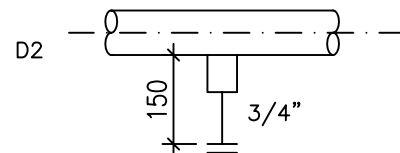
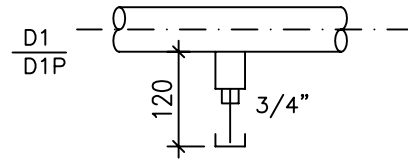
SL. NO.	DESCRIPTION OF DRAWING	DRAWING NO.
1.	Vent & Drain for Line 2" & above	BR-CGD-STD-DWG-77
2.	Wells Installation 1½ Dia Taps	BR-CGD-STD-DWG-78 (SHEET 1 OF 2))
3.	Wells Installation 1½ Dia Taps	BR-CGD-STD-DWG-78 (SHEET 2OF 2))
4.	Vent & Drain for lines 1½" & below	BR-CGD-STD-DWG-79
5.	Pressure Tapping	BR-CGD-STD-DWG-80

PREPARED BY:	CHECKED BY:	APPROVED BY:	ISSUE DATE :
(SSM)	(SK)	(ST)	JULY, 2024

TYPE VENT

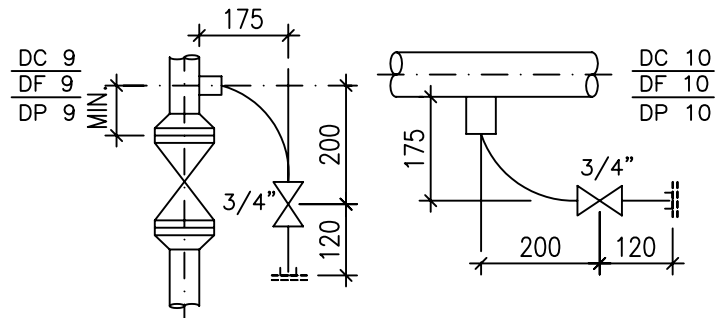


DRAIN

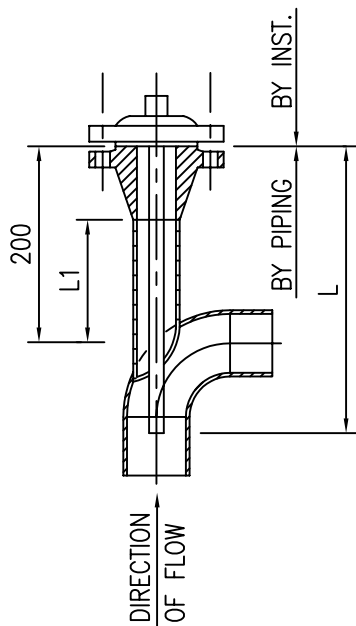


NOTES:-

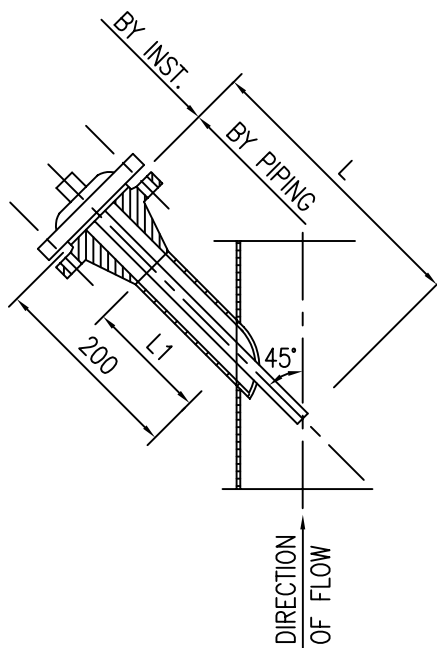
- DIMENSIONS ARE VALID FOR 75mm (MAX.) THICKNESS INSULATION FOR HIGHER INSULATION THICKNES INCASE DIMENSIONS AS REQUIRED.
- VENTS & DRAINS SHALL BE PROVIDED WITH GATE, GLOBE OR PLUG VALVE WITH HALF COUPLING OR STUB IN WITH CAP OR FLANGE, BLIND FLANGE, AS PER PIPING SPECIFICATIONS.
- VENTS/DRAINS CAN BE PROVIDED ON FLAT SIDE OF ECCENTRIC REDUCERS ON SIZES 4" & ABOVE.
- LEGEND V=VENT, D=DRAIN, C=CAP, F=FLANGE, P=PLUG
- PLUGGED END OF VALVE OR FITTING SHALL BE THREADED.



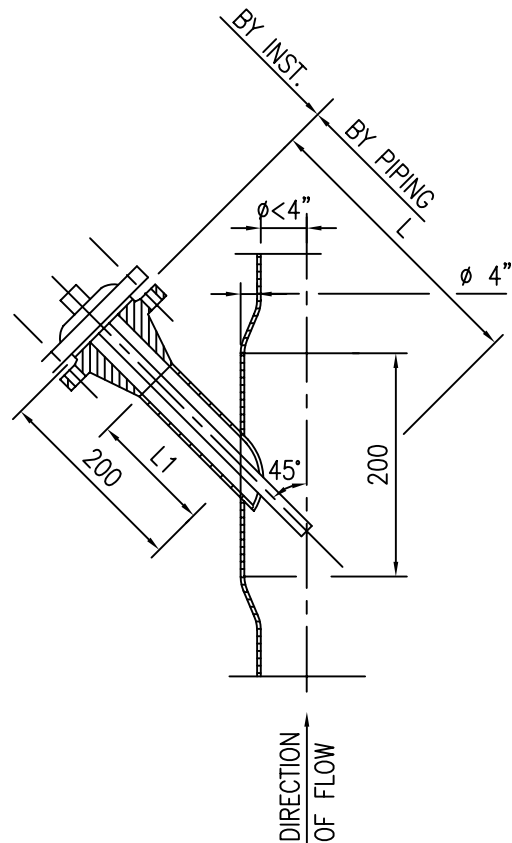
REV NO	DATE	ZONE	DESCRIPTIONS	BY	APPRD	REFERENCES	DRG. NO.
SECTION: P&PD			VENT & DRAIN				
DSGN	S'!		CHKD	DATE			
DRWN	S'!		SZ				
SANDIP TALUKDAR			APPROVED				
REV 0			0				



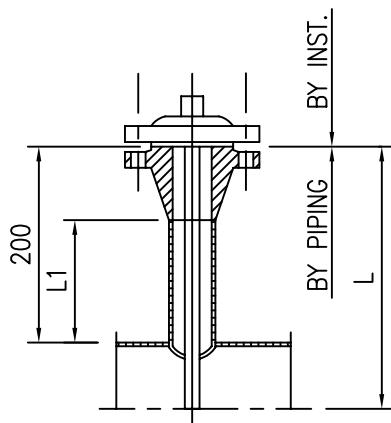
TYPE TW-1



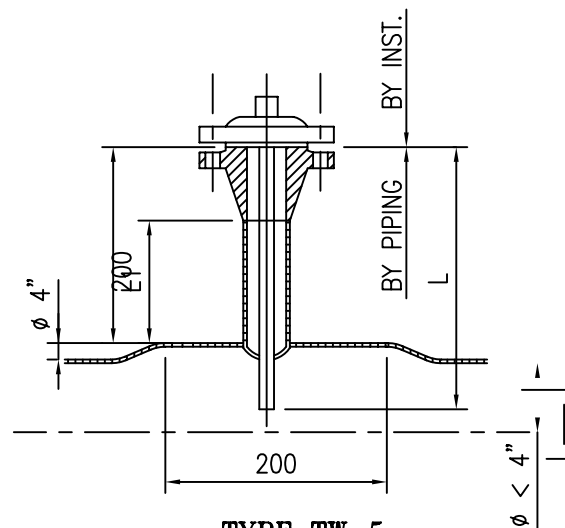
TYPE TW-2



TYPE TW-4



TYPE TW-3



TYPE TW-5

LINE DIA	L 1.5" FLANGED WELL
4"	200
6"	300
8"	300
10"	300
12"	300
14"	300
16"	400
18"	400
20" & LARGER	500
VESSELS	AS REQUIRED

1. ELBOW MIN. 4" ϕ OR LARGER
2. VERTICAL LINE 4" ϕ OR LARGER
3. HORIZONTAL LINE 4" ϕ OR LARGER
4. VERTICAL LINE DIA LESS THAN 4"
5. HORIZONTAL LINE DIA LESS THAN 4"


NOTES:

1. BOLTS, NUTS AND GASCKETS BY PIPING.
2. MIN. CLEARANCE FOR REMOVAL L+550
3. L1 DIMENSIONS ARE CALCULATED FOR WN, RF FLG. ONLY.
4. IN CASE ANY DEVIATION IS REQUIRED FOR INSTALATION TAPS FROM THIS STD. INST. DEPTT. TO BE CONSULTED.

WELLS INSTALLATION

1 1/2" DIA TAPS

Page 328 of 1596

REV NO		DATE	ZONE	DESCRIPTIONS		BY	APPRD						
REVISIONS								REFERENCES		DRG. NO.			
SECTION: P&PD				<div>WELLS INSTALLATION</div> <div>1 1/2" DIA TAPS</div> <div>Page 225 of 1596</div> <div>Page 309 of 514</div>						<div><div>बी एण्ड आर B AND R</div><div>Building Nation Since 1920</div></div>		ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड	
BRIDGE AND ROOF CO.(I) LTD.													
SANDIP TALUKDAR										SCALE : N.T.S.		REV 0	
APPROVED										DRG. NO BR-CGD-STD-DWG-78 (SHEET1 OF 2)			



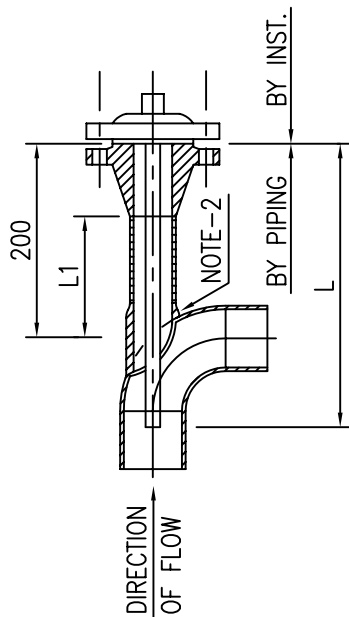
ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड

BRIDGE AND ROOF CO.(I) LTD.

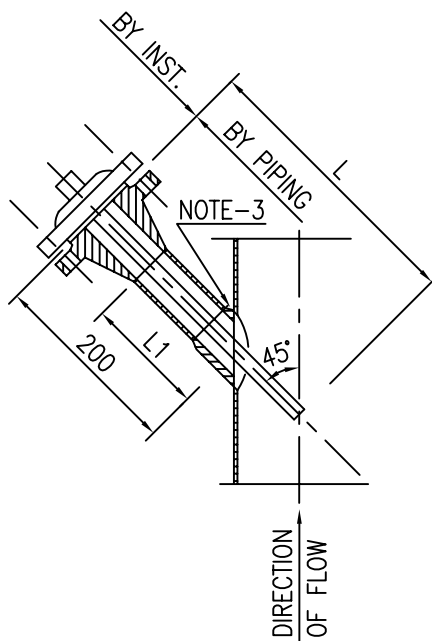
SCALE : N.T.S.

DRG. NO BR-CGD-STD-DWG-78 (SHEET1 OF 2)

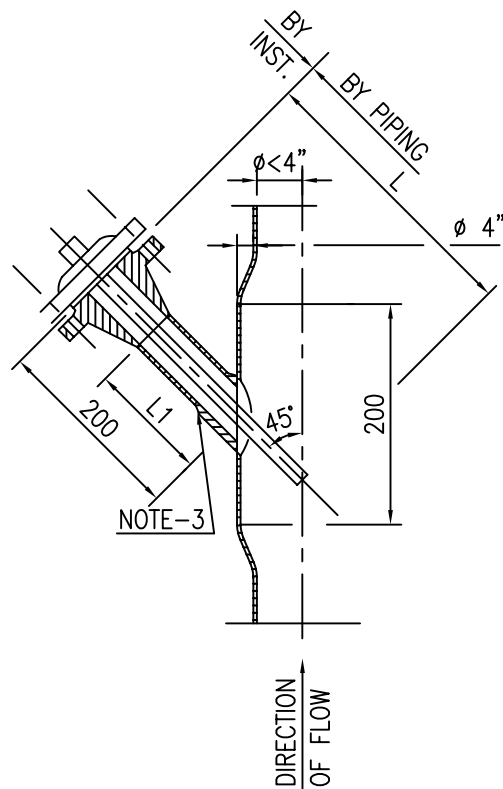
REV
0



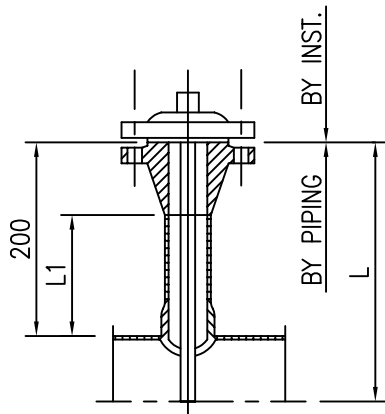
TYPE TW-6



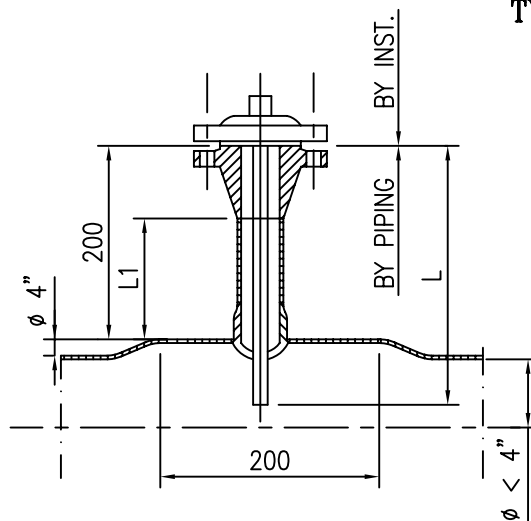
TYPE TW-7



TYPE TW-9



TYPE TW-8




TYPE TW-10

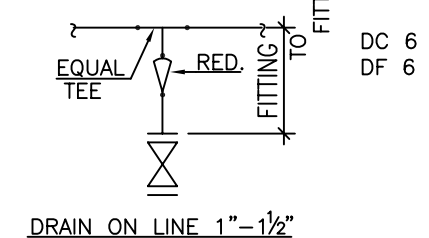
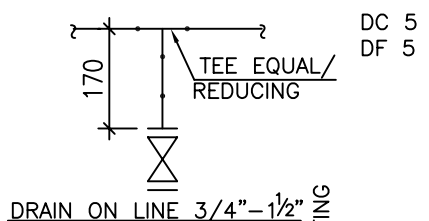
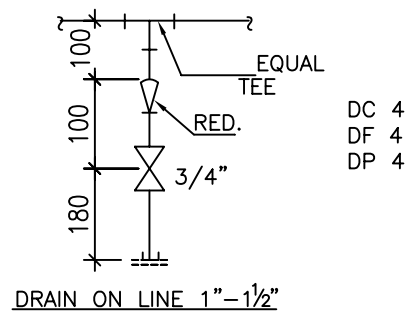
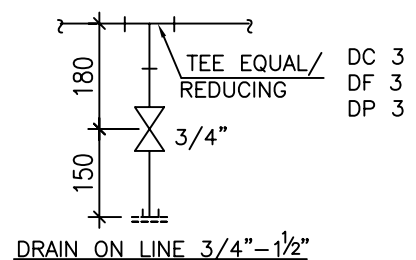
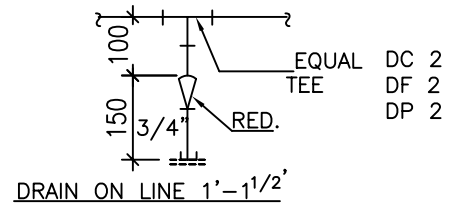
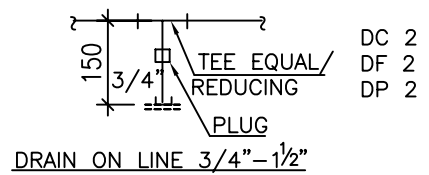
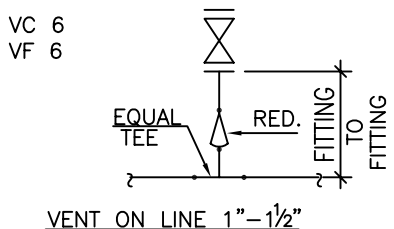
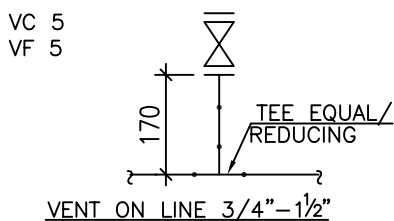
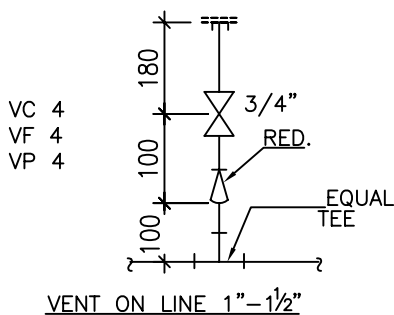
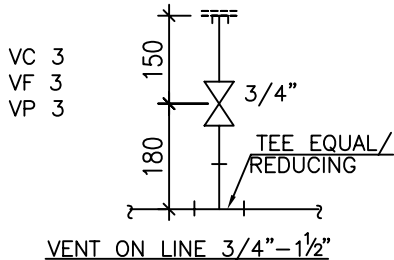
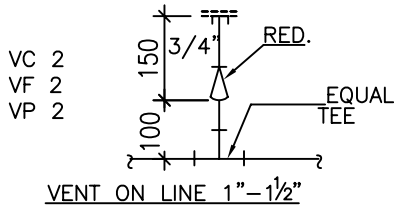
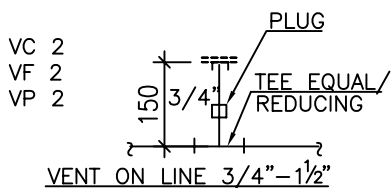
LINE DIA	L 1.5" FLANGED WELD
4"	200
6"	300
8"	300
10"	300
12"	300
14"	300
16"	400
18"	400
20" & LARGER	500
VESSLS	AS REQUIRED

6. ELBOW MIN. 4" ϕ OR LARGER
7. VERTICAL LINE 4" ϕ OR LARGER
8. HORIZONTAL LINE 4" ϕ OR LARGER
9. VERTICAL LINE DIA LESS THAN 4"
10. HORIZONTAL LINE DIA LESS THAN 4"

NOTES:

1. BOLTS, NUTS AND GASCKETS BY PIPING.
2. MIN. CLEARANCE FOR REMOVAL L+350.
3. COUPLING TO BE SPECIAL LENGTH.

REV	NO	DATE	ZONE	DESCRIPTIONS	BY	APPRD	REFERENCES	DRG. NO.
SECTION: P&PD				WELLS INSTALLATION 1 1/2" DIA TAPS				<div></div> <div>ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड</div> <div>BRIDGE AND ROOF CO.(I) LTD.</div>
DSGN	S'!		SZ					
DRWN	S'!		SZ					
SANDIP TALUKDAR								
APPROVED				SCALE : N.T.S.				REV
				DRG. NO BR-CGD-STD-DWG-78 (SHEET 2 OF 2)				0



NOTES:—

1. DIMENSIONS ARE VALID FOR 50mm (MAX.) THICKNESS INSULATION. FOR HIGHER INSULATION THICKNESS INCREASE DIMENSIONS AS REQUIRED.
2. VENTS & DRAINS SHALL BE PROVIDED WITH GATE, GLOBE OR PLUG VALVE
3. LEGEND V=VENT, D=DRAIN, C=CAP, F=FLANGE, R=REDUCER, COUPLING OR SWAGE, P=PLUG
4. PLUGGED END OF VALVE OR FITTING SHALL BE THREADED.

REV	NO	DATE	ZONE	DESCRIPTIONS	BY	APPRD
-----	----	------	------	--------------	----	-------

SECTION:	P&PD
----------	------

NAME	DATE	CHKD	DATE
DSGN	S' I	SZ	
DRWN	S' I	SZ	

SANDIP TALUKDAR
APPROVED

VENT & DRAIN ON LINES 1 1/2" & BELOW

Page 824 of 1596



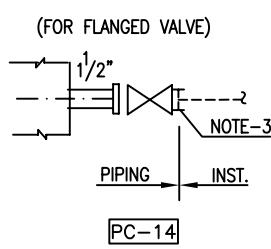
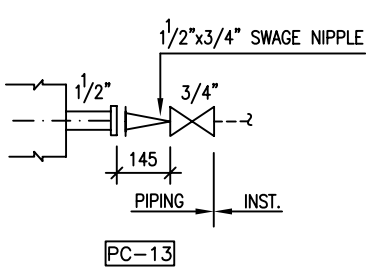
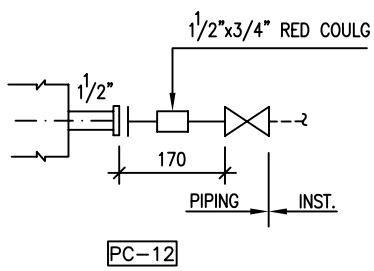
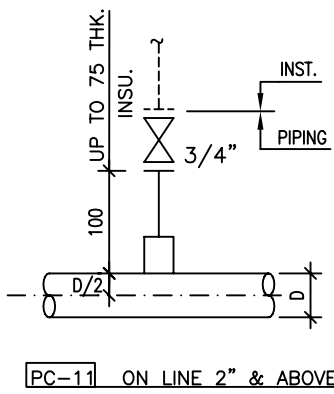
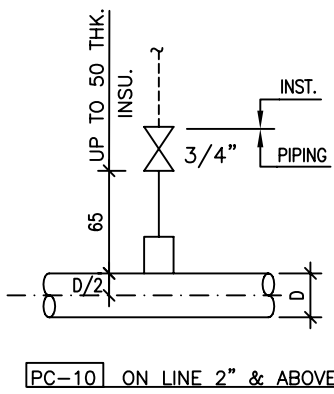
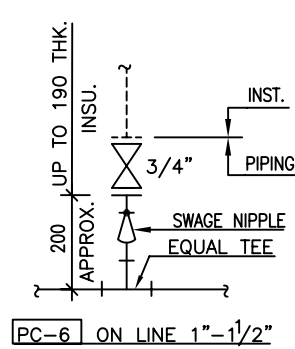
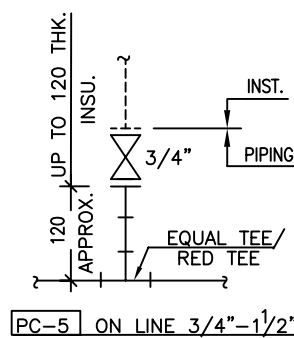
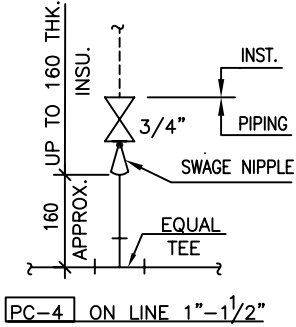
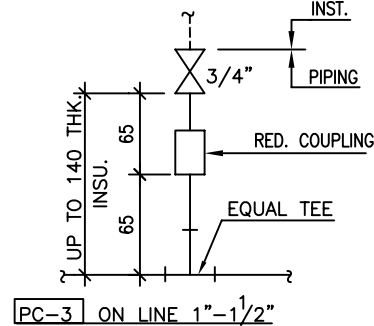
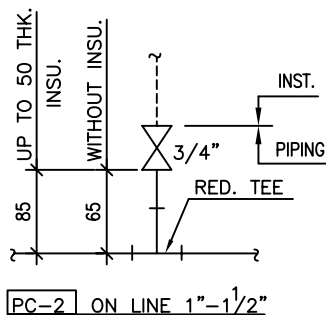
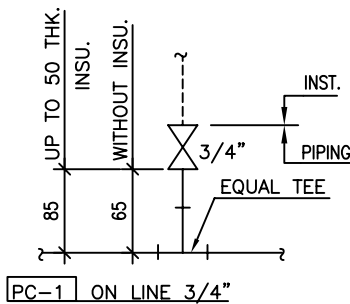
ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड
BRIDGE AND ROOF CO.(I) LTD.

SCALE : N.T.S

REV

DRG.NO BR-CGD-STD-DWG-79

0



ON VESSELS/ COLUMNS

NOTES:-

1. THE INDICATED DIMENSIONS ARE IN MINIMUM WHICH ALSO COVER INSULATION TO THE EXTENT SHOWN ABOVE. IN HIGHER THICKNESS OF INSULATION THAN INDICATED, THE DIFFERENCE SHALL BE ADDED IN THE DIMENSIONS SHOWN ABOVE ACCORDINGLY.
2. PRESSURE TAPPING SHALL BE PROVIDED WITH GATE, GLOBE OR PLUG VALVE WITH TEE, HALF COUPLING OR STUB-IN, AS PER PIPING SPECIFICATION.
3. IN CASE OF FLGD. VALVES BOLTING & GASKET ON BOTH SIDES OF VALVE SHALL BE IN PIPING SCOPE.
4. IN CASE OF TAPPINGS PROVIDED OTHER THAN INDICATED IN THIS STD FOR LAYOUT REASONS DETAILED DIMENSIONS WILL BE CALLED OUT.

REV	NO	DATE	ZONE	DESCRIPTIONS	BY	APPRD	REFERENCES	DRG. NO.
SECTION: P&PD				PRESSURE TAPPING				
DSGN	S'I		SZ					
DRWN	S'I		SZ					
SANDIP TALUKDAR				Page 825 of 1596				
APPROVED				SCALE : N.T.S.				
				DRG. NO BR-CGD-STD-DWG-80				
				REV 0				



ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड

BRIDGE AND ROOF CO.(I) LTD.

GD97 = 75HCB


: CF

; 5G? 9HGZ6C@HG/ BI HG

GD97 = 75HCB BC". BR/TS/047



fC=@/ ; 5GL
BRIDGE & ROOF
CO (I) LTD.


BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75HCB		
	C=@/ ; 5G		
TITLE	; 5G? 9HG 6C@HG/ BI HG	DOCUMENT NO. BR/TS/047	Page 1 of 4
			REVISION : 0
			EDITION : 1

H97<B=75@BCH9G: CF ; 5G? 9HG


- 1.0 All gaskets shall conform to the codes/standards and specifications given in the requisition. Vendor shall strictly comply with MR / PR stipulations and no deviations shall be permitted.
- 2.0 Process of manufacture, dimensions and tolerances not specified in requisition shall be in accordance with the requirements of the manufacturer's standards.
- 3.0 Test reports shall be supplied for all mandatory tests for gaskets as per the standards specified in the requisition.
- 4.0 Chemical composition and hardness of RT gaskets shall also be furnished in the form of test reports on samples.
- 5.0 For Spiral wound material following shall be furnished:
 - a. Manufacturer's test certificate for filler material and spiral material as per the relevant material specifications.
 - b. Manufacturer's test certificate for raw materials and tests for compressibility / sealability & recovery as per the relevant material specifications.
- 6.0 Full face gaskets shall have bolt holes punched out.
- 7.0 Filler material for spiral wound gaskets shall not have any colour or dye.
- 8.0 All spiral wound gaskets shall be supplied with Outer ring. Material of the outer ring shall be CS unless otherwise specified in the MR.
- 9.0 For spiral wound gaskets, material of Inner Compression ring shall be same as Spiral Strip material. In addition to the requirements as per code and as specified in the MR, inner rings shall be provided for the following:
 - a. Sies 26 and above.
 - b. Class 900 and above.
- 10.0 Hardness of metallic RT gaskets shall not exceed the values specified below unless otherwise specified in MR :

F]b[; Ug_YhA UHf]U **A U]ja i a <UfXbYgg'fB< Bk**

Soft Iron		90
Carbon steel	120	
5 Cr. Mo	130	
Type 304, 316, 321, 347		140
Type 304L, 316L	120	


BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ' ; 5G'		
TITLE	; 5G? 9HGZ6C@HG/ 'BI HG'	DOCUMENT NO. BR/TS/047'	Page 2 of 4
			REVISION : 0
			EDITION : 1

- 11.0 Face finish of metallic RT gaskets shall be 32 to 63 AARH.
- 12.0 Gaskets of different types and sizes shall be placed in separate shipping containers and each container clearly marked with the size, rating, material specification and item code.
- 13.0 All items shall be inspected and approved by B&R Inspector or any other agency authorised by B&R.
- 14.0 Any additional requirements specified in the requisition, shall be fully complied with.
- 15.0 Non-metallic ring gaskets as per ASME B16.21 shall match flanges to ASME B16.5 upto 24 (except 22 size) and to ASME B16.47B above 24 unless specified otherwise. For 22 size, the matching flange standard shall be MSS-SP44 unless specified otherwise.
- 16.0 Spiral wound gasket as per ASME B16.20 shall match flanges to ASME B16.5 upto 24 (except 22 size) and to ASME B16.47B above 24 unless specifically mentioned otherwise. For 22 size, the matching flange standard shall be MSS-SP44 unless specified otherwise.
- 17.0 The following abbreviations have been used in the Material Requisition for Spiral Wound Gaskets :
- | | | |
|--------|---|---------------------------|
| (I) | : | Inner Ring |
| (O) | : | Outer Ring |
| CAF | : | Compressed Asbestos Fibre |
| GRAFIL | : | Grafoil Filler |

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB ..		
	C=@/ ; 5G		
TITLE	; 5G? 9HG? 6C@HG/ BI HG	DOCUMENT NO. BR/TS/047	Page 3 of 4
			REVISION : 0
			EDITION : 1

H97 < B=75@BCH9G: CF 6C@HG/ BI HG

- 1.0 The process of manufacture, heat treatment, chemical & mechanical requirements and marking for all stud bolts, m/c bolts, jack screws & nuts shall be in accordance with the codes / standards and specification given in the requisition. The applicable identification symbol in accordance with the material specification shall be stamped on each bolt and nut. Vendor shall strictly comply with MR / PR stipulations and no deviations shall be permitted.
- 2.0 Test reports shall be supplied for all mandatory tests as per the relevant material specifications.
- 3.0 Material test certificate shall also be furnished. (Heat Analysis, Product Analysis and Mechanical Requirement)
- 4.0 Stress Rupture Test as detailed in ASTM A453 shall be carried out for all ASTM A453 bolting material irrespective of the temperature.
- 5.0 All bolting shall be as per ANSI B 18.2.1 for studs. M/c bolts and jackscrews and ANSI BI8.2.2 for nuts.
- 6.0 Threads shall be unified (UNC for 1 dia and BUN for 1 dia) as per ANSI B.1.1 with class 2A fit for studs, M/c bolts and jackscrews and class 2B fit for nuts.
- 7.0 Stud bolts shall be threaded full length with two heavy hexagonal nuts. Length tolerance shall be in accordance with the requirement as per ANSI B 16.5.
- 8.0 The nuts shall be double chamfered, semi-finished, heavy hexagonal type and shall be made by the hot forged process and stamped as per respective material specification.
- 9.0 Heads of jackscrews and m/c bolts shall be heavy hexagonal type. Jackscrew end shall be rounded.
- 10.0 Each size of studs & m/c bolts with nuts and jackscrews shall be supplied in separate containers marked with size and material specifications. CRO shall be marked additionally in case CRO is specified in the requisition.
- 11.0 All items shall be inspected and approved (stagewise) by B&R inspector or any other agency authorized by B&R.
- 12.0 The heat treatment for stud bolts & nuts shall be as per code unless mentioned otherwise.
- 13.0 All austenitic stainless steel bolts, nuts, screws shall be supplied in solution annealed condition unless specified otherwise in the material specification.
- 14.0 Any additional requirements specified in the requisition shall be fully complied with.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	; 5G? 9HGZ6C@HG/ 'BI HG'	DOCUMENT NO. BR/TS/047	Page 4 of 4
			REVISION : 0
			EDITION : 1

- 15.0 Stud bolts, nuts & jackscrews shall be impact tested wherever specified in the material specification and also where the material specification is indicated as CRO . For S.S. nuts and bolts minimum impact energy absorption shall be 27 joules and test temperature shall be -196 C unless mentioned otherwise. For other materials impact energy and test shall be as per respective code.
- 16.0 Bolts / nuts of material of construction B7M / 2HM shall be 100 Hardness tested as per supplementary requirement S3 of ASTM A 193.
- 17.0 When specified as galvanized, the studs, m/c bolts and nuts shall be hot dip incoated in accordance with requirements of class C of ASTM A 153 . As an alternative, electro-galvaning as per IS 1573, Service Grade Number 2 is also acceptable.
- 18.0 All Stud Bolts of Bolt diameter size 1 and above shall be provided with three nuts irrespective of whatever has been specified elsewhere in the MR.



GAIL (india)
LIMITED

STEEL LINE CONNECTIVITY BY LAYING, HDD AND ASSOCIATED
WORKS FOR CITY GAS DISTRIBUTION NETWORK (12
MONTHS ANNUAL RATE CONTRACT (ARC)) FOR M/s GAIL
(INDIA) LIMITED

Doc. No. BR/TS/047, R0



PIPING MATERIAL SPECIFICATION

STEEL LINE CONNECTIVITY BY LAYING, HDD AND ASSOCIATED
WORKS FOR CITY GAS DISTRIBUTION NETWORK (12
MONTHS ANNUAL RATE CONTRACT (ARC)) FOR M/s GAIL (INDIA)
LIMITED

DOC. NO. BR/TS/047, R0



(PROCESS & PIPELINE DESIGN SECTION)

BRIDGE AND ROOF CO. (I) LTD.



GAIL (India)
LIMITED

**STEEL LINE CONNECTIVITY BY LAYING, HDD AND ASSOCIATED
WORKS FOR CITY GAS DISTRIBUTION NETWORK (12
MONTHS ANNUAL RATE CONTRACT (ARC)) FOR M/s GAIL
(INDIA) LIMITED**

Doc. No. BR/TS/047, R0



TABLE OF CONTENTS

1.0	SCOPE
2.0	CODES AND STANDARDS
3.0	MATERIAL SPECIFICATION
4.0	CLASS DESIGNATION CODE
5.0	PIPELINE
6.0	PIPING
7.0	FITTINGS
8.0	BENDS
9.0	FLANGES
10.0	GASKETS
11.0	BOLTING
12.0	THREAD SEALANT
13.0	VALVES
14.0	QUICK OPENING END CLOSURE
15.0	HYDROTESTING VENTS AND DRAINS
16.0	PIPELINE SPECIALITY ITEMS
TABLE-1	PIPE WALL THICKNESS DETAILS FOR MAINLINE
TABLE-2	INDEX OF PIPING MATERIAL SPECIFICATIONS
APPENDICES-I TO VI	PIPING MATERIAL SPECIFICATIONS AS PER TABLE - 2

PREPARED BY:	CHECKED BY:	APPROVED BY:	DATE ISSUED:
(SSM)	(SK)	(ST)	July 2024



GAIL (India)
LIMITED

**STEEL LINE CONNECTIVITY BY LAYING, HDD AND ASSOCIATED
WORKS FOR CITY GAS DISTRIBUTION NETWORK (12
MONTHS ANNUAL RATE CONTRACT (ARC)) FOR M/s GAIL
(INDIA) LIMITED**

Doc. No. BR/TS/047, R0



Building Nation Since 1920

1.0 SCOPE

This specification covers the requirements of various piping materials used in piping/ pipeline system handling Natural Gas / Regasified Liquid

Natural Gas (RLNG) and associated utilities in the pipeline.

2.0 CODES AND STANDARDS

2.1 Pipeline and terminal facilities envisaged as a part of this project shall be designed and Engineered primarily in accordance with the provision of ASME B 31.8 – Gas Transmission & Distribution Piping System - Latest edition and OISD Standard 226-Natural Gas Transmission Pipeline and City Gas Distribution Networks.

2.2 All codes standards and specifications referred herein shall be the latest edition of such documents.

2.3 For sake of brevity, the initials of the society to which the codes are referred are omitted in the specification, for example, B16.5 is a code referring to ANSI/ ASME, A 105 is a code referring to ASTM.

2.4 In addition, B&R specifications for various piping and pipeline materials shall also be applicable.

3.0 MATERIAL SPECIFICATION

Piping material specifications are classified for the general purpose of selection of material for the class of services. The maximum design pressure and design temperature together with the fluid in line governs the selection of material specifications. Deviation of materials from class specifications may occur due to specific design condition. These deviations are permissible if they are equal or better than the individual class requirements.

4.0 CLASS DESIGNATION CODE

The piping class designation consist of three digits numbering system made up of letter, number and letter e. g. A1A, B1A, D1A, etc as follows:

First letter indicates ANSI class rating e. g.

A-Class 150

B-Class 300

D-Class 600



GAIL (India)
LIMITED

STEEL LINE CONNECTIVITY BY LAYING, HDD AND ASSOCIATED
WORKS FOR CITY GAS DISTRIBUTION NETWORK (12
MONTHS ANNUAL RATE CONTRACT (ARC)) FOR M/s GAIL
(INDIA) LIMITED

Doc. No. BR/TS/047, R0



The middle number indicates differences in the specification within the same rating and material.

The last letter indicates type of material e. g.

A-Carbon Steel

5.0 **PIPELINE**

The material for line pipe shall be as per the requirements of specification as indicated in Table-1.

6.0 **PIPING**

6.1 Carbon steel pipe shall be made by open hearth, electric furnace or basic oxygen process only. The steel used shall be fully killed and made with fine grain structure. The grade and wall thickness of various sizes of pipes shall be as per piping material specification for the applicable class.

6.2 Pipe dimension shall be in accordance with ANSI B 36.10 for carbon steel pipes and ANSI B 36.19 for stainless steel pipes.

6.3 All pipe threads shall conform to American Standard taper as per ANSI B 1.20.1 NPT, unless otherwise specified.

6.4 For butt weld end, bevel shall be in accordance to ANSI B 16.25/ API 5L as applicable.

7.0 **FITTINGS**

7.1 Fully killed carbon steel shall be used in the manufacture of fittings.

7.2 Threaded joints, if used shall conform to American Standard taper as per ANSI 1.20.1 NPT.

7.3 Dimension of socket weld/ screwed fittings shall conform to ASME B 16.11

7.4 Bore of socket welded fittings shall suit O. D. of pipe and its thickness.

7.5 Dimensions of butt welded carbon steel fittings shall be as per ASME B 16.9 / MSS-SP-75, as applicable.



GAIL (India)
LIMITED

STEEL LINE CONNECTIVITY BY LAYING, HDD AND ASSOCIATED
WORKS FOR CITY GAS DISTRIBUTION NETWORK (12
MONTHS ANNUAL RATE CONTRACT (ARC)) FOR M/s GAIL
(INDIA) LIMITED

Doc. No. BR/TS/047, R0



- 7.6 Butt welding ends shall conform to ANSI B 16.25/ API 5L. In case of difference in thickness of matching ends, requirements of ASME B 31.8 shall apply.
- 7.7 Integrally reinforced forged branch fittings such as sockolet, threadolet, weldolet, nipplet etc. shall be as per MSS-SP-97. Fittings not covered in ASME B 16.9 and MSS-SP-97 shall conform to manufacturer's standard.
- 7.8 Fittings thickness tolerances shall match pipe thickness tolerance.
- 8.0 **BENDS**
- 8.1 Unless otherwise specified for terminal piping, the elbow of radius $R = 1.5 D$ shall only be used.
- 8.2 The radius of cold field bends shall not be less than 30 times the nominal diameter for pipes upto nominal diameter of 16" and shall not be less than 40 times the nominal diameter for pipes of nominal diameter of 18" and above. Limited use of long radius bends ($R = 6D$) may be permitted for reason of space constraints.
- 9.0 **FLANGES**
- 9.1 Flange rating shall be same as ANSI B 16.5/MSS-SP-44/ B 16.47 Series A as specified.
- 9.2 Dimensions of flanges shall be in accordance with ANSI B 16.5/ B 16.47 Series A, as applicable.
- 9.3 Neck of Weld Neck (WN) flanges to suit pipe bore and thickness.
- 9.4 Bore of Socket Welded (SW) flanges shall suit pipe O.D. and its thickness.
- 9.5 Threads for screwed flanges if used shall conform to American Standard taper as per ANSI B 1.20.1 NPT.
- 9.6 Sizes for blind flanges shall be indicated by nominal pipe sizes.
- 9.7 Carbon steel flanges faces shall have smooth finish as indicated in the material specification. Flanges faces shall have smooth finish to 125-250 micro inches AARH as per MSS-SP-6.
- 9.8 Butt welding ends of WN flanges shall conform to ANSI B 16.25.



GAIL (India)
LIMITED

STEEL LINE CONNECTIVITY BY LAYING, HDD AND ASSOCIATED
WORKS FOR CITY GAS DISTRIBUTION NETWORK (12
MONTHS ANNUAL RATE CONTRACT (ARC)) FOR M/s GAIL
(INDIA) LIMITED

Doc. No. BR/TS/047, R0



Building Nation Since 1920

- 9.9 Spectacle blind/ spacer & blinds shall be in accordance with ASME B 16.48 / Manufacturer's Standard. Spectacle blind shall be used for sizes up to 8" NB and spacer & blind for 10" & above shall be used.
- 9.10 Two jack screws 180° apart shall be provided for all spectacle blind assemblies. The jack screws shall be as per B&R's standard.
- 10.0 **GASKETS**
- 10.1 Spiral wound metallic gaskets shall conform to B 16.20 and API 601 shall be provided with graphite filler. All spiral wound gaskets shall be provided with stainless steel centering ring.
- 11.0 **BOLTING**
- 11.1 Nuts for stud bolts shall be American Standard Hexagonal Heavy series and double chamfered.
- 11.2 Dimension and tolerances for stud bolts and nuts shall be as per ANSI B 18.2.1 and 18.2.2 with full threading to ANSI B 1.1 Class 2A thread for bolts and Class 2B for nuts. Diameter and length of stud bolts shall be as per ANSI B 16.5/ ASME B 16.47 with full threading.
- 11.3 Threads for nuts shall be as per ANSI B 1.1, as follows:
- | | | |
|--|---|--------|
| Nuts for stud dia 1/4" to 1" | : | UNC-2B |
| Nuts for stud bolts dia 1 1/8" to 3 1/4" | : | 8UN-2B |
- 11.4 Threads for stud bolts shall be as per ANSI B 1.1, as follows.
- | | | |
|---------------------------------|---|--------|
| Studs bolts dia 1/4" to 1" | : | UNC-2A |
| Stud bolts dia 1 1/8" to 3 1/4" | : | 8UN-2A |
- 11.5 Heads of jack screws shall be heavy hexagonal type. Jack screw end shall be rounded. Stud bolts shall be fully threaded with two hexagonal nuts.
- 12.0 **THREAD SEALANT**
- 12.1 Threaded joints shall be made with 1" wide PTFE Jointing tape.



GAIL (India)
LIMITED

**STEEL LINE CONNECTIVITY BY LAYING, HDD AND ASSOCIATED
WORKS FOR CITY GAS DISTRIBUTION NETWORK (12
MONTHS ANNUAL RATE CONTRACT (ARC)) FOR M/s GAIL
(INDIA) LIMITED**

Doc. No. BR/TS/047, R0



13.0 VALVES

- 13.1 Valve ends shall be as per piping material specifications (Appendices).
- 13.2 Flange dimensions and face finish of flanged end valves shall confirm to clause 9.0 of this specification.
- 13.3 Butt welding ends of Butt Welded valves shall conform to ANSI B 16.25.
- 13.4 Face to face and end to end dimensions shall conform to applicable standards.
- 13.5 Buried valves on mainline shall be provided with stem extension, sealant, vent/drain & shall have butt welded ends.
- 13.6 Sectionalizing Valves (Block valves) installed on the main pipeline shall be Ball valves with butt welded ends and shall be full bore to allow smooth passage of cleaning pigs as well as intelligent pigs.
- 13.7 Unless specified otherwise. Valves shall confirm to the following standards:

Screwed / Socket welded / Flanged end valves (1 ½" and below)

Ball Valves	-	BS 5351(latest)
Plug Valves	-	BS 5353(latest)
Globe Valves	-	BS 5352(latest)
Gate Valves	-	API 602(latest)

Flanged / Butt weld end Valves (2" and above)

Ball Valves	-	API 6D
Plug Valves	-	API 6D
Check Valves	-	API 6D
Globe Valves	-	BS 1873
Gate Valves	-	API 6D

- 13.8 Manual Valve operators shall be as indicated below, unless specified otherwise in the P&ID.



GAIL (India)
LIMITED

STEEL LINE CONNECTIVITY BY LAYING, HDD AND ASSOCIATED
WORKS FOR CITY GAS DISTRIBUTION NETWORK (12
MONTHS ANNUAL RATE CONTRACT (ARC)) FOR M/s GAIL
(INDIA) LIMITED

Doc. No. BR/TS/047, R0



a) **Gate and Globe Valves**

- i) For ANSI class 150 & 300 - Hand Wheel operated for size ≤ 12 "NB.
Gear operated for size ≥ 14 " NB.
- ii) For ANSI class 600 - Hand Wheel operated for size ≤ 10 "NB.
Gear operated for size ≥ 12 " NB.

b) **Ball and Plug Valves**

- i) For ANSI class 150, 300, 600 – Wrench operated for size ≤ 4 "NB.
Gear operated for size ≥ 6 "NB.

- c) **Actuated Valves**- Actuated valves shall be as per P & ID.

14.0 QUICK OPENING END CLOSURE

Quick opening end closure to be installed on scrapper traps shall be equipped with safety locking devices in compliance with section VIII, division 1, UG-35.2 of ASME Boiler and Pressure Vessel code.

15.0 HYDRO TESTING VENTS AND DRAINS

High point vents and low point drains required for the purpose of hydro testing shall be of size 1" and consist of sockolet, Plug & Ball valve for vent, Globe & Ball Valve for drain, flange & blind flange.

16.0 PIPELINE SPECIALITY ITEMS

Pipeline Specialty items viz., Scrapper Traps, Flow Tee, Insulating Joints, LR bends, QOEC for Venting shall be as per respective data sheets, specifications and Project Specific drawing showing Mainline & Terminal materials.



GAIL (India)
LIMITED

**STEEL LINE CONNECTIVITY BY LAYING, HDD AND ASSOCIATED
WORKS FOR CITY GAS DISTRIBUTION NETWORK (12
MONTHS ANNUAL RATE CONTRACT (ARC)) FOR M/s GAIL
(INDIA) LIMITED**

Doc. No. BR/TS/047, R0



TABLE-1

PIPE WALL THICKNESS DETAIL FOR MAIN LINE

Sl. No.	Pipe Material Description	Si e (NB)	Thickness (mm)	Length
1.	API 5L Gr. X-52, PSL-2	4"	6.4	As per SOR Quantity

TABLE-2

INDEX OF PIPING MATERIAL SPECIFICATIONS

Class	Service	C.A. (mm)	Basic Material	Design Code	Enclosed as
D1A	Natural Gas/ RLNG	1.5	ASTM A 106 Gr. B / API 5L Gr. B / X-52	ANSI B31.8	Appendix-I
D4A	Natural Gas/ RLNG	1.5	ASTM A 333 Gr. 6	ANSI B31.8	Appendix-II
B1A	Natural Gas/ RLNG	1.5	ASTM A 106 Gr. B /API 5L Gr. B	ANSI B31.8	Appendix-III
B4A	Natural Gas/ RLNG	1.5	ASTM A 333 Gr. 6	ANSI B31.8	Appendix-IV
A1A	Natural Gas/ RLNG	1.5	ASTM A 106 Gr. B /API 5L Gr. B	ANSI B31.8	Appendix-V
A4A	Natural Gas/ RLNG	1.5	ASTM A 333 Gr. 6	ANSI B31.8	Appendix-VI

ANSI CLASS: 150 #		CORROSION ALLOWANCE: 1.5 MM		TEMP °C		-29		38.0		50		100		150		200					
				PRESS. KG/CM ² g		19.98		19.98		19.57		18.05		16.11		14.07					
SERVICE : NATURAL GAS				BASE MATERIAL: CARBON STEEL (MATERIAL GROUP 1.1)																	
NOTES:-																					
1. ALL VENTS & DRAIN SHALL BE PROVIDED WITH PLUG VALVE UNLESS MENTIONED OTHERWISE IN P&IDs.																					
2. FITTINGS SHALL BE OF SEAMLESS CONSTRUCTION UP TO 16" AND SHALL BE OF WELDED CONSTRUCTION 18" AND ABOVE.																					
3. WALL THICKNESS FOR LINEPIPE USED IN VARIOUS SECTIONS SHALL BE AS PER TABLE-1 OF PMS.																					
4. BALL VALVE TO BE USED IN MAINLINE SHALL HAVE BUTT WELDED ENDS EXCEPT FOR THE VALVES USED FOR HOT TAPPING WHICH SHALL BE ONE SIDE BUTT WELDED AND OTHER SIDE FLANGED.																					
5. PROCUREMENT OF MATERIALS SHALL BE AS PER DETAILED RELEVANT SPECIFICATIONS.																					
6. DESIGN PRESSURE & TEMP. FOR PIPELINE AND RELATED FACILITIES ARE 19 Kg/Cm ² g & (-29° TO +65°C) RESPECTIVELY.																					
7. PRESSURE-TEMPERATURE RATING INDICATED ARE FOR FLANGES ONLY IN ACCORDANCE WITH ANSI B 16.5																					
8. FOR VALVES,STEELPIPE AND ASSOCIATED STEEL COMPONENTS OF 2" AND LARGER NOTCH TOUGHNESS PROPERTIES SHALL BE AS SPECIFIED IN RELEVANT SPECIFICATIONS/CODES, MECON'S STANDARD TECHNICAL SPECIFICATIONS AND DATA SHEETS ETC.																					
9. AT STATIONS, BRANCH CONNECTIONS SHALL BE AS PER BRANCH CONNECTION TABLE BELOW																					
10. ALL BUTT WELDS SHALL BE 100% RADIOGRAPHED.																					
11. 100% OF SOCKET WELD SHALL BE SUBJECTED TO MPI/DPT.																					
12. PRESSURE-TEMPERATURE RATING OF VALVE BODY SHALL BE AS PER API 6D.																					
13. PIPELINE DESIGN CODE - ASME B 31.8 & OISD 226.																					
14. FOR PIPELINE SPECIALITY ITEMS (SCRAPPER TRAP, BARRED TEE, IJ, LR BENDS ETC.) AND THEIR MATERIAL DESCRIPTIONS REFER DATA SHEET OF RESPECTIVE ITEMS.																					
STATION PIPING MATERIAL SPECIFICATION																					
ITEM		SIZE		DESCRIPTION																	
MAINTENANCE JOINTS		ALL		FLGD., BUT TO BE KEPT MINIMUM																	
PIPE JOINTS		1.5" & BELOW		SOCKET WELD																	
		2" & ABOVE		BUTT WELDED																	
DRAINS		ON LINES ≤ 1.5"		3/4", AS PER MEC/SD/05/21/15/03																	
		ON LINES ≥ 2"		3/4" OR AS PER P&ID, MEC/SD/05/21/15/01																	
VENTS		ON LINES ≤ 1.5"		3/4", AS PER MEC/SD/05/21/15/03																	
		ON LINES ≥ 2"		3/4" OR AS PER P&ID, MEC/SD/05/21/15/01																	
TEMP. CONN.		1.5"		FLGD. INSTL. AS PER MEC/SD/05/21/15/02																	
PRESS CONN.		3/4"		SCH. 160 NIPPLE WITH BALL VALVE TO SPEC. INSTALLATION AS PER MEC/SD/05/21/15/05																	
REV NO		DATE		ZONE		DESCRIPTIONS				BY		APPRD		REFERENCES				DRG. NO.			
SECTION:		OIL & GAS		NATURAL GAS PIPELINE PROJECT														BRIDGE AND ROOF CO.(I) LTD.			
DSGN		S.S.M				CHKD		S.K													
DRWN		A.M				S.K															
APPROVED		SANDIP TALUKDAR		PIPING MATERIAL SPECIFICATIONS 150#														BRIDGE AND ROOF CO.(I) LTD.			
				Page 841 of 1596														SCALE : N.T.S.		(SH. 1 OF 2)	
				APPENDIX-I																REV 0	

PIPELINE/PIPING DESIGN CODE										ASME B 31.8/ OISD 226										DESIGN FACTOR – 0.5									
ITEM	NOMINAL DIAMETER (INCHES)					0.50	0.75	1.00	1.50	2.00	3.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0							
	WALL THICKNESS (MM/SCH)					S160	S160	XS	XS	XS	STD	STD	S20	S20	S20	S10	S10	S10	S10	7.9	8.7								
MATERIAL					ASTM A106 GR.B					ASTM A106 GR.B (CHАРY)					API 5L GR.B PSL2														
DIMENSION STD.					B36.10					SEAMLESS PE					SEAMLESS BE					SAW, BE									
METHOD OF MANUFACTURE, ENDS					ASTM A 105					ASTM A 105 (CHАРY)					WN. THICKNESS TO MATCH PIPE THICKNESS, RF 125AARH														
MATERIAL AND GRADE					B16.5					ASTM A 105 (CHАРY)																			
TYPE, FLANGE FACING					RF 125AARH																								
DIMENSION STD.					ASTM A 105																								
MATERIAL AND GRADE					ASTM A 105																								
FLANGE FACING					B16.5																								
DIMENSION STD.					ASTM A 105																								
MATERIAL AND GRADE					ASTM A 105																								
FLANGE FACING					FF 125AARH																								
DIMENSION STD.					B16.48																								
TYPE					FIG.8 FLANGE										SPACER & BLIND														
STUD BOLTS (FULLY THREADED)					A 193 GR B7, B-18.2																								
NUTS (HEAVY HEXAGONAL)					A 194 GR 2H, B-18.2																								
TYPE, MATERIAL AND Dmn. STD.					SP. WND SS 316+GRAPHITE FILLED AS PER B 16.20/ANSI B 16.5																								
MATERIAL					ASTM A 105					ASTM A 234 GR.WPB (CHАРY)					ASTM A 234 GR.WPB-W (CHАРY)														
END DETAIL					SW,6000# SW,3000#					BW, 1.50																			
DIMENSION STD.					B-16.11					B-16.9																			
MATERIAL					ASTM A 105					ASTM A 234 GR.WPB (CHАРY)					ASTM A 234 GR.WPB-W (CHАРY)														
END DETAIL					SW,6000# SW,3000#					BW																			
DIMENSION STD.					B-16.11					B-16.9																			
MATERIAL					ASTM A 105					ASTM A 234 GR.WPB (CHАРY)																			
END DETAIL					SCRF6000 SCRF3000					BW, THICKNESS TO MATCH PIPE THICKNESS																			
DIMENSION STD.					B-16.11					B-16.9																			
MATERIAL					ASTM A 105					ASTM A 234 GR.WPB (CHАРY)					ASTM A 234 GR.WPB-W (CHАРY)														
END DETAIL					SW,6000# SW,3000#					BW, THICKNESS TO MATCH PIPE THICKNESS																			
DIMENSION STD.					B-16.11					B-16.9																			
TYPE					COUPLING FULL, HALF LH., RED.					RED. CON. RED. ECC.																			
MATERIAL					ASTM A 105					ASTM A 105 (CHАРY)																			
END DETAIL					SW,6000# SW,3000#					BW																			
DIMENSION STD.					MSS-SP97					MSS-SP97																			
TYPE					SOCKOLET					WELDOLET																			

REV NO	DATE	ZONE	DESCRIPTIONS	BY	APPRD	REFERENCES	DRG. NO.
SECTIONS: OIL & GAS							
DSGN	S.S.M		S.K			NATURAL GAS PIPELINE PROJECT	
DRWN	A.M		S.K			BRIDGE AND ROOF CO.(I) LTD.	
APPROVED SANDIP TALUKDAR				PIPING MATERIAL SPECIFICATIONS 150# (Page 842 of 1596)			
				SCALE : N.T.S. (SH. 2 OF 2)			
				APPENDIX-I			

बी एण्ड आर

B AND R

Building Nations Since 1920

ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड

BRIDGE AND ROOF CO.(I) LTD.

REV 0

REV NO		DATE	ZONE	DESCRIPTIONS		BY	APPRD	REFERENCES		DRG. NO.	
SECTION:		OIL & GAS			NATURAL GAS PIPELINE PROJECT				BRIDGE AND ROOF CO.(I) LTD.		
DSGN	NAME	DATE	CHKD	DATE	PIPING MATERIAL SPECIFICATIONS				SCALE : N.T.S.		
DRWN	S.S.M		S.K		150#				(SH. 1 OF 2)		
APPROVED	SANDIP TALUKDAR				150#				APPENDIX-II		
ANSI CLASS: 150#		CORROSION ALLOWANCE: 1.5MM		TEMP °C		-45	38	50	100	150	
SERVICE : RLNG		BASE MATERIAL: CARBON STEEL (MATERIAL GROUP 1.3)		PRESS. KG/CM ² g		18.76	18.76	18.55	17.74	16.11	
NOTES: -											
1. ALL VENTS & DRAIN SHALL BE PROVIDED WITH PLUG VALVE UNLESS MENTIONED OTHERWISE IN P&IDs.											
2. FITTINGS SHALL BE OF SEAMLESS CONSTRUCTION UP TO 16" AND SHALL BE OF WELDED CONSTRUCTION 18" AND ABOVE.											
3. WALL THICKNESS FOR LINEPIPE USED IN VARIOUS SECTIONS SHALL BE AS PER TABLE-1 OF PMS.											
4. BALL VALVE TO BE USED IN MAINLINE SHALL HAVE BUTT WELDED ENDS EXCEPT FOR THE VALVES USED FOR HOT TAPPING WHICH SHALL BE ONE SIDE BUTT WELDED AND OTHER SIDE FLANGED.											
5. PROCUREMENT OF MATERIALS SHALL BE AS PER DETAILED RELEVANT SPECIFICATIONS.											
6. PRESSURE-TEMPERATURE RATING INDICATED ARE FOR FLANGES ONLY IN ACCORDANCE WITH ANSI B 16.5											
7. FOR VALVES,STEELPIPE AND ASSOCIATED STEEL COMPONENTS OF 2" AND LARGER NOTCH TOUGHNESS PROPERTIES SHALL BE AS SPECIFIED IN RELEVANT SPECIFICATIONS/CODES, MECON'S STANDARD TECHNICAL SPECIFICATIONS AND DATA SHEETS ETC.											
8. AT STATIONS, BRANCH CONNECTIONS SHALL BE AS PER BRANCH CONNECTION TABLE BELOW											
9. ALL BUTT WELDS SHALL BE 100% RADIOGRAPHED.											
10. 100% OF SOCKET WELD SHALL BE SUBJECTED TO MPI/DPT.											
11. PRESSURE-TEMPERATURE RATING OF VALVE BODY SHALL BE AS PER API 6D.											
12. PIPELINE DESIGN CODE - ASME B 31.8 & OISD 226.											
13. FOR PIPELINE SPECIALITY ITEMS (SCRAPPER TRAP, FLOW TEE, LJ, LR BENDS ETC.) AND THEIR MATERIAL DESCRIPTIONS, REFER DATA SHEET OF RESPECTIVE ITEMS.											
14. DESIGN PRESSURE&TEMP. FOR PIPELINE AND RELATED FACILITIES ARE 19 KG/cm ² g &(-45° TO +65° C) RESPECTIVELY.											
STATION PIPING MATERIAL SPECIFICATION											
ITEM	SIZE	DESCRIPTION									
MAINTENANCE JOINTS	ALL	FLGD., BUT TO BE KEPT MINIMUM									
PIPE JOINTS	1.5" & BELOW	SOCKET WELD									
	2" & ABOVE	BUTT WELDED									
DRAINS	ON LINES ≤ 1.5"	3/4", AS PER MEC/SD/05/21/15/03									
	ON LINES ≥ 2"	3/4" OR AS PER P&ID, MEC/SD/05/21/15/01									
VENTS	ON LINES ≤ 1.5"	3/4", AS PER MEC/SD/05/21/15/03									
	ON LINES ≥ 2"	3/4" OR AS PER P&ID, MEC/SD/05/21/15/01									
TEMP. CONN.	1.5"	FLGD. INSTL. AS PER MEC/SD/05/21/15/02									
PRESS CONN.	3/4"	NIPPLE WITH BALL VALVE TO SPEC. INSTALLATION AS PER MEC/SD/05/21/15/05									
BRANCH CONNECTIONS											
E TEES BW											
H H. COUPLING											
P PIPE TO PIPE											
R REINFORCED											
S SOCKETLETS											
T TEES SW/											
W WELDOLETS											
D TEE WITH RED.											
BRANCH PIPE NOMINAL DIA (INCHES)											
36											
34											
32											
30											
28											
24											
22											
20											
18											
16											
14											
12											
10											
8.0											
6.0											
5.0											
4.0											
3.50											
3.00											
2.50											
2.00											
1.50											
1.25											
1.00											
0.75											
0.50											
RUN PIPE NOMINAL DIA (INCHES)											

PIPELINE/PIPING DESIGN CODE										ASME B 31.8/ OISD 226										DESIGN FACTOR – 0.5									
ITEM	NOMINAL DIAMETER (INCHES)										0.50	0.75	1.00	1.50	2.00	3.00	4.00	6.00	8.00	10.0	12.0	14.0							
	WALL THICKNESS (MM/SCH)										S160	S160	XS	XS	XS	STD	STD	STD	STD	STD	STD								
MATERIAL										ASTM A333 GR.6																			
DIMENSION STD.										B36.10																			
METHOD OF MANUFACTURE, ENDS										SEAMLESS PE																			
MATERIAL AND GRADE										SEAMLESS BE																			
TYPE, FLANGE FACING										ASTM A 350 GR. LF2, CL-I																			
DIMENSION STD.										WN. THICKNESS TO MATCH PIPE THICKNESS, RF 125AARH																			
MATERIAL AND GRADE										B16.5																			
FLANGE FACING										ASTM A 350 GR. LF2, CL-I																			
DIMENSION STD.										RF 125AARH																			
MATERIAL AND GRADE										B16.5																			
FLANGE FACING										ASTM A 350 GR. LF2, CL-I																			
DIMENSION STD.										FF 125AARH																			
TYPE										B16.48																			
STUD BOLTS (FULLY THREADED)										FIG.8 FLANGE																			
NUTS (HEAVY HEXAGONAL)										SPACER & BLIND																			
TYPE, MATERIAL AND Dmn. STD.										A 320 GR L7, B-18.2																			
MATERIAL										A 194 GR 4, B-18.2																			
END DETAIL										SPIRAL, SP.WND SS316+GRAPHITE FILLED, B-16.20-ANSI B16.5,																			
DIMENSION STD.										ASTM A 350 GR.LF2																			
MATERIAL										ASTM A 420 GR.WPL6																			
END DETAIL										SW,6000#/SW,3000#																			
DIMENSION STD.										BW, 1.5D																			
MATERIAL										B-16.11																			
END DETAIL										B-16.9																			
DIMENSION STD.										ASTM A 350 GR.LF2																			
MATERIAL										ASTM A 420 GR.WPL6																			
END DETAIL										ASTM A 350 GR.LF2																			
DIMENSION STD.										BW, THK TO MATCH PIPE THICKNESS																			
MATERIAL										B-16.11																			
END DETAIL										B-16.9																			
DIMENSION STD.										ASTM A 350 GR.LF2																			
MATERIAL										ASTM A 420 GR.WPL6																			
END DETAIL										SW-6000 SW-3000																			
DIMENSION STD.										BW, THICKNESS TO MATCH PIPE THICKNESS																			
TYPE										B-16.11																			
COUPLING FULL,HALF LH.,RED.										RED. CON. RED. ECC.																			
MATERIAL										ASTM A 350 GR.LF2																			
END DETAIL										ASTM A 350 GR.LF2																			
DIMENSION STD.										SW,6000#/SW,3000#																			
TYPE										BW																			
MATERIAL										MSS-SP97																			
END DETAIL										MSS-SP97																			
DIMENSION STD.										WELDOLET																			
TYPE										SOCKOLET																			

REV NO	DATE	ZONE	DESCRIPTIONS	BY	APPRD	REFERENCES	DRG. NO.
SECTION: OIL & GAS							
DSGN	NAME	DATE	CHKD	DATE	NATURAL GAS PIPELINE PROJECT		
DRWN	S.S.M		S.K		BRIDGE AND ROOF CO.(I) LTD.		
APPROVED	A.M		S.K		BRIDGE AND ROOF CO.(I) LTD.		
SANDIP TALUKDAR				PIPE PIPING MATERIAL SPECIFICATIONS			
				150# (Page 844 of 1596)			
				APPENDIX-II			

वी एण्ड आर

BAND R

Building Nations Since 1900

ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड

BRIDGE AND ROOF CO.(I) LTD.

SCALE : N.T.S. (SH. 2 OF 2)

REV 0

REV NO		DATE	ZONE	DESCRIPTIONS		BY	APPRD	REFERENCES		DRG. NO.	
SECTION:		OIL & GAS		NATURAL GAS PIPELINE PROJECT		PIPING MATERIAL SPECIFICATIONS		300#		BRIDGE AND ROOF CO.(I) LTD.	
DSGN		S.S.M		S.K		S.K		SCALE : N.T.S.		(SH. 1 OF 2)	
DRWN		A.M		S.K		S.K		APPENDIX-II		REV 0	
APPROVED		SANDIP TALUKDAR		SANDIP TALUKDAR		SANDIP TALUKDAR		SANDIP TALUKDAR		SANDIP TALUKDAR	
REV NO		DATE	ZONE	DESCRIPTIONS		BY	APPRD	REFERENCES		DRG. NO.	
SECTION:		OIL & GAS		NATURAL GAS PIPELINE PROJECT		PIPING MATERIAL SPECIFICATIONS		300#		BRIDGE AND ROOF CO.(I) LTD.	
DSGN		S.S.M		S.K		S.K		SCALE : N.T.S.		(SH. 1 OF 2)	
DRWN		A.M		S.K		S.K		APPENDIX-II		REV 0	
APPROVED		SANDIP TALUKDAR		SANDIP TALUKDAR		SANDIP TALUKDAR		SANDIP TALUKDAR		SANDIP TALUKDAR	

ANSI CLASS: 300 #	CORROSION ALLOWANCE: 1.5 MM	TEMP °C	-29.0	38.0	50	100	150	200
PRESS. KG/CM ² g			52.1	52.1	51.10	47.52	45.98	44.60
SERVICE : NATURAL GAS		BASE MATERIAL: CARBON STEEL (MATERIAL GROUP 1.1)						

NOTES:-

- ALL VENTS & DRAIN SHALL BE PROVIDED WITH PLUG VALVE, UNLESS MENTIONED OTHERWISE IN P&IDs.
- FITTINGS SHALL BE OF SEAMLESS CONSTRUCTION UP TO 16" AND SHALL BE OF WELDED CONSTRUCTION 18" AND ABOVE.
- WALL THICKNESS FOR LINEPIPE USED IN VARIOUS SECTIONS SHALL BE AS PER TABLE-1 OF PMS.
- BALL VALVE TO BE USED IN MAINLINE SHALL HAVE BUTT WELDED ENDS EXCEPT FOR THE VALVES USED FOR HOT TAPPING WHICH SHALL BE ONE SIDE BUTT WELDED AND OTHER SIDE FLANGED.
- PROCUREMENT OF MATERIALS SHALL BE AS PER DETAILED RELEVANT SPECIFICATIONS.
- DESIGN PRESSURE & TEMP. FOR PIPELINE AND RELATED FACILITIES ARE 49 Kg/cm² g & (-29° TO +65°C) RESPECTIVELY.
- PRESSURE-TEMPERATURE RATING INDICATED ARE FOR FLANGES ONLY IN ACCORDANCE WITH ANSI B 16.5
- FOR VALVES,STEELPIPE AND ASSOCIATED STEEL COMPONENTS OF 2" & LARGER NOTCH TOUGHNESS PROPERTIES SHALL BE AS SPECIFIED. IN RELEVANT SPECIFICATIONS/CODES, MECON'S STANDARD TECHNICAL SPECIFICATIONS AND DATA SHEETS ETC.
- AT STATIONS, BRANCH CONNECTIONS SHALL BE AS PER BRANCH CONNECTION TABLE BELOW
- ALL BUTT WELDS SHALL BE 100% RADIOGRAPHED.
- 100% OF SOCKET WELD SHALL BE SUBJECTED TO MPI/DPT.
- PRESSURE-TEMPERATURE RATING OF VALVE BODY SHALL BE AS PER API 6D.
- PIPELINE DESIGN CODE - ASME B 31.8 & OISD 226.
- FOR PIPELINE SPECIALITY ITEMS (SCRAPPER TRAP, BARRED TEE, IJ, LR BENDS ETC.) AND THEIR MATERIAL DESCRIPTIONS REFER DATA SHEET OF RESPECTIVE ITEMS.

STATION PIPING MATERIAL SPECIFICATION

ITEM	SIZE	DESCRIPTION
MAINTENANCE JOINTS	ALL	FLGD., BUT TO BE KEPT MINIMUM
PIPE JOINTS	1.5" & BELOW	SOCKET WELD
	2" & ABOVE	BUTT WELDED
DRAINS	ON LINES ≤ 1.5"	3/4", AS PER MEC/SD/05/21/15/03
	ON LINES ≥ 2"	3/4" OR AS PER P&ID, MEC/SD/05/21/15/01
VENTS	ON LINES ≤ 1.5"	3/4", AS PER MEC/SD/05/21/15/03
	ON LINES ≥ 2"	3/4" OR AS PER P&ID, MEC/SD/05/21/15/01
TEMP. CONN.	1.5"	FLGD. INSTL. AS PER MEC/SD/05/21/15/02
PRESS CONN.	3/4"	SCH. 160 NIPPLE WITH BALL VALVE TO SPEC. INSTALLATION AS PER MEC/SD/05/21/15/05

BRANCH CONNECTIONS

E	TEES BW	36
H	H. COUPLING	34
P	PIPE TO PIPE	32
R	REINFORCED	30
S	SOCKETLETS	28
T	TEES SW/	24
W	WELDOLETS	22
D	TEE WITH RED.	20
		18
		16
		14
		12
		10
		8.0
		6.0
		5.0
		4.0
		3.50
		3.00
		2.50
		2.00
		1.50
		1.25
		1.00
		0.75
		0.50

BRANCH PIPE NOMINAL DIA (INCHES)

RUN PIPE NOMINAL DIA (INCHES)

PIPELINE/PIPING DESIGN CODE										ASME B 31.8/ OISD 226										DESIGN FACTOR – 0.5									
ITEM										NOMINAL DIAMETER (INCHES)										0.50 0.75 1.00 1.50 2.00 3.00 4.00 6.00 8.00 10.0 12.0 14.0 16.0 18.0 20.0									
PIPE										WALL THICKNESS (MM/SCH)										S160 S160 XS XS STD S40 S40 S40 STD S40 S40 S40 S40 15.9									
MATERIAL										ASTM A106 GR.B										API 5L GR.B PSL2									
DIMENSION STD.										B36.10										API 5L									
METHOD OF MANUFACTURE, ENDS										SEAMLESS PE										SEAMLESS BE									
MATERIAL AND GRADE										ASTM A 105										ASTM A 105 (CHARPY)									
FLANGE										TYPE, FLANGE FACING										SW, RF 125AARH									
BLIND FLANGE										DIMENSION STD.										B16.5									
BLANK										MATERIAL AND GRADE										ASTM A 105									
BOLTING										FLANGE FACING										FF 125AARH									
GASKET										DIMENSION STD.										B16.48									
ELBOW-90										TYPE										FIG.8 FLANGE									
ELBOW-45										STUD BOLTS (FULLY THREADED)										A 193 GR B7, B-18.2									
T-EQUAL										NUTS (HEAVY HEXAGONAL)										A 194 GR 2H, B-18.2									
T-RED										TYPE ,MATERIAL AND Dmn. STD.										SPIRAL 300# , SP.WND SS316+GRAPHITE FILLED, B-16.20-ANSI B16.5,									
CAP										MATERIAL										ASTM A 105									
FITTING										END DETAIL										SW,6000# SW,3000#									
O'LET										DIMENSION STD.										B-16.11									
										MATERIAL										ASTM A 105									
										END DETAIL										SW,6000# SW,3000#									
										DIMENSION STD.										B-16.11									
										TYPE										COUPLING FULL,HALF LH.,RED.									
										MATERIAL										ASTM A 105									
										END DETAIL										SW,6000# SW,3000#									
										DIMENSION STD.										B-16.11									
										TYPE										RED. CON. RED. ECC.									
										MATERIAL										ASTM A 105 (CHARPY)									
										END DETAIL										BW									
										DIMENSION STD.										MSS-SP97									
										TYPE										WELDOLET									

REV NO	DATE	ZONE	DESCRIPTIONS	BY	APPRD	REFERENCES	DRG. NO.
SECTION: OIL & GAS							
DSGN	S.S.M		S.K		NATURAL GAS PIPELINE PROJECT		
DRWN	A.M		S.K		PIPING MATERIAL SPECIFICATIONS		
APPROVED	SANDIP TALUKDAR			300# (B1A)			
BRIDGE AND ROOF CO.(I) LTD.							
SCALE : N.T.S. (SH. 2 OF 2)							
APPENDIX-II							
REV 0							

PIPELINE/PIPING DESIGN CODE										ASME B 31.8/ OISD 226										DESIGN FACTOR – 0.5									
ITEM	NOMINAL DIAMETER (INCHES)										0.50	0.75	1.00	1.50	2.00	3.00	4.00	6.00	8.00	10.0	12.0	14.0	16.0	18.0	20.0	22.0	24.0		
	WALL THICKNESS (MM/SCH)										S160	S160	XS	XS	XS	STD	STD	STD	STD	STD	S40	S40	S30	S30	S30	S30			
PIPE										ASTM A333 GR.6																			
										B36.10																			
METHOD OF MANUFACTURE, ENDS										SEAMLESS PE										SEAMLESS BE									
MATERIAL AND GRADE																				ASTM A 350 GR. LF2, CL-I									
FLANGE										SW. RF 125AARH										WN. THICKNESS TO MATCH PIPE THICKNESS, RF 125AARH									
										B16.5																			
BLIND FLANGE																				ASTM A 350 GR. LF2, CL-I									
										RF 125AARH																			
										B16.5																			
BLANK																				ASTM A 350 GR. LF2, CL-I									
										FF 125AARH																			
										B16.48																			
TYPE										FIG.8 FLANGE										SPACER BLIND									
BOLTING										STUD BOLTS (FULLY THREADED)										A 320 GR L7, B-18.2									
										NUTS (HEAVY HEXAGONAL)										A 194 GR 4, B-18.2									
GASKET										TYPE, MATERIAL AND Dmn. STD.										SPIRAL, SP.WND SS316+GRAPHITE FILLED, B-16.20-ANSI B16.5,									
ELBOW-90										MATERIAL										ASTM A 350 GR.LF2									
ELBOW-45										END DETAIL										SW,6000#/SW,3000#									
										DIMENSION STD.										B-16.11									
T-EQUAL										MATERIAL										ASTM A 350 GR.LF2									
T-RED										END DETAIL										SW,6000#/SW,3000#									
										DIMENSION STD.										B-16.11									
CAP & PLUG (upto 1.5")										MATERIAL										ASTM A 350 GR.LF2									
										END DETAIL										SCRF6000/SCRF3000									
										DIMENSION STD.										B-16.11									
FITTING										MATERIAL										ASTM A 350 GR.LF2									
										END DETAIL										SW-6000 SW-3000									
										DIMENSION STD.										B-16.11									
										TYPE										COUPLING FULL,HALF LH.,RED.									
																				RED. CON. RED. ECC.									
O'LET										MATERIAL										ASTM A350 GR.LF2									
										END DETAIL										SW,6000#/SW,3000#									
										DIMENSION STD.										MSS-SP97									
										TYPE										SOCKOLET									
																				WELDOLET									

REV NO	DATE	ZONE	DESCRIPTIONS		BY	APPRD	REFERENCES		DRG. NO.		
SECTION:			OIL & GAS		NATURAL GAS PIPELINE PROJECT					Brij एंड रूफ कंपनी (इंडिया) लिमिटेड	
DSGN	S.S.M		CHKD	S.K	PIPING MATERIAL SPECIFICATIONS					BRIDGE AND ROOF CO.(I) LTD.	
DRWN	A.M		CHKD	S.K	300# (B4A)					SCALE : N.T.S. (SH. 2 OF 2)	
APPROVED	SANDIP TALUKDAR		Page 848 of 1596					APPENDIX-IV		REV 0	

REV NO		DATE	ZONE	DESCRIPTIONS		BY	APPRD	REFERENCES		DRG. NO.	
SECTION:		OIL & GAS		NATURAL GAS PIPELINE PROJECT		BRIDGE AND ROOF CO.(I) LTD.		SCALE : N.T.S.		(SH. 1 OF 2)	
DSGN		S.S.M		S.K		BRIDGE AND ROOF CO.(I) LTD.		APPENDIX-V		REV 0	
DRWN		A.M		S.K							
APPROVED		SANDIP TALUKDAR		PIPING MATERIAL SPECIFICATIONS							
				600#							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							
				3							
				2							
				1							
				6							
				5							
				4							

TECHNICAL SPECIFICATION FOR PRE-COMMISSIONING AND COMMISSIONING



TS NO.: BR/TS/048



**(OIL & GAS)
BRIDGE AND ROOF CO. (I) LTD.**

C O N T E N T S

<u>SL. NO.</u>	<u>DESCRIPTION</u>
-----------------------	---------------------------

1.0	INTRODUCTION
2.0	RESPONSIBILITY OF CONTRACTOR
3.0	SCOPE OF WORK
4.0	DOCUMENTATION
5.0	SPARES AND CONSUMABLES
6.0	SAFETY

ANNEXURE – I : FORMAT FOR BIODATA OF KEY PERSONNEL FOR COMMISSIONING

ANNEXURE – II : QUESTIONNAIRE

ANNEXURE – III : FORMAT TO BE USED DURING PRE-COMMISSIONING AND COMMISSIONING (TOTAL 5 FORMATS)

FORMAT – I : INTIMATION REGARDING SYSTEM COMPLETION

FORMAT - II : CHECKLIST

FORMAT - III : READY FOR PRE-COMMISSIONING CERTIFICATE

FORMAT – IV : READY FOR COMMISSIONING CERTIFICATE

FORMAT - V : COMPLETION OF COMMISSIONING CERTIFICATE

1.0 INTRODUCTION

This specification covers the minimum technical requirements for:

- i) Pre-commissioning activities consists of:
 - Carrying out pre-commissioning checks of the underground pipeline system including above ground piping at dispatch station and at receipt stations, Sectionalizing Valve (SV) stations and tap-off / hook-up piping.
 - Dewatering of the pipeline.
 - Flushing and dry air blowing of underground & above ground piping at dispatch and receipt stations, SV stations and tap-off/ hook-up point.
 - Swabbing of pipeline.
 - Preparation of detailed commissioning procedures
- ii) Commissioning activities consisting of Drying, Inertisation, Gas-in/ Commissioning, stabilization and 72 hours run of all the pipe lines and facilities mentioned in (i).

Bidder, along with his bid documents, is required to submit the following:

- Execution plan and method statement for pre-commissioning and commissioning activities.
- Past experience of pre-commissioning and commissioning activities carried out for a similar pipeline system / network.
- Plan to engage an agency / subcontractor for these activities (if envisaged).
- Organization charts of bidder's proposed pre-commissioning and commissioning team indicating the positions with the required qualifications and experience.
- Bio datas of Key personnel comprising the commissioning team along with their contact nos. In case the member of commissioning team as mentioned in the offer is not available at the actual time of commissioning then the contractor shall ensure a replacement with equivalent qualification & experience. The format of bio data is enclosed as **Annexure-I**.
- Clause wise list of deviations, if any, from this technical specification. In the absence of this, it shall be considered that the bidder has no deviation.
- Questionnaire as given in **Annexure-II**.

2.0 RESPONSIBILITY OF CONTRACTOR

The contractor shall be responsible for all the pre-commissioning and commissioning activities that need to be carried out for the pipeline system.

2.1 Pre-commissioning

In order to execute and perform pre-commissioning activities, the contractor shall be responsible for (but not limited to):

- Carrying out pre-commissioning checks of the underground pipeline system including above ground piping at dispatch station and at receipt stations, Sectionalizing Valve (SV) stations and tap-off / hook-up piping.
- Dewatering of the pipeline.
- Flushing and dry air blowing of underground & above ground piping at dispatch and receipt stations, SV stations and hook-up point.
- Swabbing of pipeline.
- Low pressure leak check (with air) for the aboveground section of the pipelines.
- Supply and supervision of manpower for pre-commissioning.
- Supply and operation of machinery & equipment for pre-commissioning.
- Supply and use of materials and consumables as required for the pre-commissioning activities.
- Design and supply all temporary line connections, pig launcher/receiver, valves, instruments, manpower etc. as required during various operations.
- Preparation of detailed pre-commissioning procedures, activity schedules, bar charts, schemes etc. This shall include preparation of detailed procedures for dewatering, flushing, swabbing and low pressure leak check and shall address the sequence and methodology describing all operations, data on materials, equipment, instruments, consumables, communication systems, necessary calculations, detailed time schedule and organization chart.
- All necessary work to perform the job successfully including all modifications that would be required.

The contractor shall demonstrate to the COMPANY (for COMPANY's approval) the successful completion of all of the above-mentioned activities.

In the event of any detail, which is not fully addressed, contractor should warrant that work shall be performed in accordance with the relevant codes, Company's specifications and the best recognized Engineering guidelines and practices being followed in the on-shore pipeline industry.

2.2 Drying, Inertisation, Gas-in / Commissioning, stabilization and 72 hours run

In order to execute and perform commissioning related activities, the contractor shall be responsible for (but not limited to):

- Drying of the underground pipeline and above ground piping system at dispatch and receipt stations, above ground piping system at SV stations and hook-up / tap-off points to a water dew point of -8°C at atmospheric pressure, and maintain this dew point in the pipeline, till inertisation and gas-in activities commence.
- Commissioning checks including Safety review prior to start of commissioning activities to achieve 'Ready for commissioning' status for underground pipeline and above ground piping system at dispatch and receipt stations, above ground piping system at SV stations and hook-up / tap-off points.
- Inertisation of the pipeline system including above ground piping system at dispatch and receipt stations, above ground piping system at SV stations and hook-up / tap-off points.
- Gas-in activities including pressurization, carrying out high pressure leak checks and establishment of flows in the pipeline system including above ground piping at dispatch and receipt stations, SV stations, IP station and hook-up points.
- Stabilization and 72 hours run of the pipeline system.
- Supply and supervision of manpower for commissioning.
- Supply and operation of machinery & equipment for commissioning.
- Supply and use of materials and consumables as required for the commissioning activities.
- Design and supply all temporary line connections, pig launcher/receiver, valves, instruments, manpower etc. as required during various operations.
- Preparation of detailed commissioning procedures, activity schedules, bar charts, schemes etc. This shall include preparation of detailed procedures for drying, inertisation, gas-in / commissioning operations, high pressure leak check operations, pressurization, establishing flows and 72 hours run of the pipeline system, and shall address the sequence and methodology describing all operations, data on materials, equipment, instruments, consumables, communication systems, necessary calculations, detailed time schedule and organization chart.
- Ensuring all communication facilities are in place and in proper working condition prior to start of commissioning activities of the pipeline system.
- All necessary work to perform the job successfully including all modifications that

would be required.

The contractor shall demonstrate to the COMPANY (for COMPANY's approval) the successful completion of all of the above-mentioned activities.

In the event of any detail, which is not fully addressed, contractor should warrant that work shall be performed in accordance with the relevant codes, Company's specifications and the best recognized Engineering guidelines and practices being followed in the on-shore pipeline industry.

2.3 Mechanical Completion

Mechanical Completion of system shall mean completion of underground / aboveground pipeline system and station work including pre-commissioning along with ECP of U/G pipeline and make the system ready to start commissioning activities.

3.0 SCOPE OF WORK

The work to be performed by the Contractor as part of the pre-commissioning activities for the facilities outlined in paragraphs (i) of Section-1.0 above and commissioning related activities for the facilities outlined in paragraphs (ii) of Section-1.0 above shall consist of the following:

3.1 Pre-commissioning activities

3.1.1 Pre-commissioning checks

Pre-commissioning checks shall be carried out for the pipeline system to ascertain that the pipeline system has been mechanically completed in all respects. These checks shall cover the pipelines including distribution network system, dispatch and receipt stations, I.P. stations, sectionalizing valve stations and the hook up points. The pre-commissioning checks shall include the following:

A) System Checks

The entire facilities shall be checked against the latest P&ID's, Engineering and Vendor drawings / documents and other design specifications. Any shortcomings observed shall be listed down in the form of punch lists and duly attended.

B) Checking of Field Instruments

All the field instruments like actuated valves, control valves, shutdown valves, transmitters, solenoid valves, shut down switches, alarms etc. shall be checked physically and also for their intended application by simulating the operating condition. It will also include checking of Different meters, gauges, action of

actuated valves, control valves, shutdown valves etc.

C) Survey of the Pipelines

This shall be performed to confirm that proper fittings/supports, cathodic protection system, route markers, warning signs, fencing around SV stations, crash barriers etc. have been installed along the pipeline.

D) Checking of Communication System

This is to check that there is proper communication with adequate back up power to ensure uninterrupted communication.

E) Checking of Electrical Distribution System

This is to ensure safety and also to ensure an uninterrupted power supply during startup and normal pipeline operation.

F) Checking of Instruments, Controls & Interlocks

This is to check that instrument controls and interlocks are functional as per the normal operating conditions.

G) Checking of Utilities

This is to check that utilities like power, nitrogen, UPS system, instrument air, etc. are available prior to start-up.

H) Any other checks as may be considered necessary.

3.1.2 Dewatering

3.1.2.1 General

Dewatering of a pipeline section shall be done subsequent to the hydro-test of the respective pipeline section. During the dewatering operation, the major quantity of hydro-test water shall be removed from the pipelines and distribution network. It is the responsibility of the contractor to develop suitable dewatering procedure and submit the same for Company's approval.

The disposal of the water shall be performed such that no harm is done to the environment and the Dewatering procedure should indicate this disposal methodology.

3.1.2.2 Operational requirements

The dewatering operation for the pipelines shall consist of a number of dewatering pig runs and dry air shall be used as propellant for pig trains.

Cup pigs shall be used and will be suitable for traversing the entire length of the pipelines / pipe segments being dewatered. Contractor shall ensure that all the pigs are designed to prevent damage to the pipeline's internal coating (if any).

The contractor shall propose the minimum speed and the backpressure of the pigs in order that continuous operation will be performed without the pig getting stuck. Contractor shall submit all the calculations regarding this procedure and a contingency plan for implementation in case the pigs get stuck.

Contractor shall provide a suitable compressor for oil-free air with sufficient capacity and pressure.

Upon arrival of the pigs at the receiving end, the Contractor in the presence of Company's representative shall remove the pigs without delay.

3.1.2.3 Flushing of aboveground piping

Flushing of above ground piping at dispatch and receipt stations, SV stations and hook-up / tap-off points shall be done with water to remove debris from within the piping and then with dry air to remove the residual amount of water from the aboveground piping.

3.1.2.4 Acceptance criteria

Before proceeding to the next stage of operations, Contractor shall ensure that bulk of the water has been removed from the pipeline system. Contractor shall specify when the dewatering phase (for the underground pipeline) and flushing and dry air blowing (for above ground piping) is finished and shall obtain approval of the company before proceeding to the next phase.

3.1.3 Swabbing

3.1.3.1 General

The swabbing operation, which shall be done subsequent to the dewatering operation, is meant to reduce the remaining water in the pipeline to acceptable condition and to ensure removal of free water left inside the pipeline prior to final drying, Inertisation and commissioning of the Pipeline system. This is done by driving number of foam pigs propelled by oil free compressed dry air, which can pick up free water in the pipeline. Hence for swabbing, air compressors of required capacity, after-coolers and dryers should be deployed by the contractor.

Contractor may suggest alternate methodology for Swabbing operation. The swabbing

activity is precursor for drying of the pipeline and is basically to reduce duration of drying.

The contractor shall submit the detailed procedure and the duration of the swabbing operation and obtain approval of the company before starting the operation.

3.1.3.2 Acceptance criteria

The Contractor shall ensure that swabbing operation is considered to be completed when it is considered that there is no free water left in the pipeline. This shall be subject to Company's approval.

3.1.4 Safety review prior to start of commissioning activities

A pre-startup safety review of the pipeline system including the underground pipeline and the above ground piping at dispatch and receipt stations, SV stations and hook-up / tap-off points shall be carried out by the Contractor before permitting entry of natural gas into the new pipeline facility. Company / Company's representative shall also participate in the pre-startup safety review.

3.2 Commissioning related activities

3.2.1 Drying

Before charging the line with gas, the contractor may propose to dry the pipeline either by super drying or vacuum drying or any other suitable technique as approved by Engineer-in-charge (EIC). Following specifications shall govern the drying procedures and shall be submitted for approval of the EIC.

3.2.1.1 Vacuum Drying

a) General

The contractor shall dry the underground pipeline and the above ground piping at dispatch and receipt stations, SV stations and hook-up / tap-off points with vacuum drying technique prior to charging natural gas.

Water vapour shall be evacuated from the pipeline by vacuum units alone or in combination with dry air or dry nitrogen vacuum purging as specified in the scope of work. The final dew point temp. of the dry pipeline shall be -8°C , which is equivalent to a pressure of 3 mbar (absolute), unless otherwise specified in the scope of work.

Vacuum drying should consist of the following stages:

- pre-drying checks;
- one or more leak tests;
- pump-down;
- evaporation/evacuation, including vacuum purging(if applicable);
- soak test/acceptance test;

The size of the vacuum units should be sufficient to reduce the pressure in the pipeline to the vaporisation pressure during pump-down within typically 12 h to 36 h of commencement of the pump-down operation, depending on the length and diameter of the pipeline. Vacuum units having excessive capacity would draw down the pressure too rapidly, which could cause localised ice formation.

The Contractor shall prepare a theoretical pressure/ time graph each of the drying phases and submit it along with detailed work procedure for approval of PMC/CLIENT.

b) Pre-drying checks

Before commencement of vacuum drying the Contractor shall verify that:

- The pipeline has been isolated from other pipelines and piping by closing valves at the battery limit. As a precaution against possible “air-in” leaks through the battery limit valves, all valves immediately adjacent to the battery limit valves shall also be closed wherever possible;
- All pressure safety valves, actuator tappings etc. shall be isolated by closing the respective valves;
- All vent drain, utility connections, tapping valves shall be closed and ends shall be blind flanged;
- The blow down piping (if any) shall also be isolated by closing the respective valves;
- The bypass piping across the mainline valves at SV stations shall be isolated by closing all the by-pass valves;
- valves are designed for vacuum drying and have been placed in to the half open position;
- valve body bleeder parts are vacuum tight;
- Temporary connections, pig trap valves and pig trap end closure seals are able to withstand the prevailing vacuum pressure. If this is not the case, Contractor shall provide adequate seals for the vacuum drying operation and replace these seals by the permanent seals once the vacuum drying operation has been completed.

c) Leak tests

I. Low pressure leak check of aboveground station piping

The above ground station piping including all instrument impulse tubing shall be pressurised with air to a minimum pressure of 6 kg/cm². All flanged threaded and tubing joints shall be checked for leaks by soap solution.

II. Leak test of pipeline

The piping connecting the vacuum unit with the pipeline, including pig trap(s) and vacuum unit(s), shall be isolated from the pipeline and the pressure in the isolated

piping lowered to slightly above the theoretical evaporation pressure.

The vacuum unit shall be switched off and the isolated piping checked for leaks by soap solution. Leaks shall be cured by flange tightening etc.

The pipeline shall then be opened to the vacuum unit(s) and the pressure in the entire system reduced to a pressure of 50 mbar (abs) to 100 mbar (abs) for the final leak test. The pressure shall be maintained at this level and all other piping, such as at the pig trap system at the other end of the pipeline if vacuum drying is carried out from one end only, shall be checked for leaks. Leaks shall be cured as stated above.

After all leaks have been cured, where possible, the vacuum unit shall be turned off and isolated from the pipeline and the pressure in the pipeline and the associated pipework monitored for at least 1 hr. Pressure increases shall be recorded and plotted on a pressure/time chart. From the measured pressure increase, the total leak rate shall be calculated. Curing of leaks shall be continued until the calculated total leak rate is less than 10 % of evacuation capacity of the vacuum units at the initial leak test pressure. The final in-leak rate shall be recorded for use when analysing the final soak test results

d) Pump-down/ pull down

The pressure in the pipeline shall then be reduced at a steady rate to a vacuum level of 40-50 torr (53- 67 mbar). Alternatively the contractor may reduce the pressure in the pipeline further to a level where the ambient temperature of the pipeline will cause the free water to boil and then eventually to evaporate. The approximate pressure value is calculated in advance but it is easily recognized at site by a fall in the rate of pressure reduction, which is noted from the plot of pressure against time.

A significantly shorter pump down time than that theoretically predicted could indicate freezing and shall be evaluated immediately. The pressure shall be kept at this level, and pig traps and piping inspected for vacuum tightness and any leaks cured.

e) Evaporation/ evacuation

As the pressure in the pipeline approaches the saturated vapour pressure at the pipeline's ambient temperature, the rate of vapour evolution will increase, resulting in a reduction in the rate of pressure decrease. During this phase, the pressure will remain at more or less constant level until all the free water has been converted into water vapour. The vaporisation pressure shall be maintained and water vapour evacuated by pumping until all residual water has evaporated. Once all the free water has evaporated from the pipeline, the rate of pressure decrease will increase.

Ice formation in the pipeline and associated fittings shall be avoided by control of the evacuation rate through the vacuum units. A vaporisation pressure plateau at a level markedly lower than expected or erratic pressure fluctuations during plateau are indications of ice formation.

Vaporisation and evacuation by pumping shall continue until the vapour pressure has reached the level that is equivalent to the dew point specified for the dry pipeline. This pressure shall be maintained for at least 3 hrs to confirm that a stable balanced vacuum pressure is established throughout the pipeline. Evacuation shall then be stopped and a soak test carried out.

Vacuum purging with dry air or nitrogen at pressures in the range of 4 mbar (abs) to 10 mbar (abs) may be applied in addition to evacuation by pumping to reduce the time needed for conventional evaporation and water vapour evacuation. The rates and pressures are dependent on the performance curves of the vacuum equipment, as the aim is to increase the pressure in the pipeline to an efficient volume transfer level. If applied, purging and evacuation shall continue until the dew point at the vacuum unit is constantly below the dew point for a dry pipeline as specified in the scope of work while replacing at least twice the contents of the pipeline. Purging shall then be stopped, and the pressure reduced to 3 mbar (abs) and maintained at this level for at least 3 hrs to achieve stable conditions in the pipeline. A soak test shall then be performed.

f) Soak test/acceptance test

Soak test is carried out to ensure that all free water has been evaporated. All the equipment other than that required for pressure monitoring shall be temporarily isolated from pipeline for a period of at least 12 hrs and pressure is monitored at an interval of 1 hr.

Pressure monitoring shall be carried out by means of pressure gauges and recorders with range 0 mbar to 10 mbar, a reading division of 0.1 mbar and an accuracy of $\pm 1\%$ of the measured value.

Initially the pressure will rise as the higher pressure in the centre of the pipeline (or at the opposite end if a single vacuum plant is in operation) balances with that nearest to the vacuum plant. After this initial stabilisation, which should occur well below the evaporation plateau, the test shall be acceptable if the pressure remains more or less constant ($\pm 5\%$ variation is acceptable) at 3 mbar. If this is not the case, the observed pressure increases must be due to further flashing-off of moisture vapour, indicating that additional drying is required.

3.2.2.2 Super drying

a) General

The pipeline shall be dried using super dry air or nitrogen. The contractor shall submit work procedure for super drying in line with the scope of work to Engineer-in-charge for approval prior to start of any activity.

The super drying operation shall follow within 48 hrs of swabbing. In case super

drying of the pipeline does not start within 48 hrs of completion of swabbing, then the swabbing shall be repeated again.

The drying medium to be used shall be as specified in the scope of work or as per the directions of Engineer-in-charge. Dry air or nitrogen drying shall be executed consecutively in the following phases:

- pigging;
- purging for drying; and
- Purging for acceptance testing.

The basis of this technique is to run a series of light weight foam pigs through the pipeline with super dry air or dry nitrogen. The pigs initially absorb large quantities of water and ensure that water in the pipeline is continually spread out in a thin film, thus facilitating evaporation into the dry air system. Where permanent pig- launcher and receivers are not available temporary traps must be connected to the line and the drying unit may then be connected to the pig launcher by flexible hoses of appropriate rating.

The sizing of the drying equipment and calculations of the time required for drying shall be based on a film thickness of the residual water of not less than 0.1 mm for internally uncoated pipes and not less than 0.05 mm for internally coated pipes. Air introduced into the pipeline during dry air drying shall have a dew point of at least 15 °C below the final dew point (-8°C) of the pipeline.

Nitrogen used during drying shall have a minimum dew point of -50 °C at atmospheric pressure.

b) Pigging

The pipeline shall be pigged with high sealing disc pigs driven by dry air or nitrogen in combination with water absorbing foam pigs having a large water absorption capacity (approximately 80 % of their body mass), high abrasion resistance and a density between 30 to 50 kg/m³ as follows:

- the travelling speed of the foam pigs should not exceed 1.2 m/s;
- a back-pressure of at least 0.5 bar shall be maintained at the receiving end; and
- pigs in a pig train should be separated by at least 300 meters

Pigging shall continue until the dew point of the drying medium at the receiving end remains below the dew point specified in the scope of work and does not fluctuate by more than 3°C whilst replacing the content of the line by a pig.

c) Purging For Drying

After pigging, the pipeline should be purged with the drying medium with a minimum velocity of 3 m/s in the pipeline at the discharge end. Purging shall continue until the dew point at the discharge end remains below the specified dew

point whilst replacing twice the content of the pipeline at purging pressure.

d) Purging For Acceptance Testing

The difficulty in defining the acceptance criterion is that the dew point sampling at each end of the pipeline does not necessarily represent the actual dew point condition prevailing within the whole pipeline. This is because the dry air (or nitrogen) entering the pipeline performs extensive drying at the start of the pipeline and then becomes saturated. As the pressure falls off towards the end of the pipeline, the air (or nitrogen) is again able to absorb moisture. Thus the situation can arise where the beginning and the end of a pipeline are dry but the middle may still be wet, or at a higher dew point than the ends. It can be checked that the acceptance criterion has been met by means of the following procedure.

Upon completion of purging, the pipeline shall be blocked-in for a period of at least 12 hrs and at a pressure of 0.5 bar above the ambient pressure at all points along the pipeline. After this period the pipeline content shall be replaced at the lowest possible pressure and the dew point continuously measured at the discharge end.

Drying is complete when the dew point during acceptance purging remains below the final dew point (-8°C) specified for the pipeline whilst replacing the line content. Purging for drying shall recommence and the acceptance test shall be repeated until this requirement has been met.

Upon completion of the drying, the pipeline shall be blocked in at a pressure of 0.5 bar above the ambient pressure at any point along the pipeline.

e) Preservation after Drying

The Contractor shall increase the pressure in the pipeline with either dry air or dry nitrogen.

The requirements for preservation are as follows:

- the final pipeline pressure to be achieved at the end of the filling operation shall be 0.5 bar above the ambient pressure at any point along the pipeline, plus a margin allowing for the maximum possible ambient temperature fluctuation during the post pre-commissioning period;
- The dew point, pressure and temperature of the medium introduced into the pipeline shall be measured and recorded constantly at the inlet of the pipeline throughout the filling operation;
- Warning signs, in English and the local or working languages, such as "PIPELINE FILLED WITH NITROGEN" or "PIPELINE FILLED WITH DRY AIR" shall be provided and placed at block valve stations and pig trap systems.

3.2.2 Low Pressure leak check for aboveground piping

3.2.2.1 General

The aboveground piping sections of the pipeline system shall be checked for leaks at flange points of piping and equipment, instrument impulse tubing points etc. This shall be done by pressurizing the system piping / equipment with dry compressed air (for this purpose, oil free air compressors shall be used) and testing the system by means of soap solution for leaks.

The contractor shall submit the detailed procedure and the duration of the leak check operations and obtain approval of the company before starting the operation.

3.2.2.2 Acceptance criteria

The leak check operation shall be considered to be completed when the piping system / equipment is free of leaks when tested at a pressure of 6.0 Kg/cm² g. This shall be subject to Company's approval.

3.2.3 Ready for Commissioning

After completion of drying activities and safety review prior to startup, Contractor shall notify the Company that the systems associated with the pipeline system including the underground pipeline and the above ground piping at dispatch and receipt stations, SV stations and hook-up / tap-of points are ready for gas-in/commissioning. 'Ready for commissioning status' shall be jointly reviewed by Company and Contractor and final clearance for start-up shall be given by the Company. After such joint assessment, if all the criteria are met, it will then be declared that the pipeline system has reached a stage of 'Ready for Commissioning'.

3.2.4 Inertisation**3.2.4.1 General**

Contractor shall carry out inertisation of the entire pipeline system including the underground pipeline and the above ground piping at dispatch and receipt stations, SV stations and hook-up / tap-off points).

3.2.4.2 Operational requirements

During the Inertisation operation, the air left in the pipelines shall be replaced by nitrogen before admitting the natural gas into the pipeline for safe commissioning. The pipeline shall be inertized under vacuum condition after drying is achieved. For this, introduce nitrogen from one end of the pipeline maintaining vacuum from other end of the pipeline. After inertisation, gas charging shall be done into the pipeline.

For above ground piping at dispatch and receipt stations, SV stations and hook-up / tap-

of points, the piping shall be purged with nitrogen till the residual oxygen content in the piping is below 1% (vol/vol).

Nitrogen required for Inertisation purpose of the pipeline and aboveground piping shall be supplied by the contractor and should be of purity level 99.9% or above. Nitrogen gas at ambient temperatures (AND NOT LIQUID NITROGEN) and in completely vaporized and gaseous state shall be used as the inertising medium. In case the source of gaseous nitrogen is from liquid nitrogen tankers, then all precautions (including verification of the lowest tolerable temperature of all components in the system under commissioning) should be ensured.

The contractor shall submit the detailed procedure (in line with the above suggested method or any other acceptable one) and the duration of the inertisation operation and obtain approval of the company before starting the operation. Inertisation shall be followed immediately by charging of pipeline by natural gas.

3.2.4.3 Acceptance Criteria

Inertisation of the pipelines may be accepted to be complete when the required quantity of nitrogen has been introduced into the pipeline. The contractor has to ensure this condition for safe commissioning of the pipeline. For above ground piping at dispatch and receipt stations, SV stations and hook-up / tap-of points, the inertisation may be accepted to be complete when the residual oxygen content in the piping is below 1% (vol/vol).

3.2.5 Gas-in/Commissioning and Stabilization

3.2.5.1 General

Contractor shall carry out gas-in and commissioning activities of the entire pipeline system including the underground pipeline and the above ground piping at dispatch and receipt stations, SV stations and hook-up / tap-of points.

3.2.5.2 Operational requirements

During introduction of natural gas into the pipeline, natural gas shall be the motive fluid for driving the last pig of the nitrogen slug train. The pig train speed shall be maintained at 3 to 4 Km/hr. Maintenance of proper backpressure shall control pig train speed. Venting shall be controlled at the pig-receiving end to achieve the desired dynamics. In this fashion, slowly the desired portion of the pipeline shall be commissioned. Alternatively contractor may propose procedure for introduction of gas in pipeline under vacuum condition after inertisation with Nitrogen.

Subsequently, the pipeline system shall be slowly pressurized upto its operating

conditions and high pressure leak checks of the pipeline system at flange points, instrument points etc. shall be carried out with soap solution at regular intervals during the course of pressurization of the pipeline system. Once the pipeline system is pressurized at its operating conditions, normal gas flows shall be established in the pipeline system.

The contractor shall submit the detailed procedure (in line with the above suggested method or any other acceptable one) and the duration of the commissioning operation and obtain approval of the company before starting the operation.

Commissioning shall also include establishing the process control parameters first at turn down & then at design value stipulated in the process package along with supplementary instructions, if any, from Company / Company's Representative.

3.2.5.3 Acceptance Criteria

The system shall be considered to be commissioned successfully when the pipeline system including the underground pipeline and the above ground piping at dispatch and receipt stations, SV stations and hook-up / tap-of points is charged with natural gas, is free of leaks and run successfully at stable operating conditions with instrumentation / control systems process utilities and support systems taken on line for a minimum period of 72 hours.

The commissioning of pipeline system shall include commissioning of branch lines and associated facilities including auxiliary facilities and aboveground piping.

4.0 DOCUMENTATION

Contractor shall submit for approval of the Company, the complete description, detailed procedures and time schedule for all of the following activities:

- Pre-commissioning checks
- Dewatering
- Flushing
- Swabbing
- Drying
- Low pressure leak check of aboveground piping system with dry compressed air
- Inertisation
- Gas in and commissioning activities (including pressurization of pipeline system, high pressure leak check, establishment of flows and 72 hours run).

All these documents should be prepared covering all aspects of HSE, quality assurance and quality control plans.

Contractor shall ensure that his documents are related to “as-built” conditions of the pipeline and structure involved.

Documents shall also contain all safety plans, procedures, to be followed while carrying out the activities.

Upon successful completion of the work, contractor shall prepare a final report of the work which shall include necessary charts, diagrams, graphs, calculations, recordings, daily logs, measurements, details of the operation, etc. Report shall also include all certificates of calibration of instruments required, together with records of calibration performed at site prior to the start of any operation and the approved pre-commissioning and commissioning formats and check sheets.

5.0 SPARES AND CONSUMABLES

Contractor shall identify and arrange for supply of manpower, spares, tools, tackles and consumables as required for pre-commissioning and commissioning activities.

6.0 SAFETY

Contractor shall follow the safety practices during execution of pre-commissioning and Commissioning works as detailed in the scope of work. He shall also maintain and follow all safety practices equivalent or better than those being practiced by the industry during pre-commissioning and commissioning activities.

ANNEXURE - I

FORMAT FOR BIODATA OF KEY PERSONNEL FOR COMMISSIONING

1. PROPOSED POSITION IN ORGANISATION CHART:
2. NAME:
3. QUALIFICATION:
4. TOTAL YEARS OF EXPERIENCE IN PLANT OPERATION / COMMISSIONING:
5. DETAILS OF COMMISSIONING EXPERIENCE:

SL NO.	PROJECT DESCRIPTION	PLANT CAPACITY	LICENSOR	OWNER	YEAR OF COMMISS.	DURATION OF STAY AT SITE

ANNEXURE - II**QUESTIONNAIRE**

CLAUSE NO.	DESCRIPTION OF CLAUSE	AGREED	NOT AGREED	REMARKS
1.0	SCOPE	[]	[]	
2.0	DEFINITIONS	[]	[]	
3.0	MANUFACTURER REPRESENTATIVE	[]	[]	
4.0	DOCUMENT FOR PRECOMMISSIONING AND COMMISSIONING	[]	[]	
5.0	OTHER REQUIREMENTS	[]	[]	
6.0	REVIEW/CHECKLISTING/INSPECTION/CO-ORDINATION	[]	[]	
7.0	COMMISSIONING	[]	[]	
8.0	CONSUMABLES	[]	[]	
9.0	SPECIAL REQUIREMENTS	[]	[]	
10.0	SAFETY	[]	[]	

NOTE:

- 1) PLEASE TICK THE RELEVANT BOX.
- 2) MENTION THE REASON & THE SUB-CLAUSE NOT AGREED IN THE REMARKS COLUMN.

ANNEXURE-III

FORMAT TO BE USED DURING PRE-COMMISSIONING AND COMMISSIONING

(TOTAL 5 FORMATS)

FORMAT - I

INTIMATION REGARDING SYSTEM COMPLETION

PROJECT:_____ CUSTOMER:_____ UNIT:_____

Following system/sub-system has been mechanically completed in all respects with exceptions noted below. The system/sub-system can be taken up for checking and preparation of checklist.

SYSTEM NO.

SYSTEM DESCRIPTION:

EXCEPTIONS:

SIGNATURE

DATE

CONTRACTOR'S CONSTRUCTION:

CO-ORDINATOR

The system is ready/ not ready for Check listing

OWNER/ PMC:

BRIDGE AND ROOF
CO. (I) LTD.

**TECHNICAL SPECIFICATION FOR
PRE-COMMISSIONING AND COMMISSIONING**

TS NO.: BR/TS/048



Page 21 of 24

FORMAT - II

CHECKLIST

PROJECT:_____CUSTOMER:_____UNIT:_____

SYSTEM/SUB-SYSTEM_____

CHECKLIST TYPE

PRELIMINARY/FINAL

SL.NO.

CHECKLIST ITEMS

REMARKS

SIGNATURE

DATE

PMC :

OWNER:

F O R M A T - III

READY FOR PRE-COMMISSIONING CERTIFICATE

PROJECT:_____CUSTOMER:_____UNIT:_____

SYSTEM/SUB-SYSTEM_____

This is to certify that the following Plant/system/sub- system as detailed below is completely installed and all the Checklist points are carried out except for minor details as given in the attached list.

DESCRIPTION ON PLANT/SECTION/SUB-SECTION_____

SIGNATURE

DATE

CONTRACTOR'S CONSTRUCTION
CO-ORDINATOR:

CONTRACTOR'S COMMISSIONING
CO-ORDINATOR

The system is ready/ not ready for pre-commissioning

PMC :
OWNER:

FORMAT - IV

READY FOR COMMISSIONING CERTIFICATE

PROJECT:_____CUSTOMER:_____UNIT:_____

SYSTEM/SUB-SYSTEM_____

This is to certify that all the necessary pre-commissioning activities for the system/sub-system as detailed below have been completed and the system/sub-system is ready for commissioning except for the minor details as given below which will not effect the commissioning trial runs.

DESCRIPTION OF SYSTEM/SUB-SYSTEM_____

SIGNATURE

DATE

CONTRACTOR'S COMMISSIONING:

CO-ORDINATOR SIGNATURE DATE

PMC: OWNER:

F O R M A T - V

COMPLETION OF COMMISSIONING CERTIFICATE

PROJECT:_____CUSTOMER:_____UNIT:_____

SYSTEM/SUB-SYSTEM_____

This is to certify that the system/sub-system as detailed below has been successfully commissioned and is under operational control of Client's Production department. The minor items, which will not effect the normal operation of the system/sub-system, are given in the attached list.

DESCRIPTION OF SYSTEM/SUB-SYSTEM_____

SIGNATURE

DATE

CONTRACTOR'S COMMISSIONING:
CO-ORDINATOR

SIGNATURE

DATE

PMC: OWNER:

FORMAT - V

COMPLETION OF COMMISSIONING CERTIFICATE

PROJECT:_____CUSTOMER:_____UNIT:_____

SYSTEM/SUB-SYSTEM_____

This is to certify that the system/sub-system as detailed below has been successfully commissioned and is under operational control of Client's Production department. The minor items, which will not effect the normal operation of the system/sub-system, are given in the attached list.

DESCRIPTION OF SYSTEM/SUB-SYSTEM_____

SIGNATURE

DATE

CONTRACTOR'S COMMISSIONING:
CO-ORDINATOR

SIGNATURE

DATE


PMC: OWNER:

**SPECIFICATION
FOR
HEALTH, SAFETY
AND
ENVIRONMENT (HSE)
MANAGEMENT**

SPECIFICATION NO.: BR/TS/049



**(OIL & GAS)
BRIDGE & ROOF CO. (I) LTD.**


BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97 < B=75@GD97 = 75H-CB "		
	C=@/ ; 5G		
TITLE	< 95@Hk žG5: 9HM5B8 9BJ =F CBA 9BHfk G9L A 5B5; 9A 9BH	DOCUMENT NO. BR/TS/049	Page 1 of 1
			REVISION : 0
			EDITION : 1

C O N T E N T S

SL. NO. DESCRIPTION

- | | |
|-----|---|
| 1.0 | SCOPE |
| 2.0 | REFERENCES |
| 3.0 | REQUIREMENT OF HEALTH, SAFETY & ENVIRONMENT (HSE) MANAGEMENT SYSTEM TO BE COMPLETED BY BIDDERS. |
| 4.0 | DETAILS OF HSE MANAGEMENT SYSTEM BY CONTRACTOR |
| 5.0 | RECORDS |
| | ANNEXURE-A |
| | ANNEXURE-B |
| | ANNEXURE-C |
| | ANNEXURE-D |
| | ANNEXURE-E |

PREPARED BY:	CHECKED BY:	APPROVED BY:	ISSUE DATE :
(SSM)	(SK)	(ST)	JULY. 2024

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	< 95@H<ZG5: 9HM5B8' 9BJ =F CBA 9BHfk G9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 1 of 59
			REVISION : 0
			EDITION : 1

1.0 SCOPE _____

This specification establishes the Healthy, Safety and Environment (HSE) management requirement to be complied with by the Contractors during construction.

This specification is not intended to replace the necessary professional judgement needed to design & implement an effective HSE system for construction activities and the contractor is expected to exceed requirements given in this specification.

Requirement stipulated in this specification shall supplement the requirement of HSE management given in relevant Act(S)/ legislations. General Condition of Contract (GCC) Special Condition of Contract (SCC) and Job Specifications. Where different documents stipulate different requirements, the most stringent shall be adopted.

2.0 REFERENCES

This document should be read in conjunction with following:

- General Conditions of Contract (GCC)
- Special Conditions of Contract (SCC)
- Building and other construction workers (regulation of employment and condition of service) Act, 1996
- Job Specifications
- Relevant IS Codes (refer Annexure-A)
- Reporting Formats (refer Annexure-B)
- Statutory requirements

3.0 REQUIREMENT OF HEALTH, SAFETY & ENVIRONMENT (HSE) MANAGEMENT SYSTEM TO BE COMPLETED BY BIDDERS.

3.1 Management Responsibility

3.1.1 The Contract should have a document HSE policy to cover commitment of the organization to ensure health, safety and environment aspects in their line of operations .


3.1.2 The HSE management system of the Contractor shall cover HSE requirement including but not limited to what specified under clause 1.0 & 2.0 mentioned above

3.1.3 Contractor shall be fully responsible for planning and implementing HSE requirement to the satisfaction of the company. Contractor as a minimum requirement shall designate/deploy the following to co-ordinate the above:

No. Of workers deployed

Up to 250

- Designate one safety supervisor who will guide the workers from time to time, as well as impart training basic guidelines at least weekly once.


BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB ''		
	C=@/ ' ; 5G''		
TITLE	< 95@H-k žG5: 9HM5B8 ' 9BJ =F CBA 9BHfkG9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 2 of 59
			REVISION : 0
			EDITION : 1

- Above 250 & upto 500 - Deploy one qualified and experienced safety Engineer/ Officer who will guide the workers from time to time as well as impart basic guideline & training at least weekly once. He / She shall possess a recognized Degree in any branch of engineering or technology or architecture and had a post qualification construction experience of minimum two years or possess a recognized Diploma in any branch of engineering or technology or Graduate in Science stream and had a post qualification construction experience of minimum five years.
- Above 500
(for every 500 or less) - One additional safety engineer/Officer whose function will be as mentioned above

Contractor shall identify and hold harmless OWNER/ CONSULTANT & their representative's from any and all liabilities arising out of non fulfillment of HSE requirements.

Above is the minimum requirement and the Contractor shall ensure physical presence of a safety personnel at each place where Hot work permit is required. No work shall be started at site until above safety personnel are physically present at site. The contractor shall submit a safety organogram clearly indicating the lines of responsibility and reporting system. He shall furnish Bio- Data/Resume/Curriculum Vitae of the safety personnel he intends to mobilize, at least 1 month before the intended mobilization, for CONSULTANT/Owner's approval.

- 3.1.4 The Contractor shall ensure that the Health, Safety and Environment (HSE) requirements are clearly understood & faithfully implemented at all levels, at each and every site/ work place.
- 3.1.5 The Contractor shall promote and develop consciousness for Health, Safety and Environment among all personnel working for the Contractor. Regular awareness programs and fabrication shop/work site meeting shall be arranged on HSE activities to cover hazards involved in various operations during construction.
- 3.1.6 Arrange suitable first aid measures such as First Aid Box , trained personnel to give First Aid, Stand by Ambulance or Vehicle and install fire protection measures such as: adequate number of steel buckets with sand and water and adequate fire extinguishers to the satisfaction of OWNER/ CONSULTANT. In case the number of workers exceeds 500, the Contractor shall position an ambulance /vehicle on full time basis very close to the worksite.
- 3.1.7 The Contractor shall evolve a comprehensive planned and documented system for implementation and monitoring of the HSE requirements. This shall be submitted to

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB		
	C=@/ ; 5G		
TITLE	< 95@H < ZG5: 9HM5B8 9BJ =F CBA 9BHfk G9L A 5B5; 9A 9BH	DOCUMENT NO. BR/TS/049	Page 3 of 59
			REVISION : 0
			EDITION : 1

OWNER & CONSULTANT for approval well in advance, prior to start of work. The monitoring for implementation shall be done by regular inspection and compliance to the observations thereof. The Contractor shall get similar HSE requirements implemented at his sub-contractor (s) work site/ Office. However, compliance of HSE requirement shall be the sole responsibility of the Contractor. Any review/ approval by OWNER/ CONSULTANT shall not absolve the Contractor of his responsibility/ liability in relation to all HSE requirements.

3.1.8 Non-Conformance on HSE by the Contractor (including his Sub-contractors) as brought out during review/ audit by CONSULTANT/ OWNER representative shall be resolved forth with by Contractor. Compliance report shall be possibility submitted to CONSULTANT/ OWNER at the earliest.

3.1.9 The Contractor shall ensure participation of his Resident Engineer/Site-in-Charge in the Safety Committee/HSE Committee meetings arranged by OWNER/ CONSULTANT. The compliance of any observation shall be arranged urgently. Contractor shall assist OWNER/B&R to achieve the targets set by them on HSE during the project implementation.


The contractor shall ensure that his staff members & workers (permanent as well casual) shall not be in a state of intoxication during working hours and shall abide by any law relating to consumption & possession of intoxicating drinks or drugs in force. Awareness about local laws on this issue shall form part of the Induction Training.

The contractor shall ensure that all personnel working for him comply with No-smoking requirements of the owner as notified from time to time. Cigarettes, lighters, autoignition tools or appliances shall not be allowed inside the plant complex. Smoking shall be permitted only inside smoking booths expressly designated & authorized by the Owner/CONSULTANT.


3.1.10 The Contractor shall adhere consistently to all provisions of HSE requirements. In case of non-compliance or continuous failure in implementation of any of HSE provisions; OWNER/ CONSULTANT may impose stoppage of work without any Cost & Time implication to Owner and/or impose a suitable penalty for non-compliance with a notice of suitable period, upto a cumulative limit of 1.0% (one percent) of Contract value with a ceiling of Rs. 10 lakhs.

0.2% (Zero decimal two percent) of the contract value for LSTK, EPC, EPCC or Package contracts with an overall ceiling of Rs. 1,00,00,000/- (Rupees one crore).

S. No.	Violation or HSE norms	Penalty Amount
1.	For not using personal protective equipment (Helmet, Shoes, Goggles, person Gloves, Full body harness, Face shield, Boiler suit, etc.)	Rs. 250/- per day / item / person
2.	Working without Work Permit / Clearance	Rs.5,000/- per occasion

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB "		
	C=@/ ' ; 5G'		
TITLE	< 95@H < ZG5: 9HM5B8' 9BJ =FCBA 9BHfk G9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 4 of 59
			REVISION : 0
			EDITION : 1

S. No.	Violation or HSE norms	Penalty Amount
3.	Unsafe electrical practices (not installing ELCB, using poor joints of cables, using naked wire without top plug into socket, laying wire / cables on the roads, electrical jobs by incompetent person, etc.)	Rs.3,000/- per item per day.
4.	Working at height without full body harness, using non-standard / rejected scaffolding and not arranging fall protection arrangement as required like safety nets.	Rs.1,000/ per case per day.
5.	Unsafe handling of compressed gas cylinders (No trolley, jubilee clips double gauge regulator, improper storage / handling).	Rs. 100/- per item per day
6.	Use of domestic LPG for cutting purpose.	Rs.1,000/- per occasion
7.	No fencing / barricading of excavated areas.	Rs.1,000/- per occasion
8.	Not providing shoring / strutting / proper slope and not keeping the excavated earth atleast 1.5 M away from excavated area.	Rs.5,000/- per occasion
9.	Non display of caution boards, list of hospitals, emergency services available at work locations.	Rs.500/- per occasion
10.	Traffic rules violations like over speeding of vehicles, rash driving, wrong parking, not using seat belts, vehicles not fitted with reverse warning alarms.	Rs.1,000/- per occasion
11.	Absence of Contractor's top most executive at site in the safety meetings whenever called by CONSULTANT / Owner	Rs.1,000/- per occasion
12.	Failure to maintain safety records by Contractor Safety personnel.	Rs.1,000/- per month.
13.	Failure to conduct daily safety site inspection, HSE meeting and HSE audit at predefined frequencies.	Rs.1,000/- per occasion
14.	Failure to submit the monthly HSE report by 5 th of subsequent month to Engineer-in-Charge.	Rs. 1,000/- per occasion and Rs. 100/- per day for further delay.
15.	Poor House Keeping	Rs.1,000/- per occasion
16.	Failure to report & follow up accident (including Near Miss) reporting system.	Rs. 10,000/- per occasion

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB ..		
	C=@/ ; 5G		
TITLE	< 95@H < ZG5: 9HM5B8 9BJ =F CBA 9BHfk G9L A 5B5; 9A 9BH	DOCUMENT NO. BR/TS/049	Page 5 of 59
			REVISION : 0
			EDITION : 1

S. No.	Violation or HSE norms	Penalty Amount
17.	Degradation of environment (not confining toxic spills oil / lubricants onto ground)	Rs.1,000/- per occasion
18.	Not medically examining the workers before allowing them to work at height, not providing ear muffs while allowing them to work in noise polluted areas, made them to work in air polluted areas without respiratory protective devices, etc.	Rs.1,000/- per occasion
19.	Violation of any other safety condition as per job HSE plan, work permit and HSE conditions of contract (using crowbar on cable trenches, improper welding booth, not keeping fire extinguisher ready at hot work site, unsafe rigging practices, non-availability of First-Aid box, etc.)	Rs.1,000/- per occasion
20.	Any violation not covered above.	To be decided by B&R / Owner


This penalty shall be in addition to all other penalties specified else where in the contract. The decision of imposing stoppage of work, its extent & monetary penalty shall rest with CONSULTANT/OWNER & binding on the Contractor.

3.1.11 All fatal accidents and other personnel accidents shall be investigated by a team of Contractor's senior personnel for root cause and recommend corrective and preventive actions. Findings shall be documented and suitable actions taken to avoid recurrences shall be communicated to OWNER / CONSULTANT. OWNER / CONSULTANT shall have the liberty to independently investigate such occurrences and Contractor shall extend all necessary help and co-operation in this regard. CONSULTANT / Owner shall have the right to share the content of this report with the outside world.

3.2 House Keeping

3.2.1 Contractor shall ensure that a high degree of house keeping is maintained and shall ensure the followings:

- All surplus earth and debris are removed/disposed off from the working site to identified location (s).
- Unused/Surplus Cables Steel items and steel scrap lying scattered at different places within the working areas are removed to identified location(s).
- All wooden scrap, empty wooden cable drums and other combustible packing materials shall be removed from work place to identified location(s).

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB "		
	C=@/ ; 5G		
TITLE	< 95@H < ZG5: 9HM5B8` 9BJ =F CBA 9BHfk G9L` A 5B5; 9A 9BH`	DOCUMENT NO. BR/TS/049`	Page 6 of 59
			REVISION : 0
			EDITION : 1


- d. Roads shall be kept clear and materials like pipes, steel, sand, boulders, concrete chips and bricks, etc. shall not be allowed in the roads to obstruct free movement of men & machineries.
- e. Fabricated steel structurals, pipes & piping materials shall be stacked properly for erection.
- f. Water logging on roads shall not be allowed.
- g. No parking of trucks/ trolleys, cranes and trailers etc. shall be allowed on of roads, which may obstruct the traffic movements.
- h. Utmost care shall be taken to ensure over all cleanliness and proper up keep of the working areas.
- i. Trucks carrying sand, earth and pulverized materials etc. shall be covered while moving within the plant areas.
- j. The contractor shall ensure that the atmosphere in plant area and on roads is free from particulate matter like dust, sand, etc. by keeping the top surface wet for ease in breathing.
- k. At least two exits for any unit area shall be assured at all times.

3.3

Healthy, Safety and Environment

- a) The Contractor shall provide safe means of access to any working place including provision of suitable and sufficient scaffolding at various stages during all operations of the work for the safety of his workmen, and OWNER/ CONSULTANT. Contractor shall ensure deployment of appropriate equipment appliances for adequate safety and healthy of the workmen and protection of surrounding areas.

Contractor shall ensure identification of all Occupational Health, Safety & Environmental hazards in the type of work he is going to undertake and enlist mitigation measures. Contractor shall carry out Job Safety Analysis (JSA) specifically for high risk jobs like working at height & in confined space, deep excavations, radiography jobs, electrical installations, blasting operations, demolishing / dismantling activities, welding / gas cutting jobs and submit the findings to CONSULTANT / Owner. The necessary HSE measures devised shall be in place prior to start of an activity by the contractor.
- b) The Contractor shall ensure that all their staff workers including their sub-Contractor(s) shall wear Safety Helmet and Safety shoes. Contractor shall also ensure use of safety belt, protective goggles, gloves etc. by the personnel as per jobs requirements. All these gadgets shall conform to relevant IS specification equivalent.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB ``		
	C=@/ `; 5G`		
TITLE	< 95@H<ZG5: 9HM5B8` 9BJ =FCBA 9BHfk G9L` A 5B5; 9A 9BH`	DOCUMENT NO. BR/TS/049`	Page 7 of 59
			REVISION : 0
			EDITION : 1

The Contractor shall ensure that all their staff, workers and visitors including their sub- contractor(s) have been issued (records to be kept) & wear appropriate PPEs like nape strap type safety helmets preferably with head & sweat band with ¾" cotton chin strap (made of industrial HDPE), safety shoes with steel toe cap and antiskid sole, full body harness (C€ marked and conforming to EN361) , protective goggles, gloves, ear muffs, respiratory protective devices, etc. All these gadgets shall conform to applicable IS Specifications / C€ or other applicable international standards.

Owner may issue a comprehensive color scheme for helmets to be used by various agencies. The Contractor shall follow the scheme issued by the owner. All Safety / Fire personnel shall preferably wear red colour helmet so that workmen can approach them for guidance during emergencies.

For shot blasting, the usage of protective face shield and helm ets, gauntlet and protective clothing is mandatory.

For offshore jobs/contracts, contractor shall provide PPEs (new) to CONSULTANT & Owner's per sonnel, at his (contractor's) cost . All personnel shall wear life jacket at all time.


An indicative list of HSE standards/codes is given under Appendix-A.

The contractor shall issue heig ht permit for working at height after verifying and certifying the checkpoints as specified in the attached permit (Format No. HSE-6). He shall also undertake to ensure compliance to the conditions of the permit during the currency of the permit including adherence to personal protective equipments.

The permit shall be issued initially f or one week or expected duration of an activity and extended f urther for the balance duration. This permit shall be applicable in areas where specific clearance from Owner's operation Deptt. / Safety Deptt. is not required. B&R field Engineers / Safety Officers / Area Coordinators may verify and count er sign this permit (as an evidence of verification) during the execution of the job.

In case work is under taken without taking sufficient precautions as given in the permit, B&R Engineers may cancel the permit and stop the work till satisfactory compliance is ar ranged. Contractors are expected to maintain a register for issuance of per mit and ex tensions t hereof including pr eserving the used permits for verification during audits etc.

Contractor shall arrange (at his cost) and ensure use of Fall Arrester Systems by his workers. Fall arresters are to be used while climbing / descending tall structures. These arresters should lock automatically against the anchorage line, restricting free fall of the user. The device is to be provided with a double security opening system to ensure safe attachment or release of the user at

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB ``		
	C=@/ `; 5G`		
TITLE	< 95@H< žG5: 9HM5B8` 9BJ =FCBA 9BHfkG9L` A 5B5; 9A 9BH`	DOCUMENT NO. BR/TS/049	Page 8 of 59
			REVISION : 0
			EDITION : 1

any point of rope. In order to avoid shock, the system should be capable of keeping the person in vertical position in case of a fall.


Contractor shall ensure that Full body harnesses conforming EN361 and having authorized CC marking is used by all personnel while working at height. The lanyards and life lines should have enough tensile strength to take the load of the worker in case of a fall. One end of the lanyard shall be firmly tied with the harnesses and the other end with life line. The harness should be capable of keeping the workman vertical in case of a fall, enabling him to rescue himself.

Contractor shall provide Roof Top Walk Ladders for carrying out activities on sloping roofs in order to reduce the chances of slippages and falls.

- c) Contractor shall ensure that a proper Safety Net System shall be used at appropriate locations. The safety net shall be located not more than 30 feet (9.0 metres) below the working surface at site to arrest or to reduce the consequences of possible fall of persons working at different heights.
- d) Contractor shall ensure that flash back arrestors conforming to BS:6158 or equivalent are installed on all gas cylinders as well as at the torch end of the gas hose, while in use. All cylinders shall be mounted on trolleys and provided with a closing key. The burner and the hose placed downstream of pressure reducer shall be equipped with Flash Back Arrestor / Non Return Valve device. The hoses for acetylene and oxygen cylinders must be of different colours. Their connections to cylinders and burners shall be made with a safety collar. At end of work, the cylinders in use shall be closed and hoses depressurized. All welding machines shall have effective earthing. In order to help maintain good housekeeping, and to reduce fire hazard, live electrode bits shall be contained safely and shall not be thrown directly on the ground.
- e) The Contractor shall assign to his workmen, tasks commensurate with their qualification, experience and state of health for driving of vehicles, handling and erections of materials and equipment's. All lifting equipments shall be tested certified for its capacity before use. Adequate and suitable lighting at every work place and approach there to shall be provided by the contractor before starting the actual work/ operation at night.

Contractor shall ensure installation of Safe Load Indicator (SLI) on all cranes (while in use) to minimize overloading risk. SLI shall have capability to continuously monitor and display the load on the hook, and automatically compare it with the rated crane capacity at the operating condition of the crane. The system shall also provide visual and audible warnings at set capacity levels to alert the operator in case of violations.

The contractor shall be responsible for safe operations of different equipments mobilized and used by him at the workplace like transport

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97< B=75@GD97= =75H-CB ``		
	C=@/ `; 5G`		
TITLE	< 95@Hk žG5: 9HM5B8` 9BJ =F CBA 9BHfk G9L` A 5B5; 9A 9BH`	DOCUMENT NO. BR/TS/049	Page 9 of 59
			REVISION : 0
			EDITION : 1

vehicles, engines, cranes, mobile ladders, scaffoldings, work tools, etc.

- f) Hazardous and/or toxic material such as solvent coating or thinners shall be stored in appropriate containers.
- g) All hazardous materials shall be labeled with the name of the materials, the hazards associated with its use and necessary precautions to be taken.


The work place shall be checked prior to start of activities to identify the location, type and condition of any asbestos materials which could be disturbed during the work. In case asbestos material is detected, usage of appropriate PPEs by all personnel shall be ensured and the matter shall be reported immediately to B&R/ Owner.

- h) Contractor shall ensure that during the performance of the work all hazards to the health of personnel have been identified assessed and eliminated.
- i) Chemical spills shall be contained & cleaned up immediately to prevent further contamination.
- j) All personnel exposed to physical agents such as ionizing or non- ionizing radiation ult raviolet rays or similar other physical agents shall be provided with adequate shielding or protection commensurate with type of exposure involved. For ionizing radiation, requirements of Bhabha Atomic Research Centre (BARC)/ Atomic Energy Regulatory Board (AERB) shall be followed.
- k) Where contract or exposure of hazardous materials could exceed limits or could otherwise have harmful affects, appropriate personal protective equipment's such as gloves, goggles, aprons, chemical resistant clothing and respirator shall be used.
- l) Contractor shall ensure the following facilities at work sites:
 - I) A Crèche where 10 or more female workers are having children below the age of 6 years.

II) Reasonable Canteen facilities are made available at appropriate location depending upon site conditions.

- m) Suitable facilities for toilet, drinking water, proper lighting shall be provided at site and labor camps, commensurate with applicable Laws/Legislation.
- n) Contractor shall ensure storage and utilization methodology of material that are not detrimental to the environment. Wherever required Contractor shall ensure that only the environment friendly material are selected.

Emphasize on recycling of waste materials such as metals, plastics, glass, paper, oil & solvents. The waste that cannot be minimized, reused or

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB "		
	C=@/ ; 5G		
TITLE	< 95@k ZG5: 9HM5B8` 9BJ =F CBA 9BHfk G9L` A 5B5; 9A 9BH`	DOCUMENT NO. BR/TS/049	Page 10 of 59
			REVISION : 0
			EDITION : 1

recovered shall be stored and disposed of safely. In no way, toxic spills shall be allowed to percolate into the ground. The contractor shall not use the empty areas for dumping the wastes.

- o) All person deployed at site shall be knowledgeable of and comply with the environmental laws, rules & regulation relating to the hazardous materials substance and wastes. Contractor shall not dump, release or otherwise discharge or dispose of any such materials without the authorization of OWNER/ B&R.

Suitable scaffoldings shall be provided to workmen for all works that cannot be safely done from the ground or from solid construction except such short period work that can be safely done using ladders. When a ladder is used, an extra workman shall be engaged for holding the ladder.

The contractor shall ensure that the scaffolds used during construction activities shall be strong enough to take the designed load. Owner / B&R reserves the right to ask the contractor to submit certification and or design calculations from his Engineering regarding load carrying capacity of the scaffoldings.


All scaffolds shall be inspected by a Scaffolding nspector of the contractor. He shall paste a GREEN tag on each scaffold found safe and a RED tag on each scaffold found unsafe. Scaffoldings with GREEN tag only shall be permitted to be used and RED ones shall immediately be removed from the site.

All electrical installations /connections shall be carried out as per the provisions of latest revision of following codes/ standards, in addition to the requirements of Statutory Authorities and IE / applicable international rules & regulations:

- OISO SID 173 : Fire prevention & protection system for electrical installations
- SP 30 (BIS) : National Electric Code


All electrical installations shall be approved by the concerned statutory authorities.

- The contractor shall meet the following requirements:
 - i) Ensure that electrical systems and equipment including tools & tackles used during construction phase are properly selected, installed, used and maintained as per provisions of the latest revision of the Indian Electrical / applicable international regulations.
 - ii) Shall deploy qualified & licensed electricians for proper & safe installation and for regular inspection of construction power

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 'H97< B=75@GD97= =75H-CB ''		
	C=@/ ' ; 5G'		
TITLE	< 95@Hk žG5: 9HM5B8' 9BJ =F CBA 9BHfk G9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 11 of 59
			REVISION : 0
			EDITION : 1


distribution system / points including their earthing. A copy of the license shall be submitted to B&R / Owner for records. Availability of at least one competent licensed electrician shall be ensured at site round the clock to attend to the normal / emergency jobs.

- iii) All switchboards / welding machines shall be kept in well-ventilated & covered shed. The shed shall be elevated to avoid water logging. No flammable materials shall be used for constructing the shed. Also flammable materials shall not be stored in and around electrical equipment / switchboard. Adequate clearances and operational space shall be provided around the equipment.
- iv) Fire extinguishers and insulating mats shall be provided in all power distribution centers.
- v) Temporary electrical equipment shall not be employed in hazardous area without obtaining safety permit.
- vi) Proper house keeping shall be done around the electrical installations.
- vii) All temporary installations shall be tested before energising, to ensure proper earthing, bonding, suitability of protection system, adequacy of feeders/cables etc.
- viii) All welders shall use hand gloves irrespective of holder voltage.
- ix) Multilingual (Hindi, English and local language) caution boards, shock treatment charts and instruction plate containing location of isolation point for incoming supply, name & telephone No. of contact person in emergency shall be provided in substations and near all distribution boards / local panels.
- x) Operation of earth leakage device shall be checked regularly by temporarily connecting series test lamp (2 bulbs of equal rating connected in series) between phase and earth.
- xi) Regular inspection of all installations (at least once in a month)
- The following features shall also be ensured for all electrical installations during construction phase by the contractor:
 - i) Each installation shall have a main switch with a protective device, installed in an enclosure adjacent to the metering point. The operating height of the main switch shall not exceed 1.5 M. The main switch shall be connected to the point of supply by means of armoured cable.
 - ii) The outgoing feeders shall be double or triple pole switches with fuses MCBs. Loads in a three phase circuit shall be balanced as far as

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97 < B=75@GD97 = 75H-CB ..		
	C=@/ ; 5G		
TITLE	< 95@H k ZG5: 9HM5B8` 9BJ -F CBA 9BHfk G9L` A 5B5; 9A 9BH`	DOCUMENT NO. BR/TS/049`	Page 12 of 59
			REVISION : 0
			EDITION : 1

possible and load on neutral should not exceed 20% of load in the phase.

- iii) The installation shall be adequately protected against overload, short circuit and earth leakage by the use of suitable protective devices. Fuses wherever used shall be HRC type. Use of rewirable fuses shall be strictly prohibited. The earth leakage device shall have an operating current not exceeding 30 mA.
- iv) All connections to the hand tools / welding receptacles shall be taken through proper switches, sockets and plugs.
- v) All single phase sockets shall be minimum 3 pin type only. All unused sockets shall be provided with socket caps.
- vi) Only 3 core (P+N+E) overall sheathed flexible cables with minimum conductor size of 1.5 mm² copper shall be used for all single phase hand tools.
- vii) Only metallic distribution boxes with double earthing shall be used at site. No wooden boxes shall be used.
- viii) All power cables shall be terminated with compression type cable glands. Tinned copper lugs shall be used for multistrand wires /cables.
- ix) Cables shall be free from any insulation damage.
- x) Minimum depth of cable trench shall be 750 mm for MV & control cables and 900 mm for HV cables. These cables shall be laid over a sand layer and covered with sand, brick & soil for ensuring mechanical protection. Cables shall not be laid in waterlogged area as far as practicable. Cable route markers shall be provided at every 25 M of buried trench route. When laid above ground, cables shall be properly cleated or supported on rigid poles of at least 2 M high. Minimum head clearance of 6 meters shall be provided at road crossings.
- xi) Under ground road crossings for cables shall be avoided to the extent feasible. In any case no under ground power cable shall be allowed to cross the roads without pipe sleeve.
- xii) All cable joints shall be done with proper jointing kit. No taped / temporary joints shall be used.
- xiii) An independent earthing facility should preferably be established within the temporary installation premises. All appliances and

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 'H97< B=75@GD97= =75H-CB ''		
	C=@/ ' ; 5G'		
TITLE	< 95@H< Z'G5: 9HM5B8' 9BJ =F CBA 9BHfk G9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 13 of 59
			REVISION : 0
			EDITION : 1

equipment shall be adequately earthed. In case of armoured cables, the armour shall be bonded to the earthing system.

- xiv) All cables and wire rope used for earth connections shall be terminated through tinned copper lugs.
- xv) In case of local earthing, earth electrodes shall be buried near the supply point and earth continuity wire shall be connected to local earth plate for further distribution to various appliances. All insulated wires for earth connection shall have insulation of green colour.
- xvi) Separate core shall be provided for neutral. Earth / Structures shall not be used as a neutral in any case.
- xvii) ON/OFF position of all switches shall be clearly designated / painted for easy isolation in emergency.

The contractor shall identify all operations that can adversely affect the health of its workers and issue & implement mitigation measures.

For surface cleaning operations, sand blasting shall not be permitted even if not explicitly stated elsewhere in the contract.

To eliminate radiation hazard, Tungsten electrodes used for Gas Tungsten Arc Welding shall not contain Thorium.


Appropriate respiratory protective devices shall be used to protect workmen from inhalation of air borne contaminants like silica, asbestos, gases, fumes, etc.

Workmen shall be made aware of correct methods for lifting, carrying, pushing & pulling of heavy loads. Wherever possible, manual handling shall be replaced by mechanical lifting equipments.

For jobs like drilling / demolishing / dismantling where noise pollution exceeds the specified limit of 85 decibels, ear muffs shall be provided to the workers.

To avoid upper limb disorders and back aches, Display Screen Equipments' workplace stations shall be carefully designed & used with proper sitting postures. Power driven hand-held tools shall be maintained in good working condition to minimize their vibrating effects and personnel using these tools shall be taught how to operate them safely & how to maintain good circulation in hands.

The contractor shall arrange health check up for all the workers at the time of induction. Health check may have to be repeated if the nature of duty assigned to him is changed necessitating health check or doubt arises about his wellness. B&R/ Owner reserve the right to ask the contractor to submit test reports.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 'H97<B=75@GD97= =75H-CB ''		
	C=@/ ' ; 5G'		
TITLE	< 95@H<ZG5: 9HM5B8' 9BJ =F CBA 9BH'fk G9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 14 of 59
			REVISION : 0
			EDITION : 1

Weather Protection

Contractor shall take appropriate measures to protect workers from severe storms, solar radiations, poisonous gases, dust, etc. by ensuring proper usage of PPEs like Sun glasses, Sun screen lotions, respirators, dust masks, etc. and rearranging / planning the construction activities to suit the weather conditions.

Communication

All persons deployed at the work site shall have access to effective means of communication so that any untoward incident can be reported immediately and assistance sought by them.

All health & safety information shall be communicated in a simple & clear language easily understood by the local workforce.

Unsuitable Land Conditions


Contractor shall take appropriate measures and necessary work permits / clearances if work is to be done in or around marshy areas, river crossings, mountains, monuments, etc.

Under Water Inspection

Contractor shall ensure that boats and other means used for transportation, surveying & investigation works shall be certified seaworthy by a recognized classification society. It shall be equipped with all life saving devices like life jackets, adequate fire protection arrangements and shall possess communication facilities like cellular phones, wireless, walkie-talkie. All divers used for seabed surveys, underwater inspections shall have required authorized license, suitable life saving kit. Number of hours of work by divers shall be limited as per regulations. B&R/ Owner shall have the right to inspect the boat and scrutinize documents in this regard.

TOOL BOX MEETING (TBM)

Contractor shall conduct daily TBM with workers prior to start of work and shall maintain proper record of the meeting. A suggested format is given below . The TBM is to be conducted by the immediate supervisor of the workers.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	<95@H<ZG5: 9HM5B8' 9BJ =F CBA 9BHfk G9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 15 of 59
			REVISION : 0
			EDITION : 1

TOOLBOX MEETING RECORDING SHEET

Date & Time		
Subject		
Presenter		
Hazards involved		
Precautions to be taken		
Worker's Name	Signature	Section
Remarks, if any		

The topics during TBM shall include

- Hazards related to work assigned on that day and precautions to be taken.
- Any forthcoming HSE hazards / events / instruction / orders, etc.

The above record can be kept in local language, which workers can read. These records shall be made available to CONSULTANT / Owner whenever demanded.

TRAINING

Contractor shall ensure that all his per sonnel possess appr opriate training to carry out the assigned job safely. The training should be imparted in a language understood by them and should specifically be trained about


- Potential hazards to which they may be exposed at their workplace
- Measures available for prevention and elimination of these hazards

The topics during training shall cover, at the minimum;

- Education about hazards and precautions required
- Emergency and evacuation plan
- HSE requirements
- Fire fighting and First-Aid
- Use of PPEs
- Local laws on intoxicating drinks, drugs, smoking in force

Records of the training shall be kept and submitted to CONSULTANT / Owner whenever demanded.

For offshore and jetty jobs, contractor shall ensure that all personnel deployed have undergone a st ructured sea sur vival training including use of lifeboats, basket landing, use of radio communication etc. from an agency acceptable to Owner / CONSULTANT.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	<95@HkžG5: 9HM5B8' 9BJ =F CBA 9BH'fk G9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 16 of 59
			REVISION : 0
			EDITION : 1


INSPECTION

The contractor shall carryout daily HSE inspection and record observations at a central location. These inspection records shall be freely accessible to Owner / CONSULTANT representatives. The contractor shall also assist Owner / CONSULTANT representatives during the HSE inspections conducted by them.

ADDITIONAL SAFETY REQUIREMENTS FOR WORKING INSIDE A RUNNING PLANT

As a minimum, the contractor shall ensure adherence to following safety requirements while working in or in the close vicinity of an operating plant :


- Contractor shall obtain permits for Hot work, Cold work, Excavation and Confined Space from Owner in the prescribed format.
- The contractor shall monitor, record and compile list of his workers entering the operational plant/unit each day and ensure & record their return after completing the job.
- Contractor's workers and staff members shall use designated entrances and proceed by designated routes to work areas only assigned to them. The workers shall not be allowed to enter units' area, tanks area, pump rooms, etc. without work authorization permit.
- Work activities shall be planned in such a way so as to minimize the disruption of other activities being carried out in an operational plant / unit and activities of other contractors.
- The contractor shall submit a list of all chemicals / toxic substances that are intended to be used at site and shall take prior approval of the Owner.
- Specific training on working in a hydrocarbon plant shall be imparted to the workforce and mock drills shall be carried out for Rescue operations / First-Aid measures.
- Proper barricading / cordoning of the operational units / plants shall be done before starting the construction activities. No unauthorized person shall be allowed to trespass. The height and overall design of the barricading structure shall be finalized in consultation with the Owner and shall be got approved from the Owner.
- Care shall be taken to prevent hitting underground facilities such as electrical cables, hydrocarbon piping during execution of work.
- Barricading with water curtain shall be arranged in specific/critical areas where hydrocarbon vapors are likely to be present such as near horton spheres or tanks. Positioning of fire tenders (from owner) shall also be ensured during execution of critical activities.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 'H97< B=75@GD97= =75H-CB ''		
	C=@/ ; 5G'		
TITLE	< 95@H< ZG5: 9HM5B8' 9BJ =FCBA 9BHfk G9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 17 of 59
			REVISION : 0
			EDITION : 1

- j) Emergency evacuation plan shall be worked out and all workmen shall be appr ised about evacuation routes. Mock drill operations may also be conducted.
- k) Flammable gas test shall be conducted prior to any hot work using appropriate measuring instruments. Sewers, drains, vents or any other gas escaping points shall be covered with flame retardant tarpaulin.
- l) Respiratory devices shall be kept handy while working in confined zones where there is a danger of inhalation of poisonous gases. Constant monitoring of presence of Gas / Hydrocarbon shall be done.
- m) Clearance shall be obtained from all par ties before starting hot tapping, patchwork on live lines and work on corroded tank roof.
- n) Positive isolat ion of line/equipment by blinding for welding/cutting/grinding shall be done. Closing of valve will not be considered sufficient for isolation.
- o) Welding spatters shall be contained properly and in no case shall be allow ed to fall on the ground containing oil. Similar care shall be taken during cutting operations.
- p) The vehicles, cranes, engines, etc. shall be fitted with spark arresters on the exhaust pipe and got it approved from Safety Department of the Owner.
- q) Plant air should not be used to clean any part of the body or clothing or use to blow off dirt on the floor.
- r) Gas detectors should be inst alled in gas leakage prone areas as per requirement of Owner's plant operation personnel.
- s) An experienced full time safety personnel shall be exclusively deployed to monitor safety aspects in running plants.

HSE PROMOTION

The contractor shall encourage his workforce to promote HSE efforts at workplace by way of organizing workshops / seminars / training programmes, celebrating HSE awareness weeks & National Safety Day, conducting q uizzes & essay com petitions, dist ributing pam phlets, posters & material on HSE, providing incentives for m aintaining good HSE pr actices and granting bonus for completing the job without any lost time accident.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB "		
	C=@/ `; 5G`		
TITLE	< 95@H-kžG5: 9HM5B8` 9BJ =F CBA 9BHfkG9L` A 5B5; 9A 9BH`	DOCUMENT NO. BR/TS/049	Page 18 of 59
			REVISION : 0
			EDITION : 1

4.0 **DETAILS OF HSE MANAGEMENT SYSTEM BY CONTRACTOR**

4.1 **On Award of Contract**


The Contractor shall prior to start of work submit his Health, Safety and Environment Manual of procedure and HSE Plans for approval by OWNER/CONSULTANT. The Contractor shall participate in the pre-start meeting with OWNER/CONSULTANT to finalize HSE plans including the following.

- Job procedure to be followed by Contractor for activities covering Handling of equipment's, Scaffolding, Electric Installation, describing the risks involved, actions to be taken and methodology for monitoring each.
- Organizations structure alongwith responsibility and authority records/ reports etc. on HSE activities.

4.2 **During job execution**

4.2.1 Implement approved Health, Safety and Environment management procedure including but not limited to as brought out under para 3.0. Contractor shall also ensure to:

- Arrange workmen compensation insurance, registration under ESI Act, third party liability insurance etc. as applicable.
- Arrange all HSE permits before start of activities (as applicable) like hot work, confined space, work at heights, storage of Chemicals/explosives materials and its use and implement all precautions mentioned therein
- Submit timely the completed check list on HSE activities, Monthly HSE report, accident report, investigation report, etc. as per OWNER/CONSULTANT requirements. Compliance of instructions on HSE shall be done by Contractor and informed urgently to OWNER/CONSULTANT.
- Ensure that resident Engineers/Site-In-Charge of the Contractor shall attend all the Safety Committee/HSE meeting arranged by OWNER/ B&R only in case of his absence from site, a second senior most person shall be nominated by him in advance and communicated to OWNER/CONSULTANT.
- Display at site office and work locations caution boards, list of hospitals for emergency services available.
- Provided posters, banners, for safe working to promote safety consciousness
- Carryout audits/inspection at sub Contractor work as per approved HSE documents & submit the reports for OWNER/CONSULTANT review.


BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97 =75H-CB "		
	C=@/ `; 5G`		
TITLE	< 95@H < ZG5: 9HM5B8` 9BJ =F CBA 9BHfk G9L` A 5B5; 9A 9BH`	DOCUMENT NO. BR/TS/049	Page 19 of 59
			REVISION : 0
			EDITION : 1

- Assist in HSE audits by OWNER/B&R and submit compliance report.
- Generate & submit HSE records/ reports as per HSE Plan.
- Appraise OWNER/B&R on HSE activities at site.

5.0 RECORDS

At the minimum, the contractor shall maintain/ submit HSE records in the following reporting formats:


1.	Monthly HSE Checklist cum compliance report	HSE-1
2.	Accident / Incident Report	HSE-2
3.	Supplementary Accident / Incident Investigation report	HSE-3
4.	Near Miss Incident Report	HSE-4
5.	Monthly HSE Report	HSE-5
6.	Permit for working at height	HSE-6
7.	Permit for working in confined space	HSE-7
8.	Permit for radiation work	HSE-8
9.	Permit for demolishing / dismantling	HSE-9

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB ''		
	C=@/ ' ; 5G'		
TITLE	<95@H<Z'G5: 9HM5B8' 9BJ =F CBA 9BH'fk G9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 20 of 59
			REVISION : 0
			EDITION : 1

ANNEXURE-A

A. I.S. CODES ON HSE


SP:53	Safety code for the use, Care and protection of hand operated tools.
IS: 818	Code of practice for safety and health requirements in electric and gas welding and cutting operations
IS: 1179	Eye and Face precautions during welding, equipment etc.
IS: 1860	Safety requirements for use, care and protection of abrasive grinding wheels.
IS: 1989(Part-I & II)	Leather safety boots and shoes
IS: 2925	Industrial Safety Helmets
IS: 3016	Code of practice for fire safety precautions in welding and cutting operations.
IS: 3043	Code of practice for earthing.
IS: 3764	Code of safety for excavation work
IS: 3786	Methods for computation of frequency and severity rates for industrial injuries and classification of industrial accidents.
IS: 3996	Safety Code of scaffolds and ladders.
IS: 4082	Recommendation on stacking and storage of construction materials and components at site.
IS: 4770	Rubber gloves for electrical purposes
IS: 5121	Safety code for piling and other deep foundations
IS: 5216 (Part-I)	Recommendations on Safety procedures and practices in electrical works
IS: 5557	Industrial and Safety rubber lined boots.
IS: 5983	Eye protectors
IS:6519	Selection, care and repair of Safety footwear
IS: 6994 (Part-I)	Industrial Safety Gloves (Leather & Cotton Gloves)
IS: 7293	Safety Code for working with construction Machinery

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB ..		
	C=@/ ; 5G`		
TITLE	< 95@H < ZG5: 9HM5B8` 9BJ =F CBA 9BHfk G9L` A 5B5; 9A 9BH`	DOCUMENT NO. BR/TS/049	Page 21 of 59
			REVISION : 0
			EDITION : 1

IS: 8519	Guide for selection of industrial safety equipment for body protection
IS: 9167	Ear protectors
IS: 11006	Flash back arrestor (Flame arrestor)
IS:11016	General and safety requirements for machine tools and their operation
IS: 11057	Specification for Industrial safety nets
IS: 11226	Leather safety footwear having direct moulded rubber sole
IS: 11972	Code of practice for safety precaution to be taken when entering a sewerage system
IS: 13367	Code of practice-safe use of cranes
IS: 13416	Recommendations for preventive measures against hazards at working place

B. INTERNATIONAL STANDARDS ON HSE

Safety Glasses	:	ANSI Z 87.1, ANSI ZZ 87.1, AS 1337, BS 2092, BS 1542, BS 679, DIN 4646 / 58211
Safety Shoes	:	ANSI Z 41.1, AS 2210, EN 345
Hand Gloves	:	BS 1651
Ear Muffs	:	BS 6344, ANSI S 31.9
Hard Hat	:	ANSI Z 89.1 / 89.2, AS 1808, BS 5240, DIN 4840
Goggles	:	ANSI Z 87.1
Face Shield	:	ANSI Z 89.1
Breathing Apparatus	:	BS 4667, NIOSH
Welding & Cutting	:	ANSI Z 49.1
Safe handling of compressed Gases in cylinders	:	P-1 (Compressed Gas Association 1235 Jefferson Davis Highway, Arlington VA 22202 – USA)


BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB ``		
	C=@/ ; 5G`		
TITLE	< 95@kžG5: 9HM5B8` 9BJ =F CBA 9BHfk G9L` A 5B5; 9A 9BH`	DOCUMENT NO. BR/TS/049	Page 22 of 59
			REVISION : 0
			EDITION : 1

ANNEXURE-B

DETAILS OF FIRST AID BOX

SL. NO	DESCRIPTION	QUANTITY
1.	Small size Roller Bandages, 1 inch wide (Finger Dressing small)	6 Pcs.
2.	Medium size Roller Bandages, 2 inch wide (Hand and Foot Dressing)	6 Pcs.
3.	Large size Roller Bandages, 4 inch wide (Body Dressing Large)	6 Pcs.
4.	Large size Burn Dressing (Burn Dressing Large)	4 Pkts.
5.	Cotton wool (20 gms packing)	4 Pkts.
6.	Antiseptic Solution Dettol (100 ml.) or Savlon	1 Bottle
7.	Mercurochrome Solution (100 ml.) 2% in water	1 Bottle
8.	Ammonia Solution (20 ml.)	1 Bottle
9.	A Pair of Scissors	1 Piece
10.	Adhesive Plaster (1.25 cm x 5 m)	1 Spool
11.	Eye pads in Separate Sealed Packet	4 Pcs.
12.	Tourniquet	1 No.
13.	Safety Pins	1 Dozen
14.	Tinc. Iodine / Betadin (100 ml.)	1 Bottles
15.	Ointment for burns (Burnol 20 gms.)	1 Bottole
16.	Polythene Wash cup for washing eyes	1 No.
17.	Potassium Permanganate (20 gms.)	1 Pkt.
18.	Tinc. Benzoine (100 ml.)	1 Bottole
19.	Triangular Bandages	2 Nos.
20.	Band Aid Dressing	5 Pcs.
21.	Iodex / Moov (25 gms.)	1 Bottole
22.	Tongue Depressor	1 No.
23.	Boric Acid Powder (20 gms.)	2 Pkt.
24.	Sodium Bicarbonate (20 gms.)	1 Pkt.
25.	Dressing Powder (Nebasulf) (10 gms.)	1 Bottole
26.	Medicinal Glass	1 No.
27.	Duster	1 No.
28.	Booklet (English & Local Language)	1 No. each
29.	Soap	1 No.
30.	Toothache Solution	1 No.
31.	Eye Ointment	1 Bottle
32.	Vicks (22 gms.)	1 Bottle
33.	Forceps	1 No.
34.	Cotton Buds (5 nos.)	1 Pkt.
35.	Note Book	1 No.
36.	Splints	4 Nos.
37.	Lock	1 Piece
38.	Life Saving/Emergency/Over-the Counter Drugs	As decided at site
	Box size : 14" x 12" x 4"	

Note : The medicines prescribed above are only indicative. Equivalent medicines can also be used. A prescription, in this regard, shall be required from a qualified Physician.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	< 95@H-kŽG5: 9HM5B8' 9BJ =F CBA 9BH'fk G9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 23 of 59
			REVISION : 0
			EDITION : 1


ANNEXURE – C

TYPE OF FIRES VIS-À-VIS FIRE EXTINGUISHERS

Fire	Fire Extinguishers				
	Water Foam		CO ₂	Dry Powder	Multi Purpose (ABC)
Originated from paper, clothes, wood	√	√ Can	control minor surface fires	Can control minor surface fires	√
Inflammable liquids like alcohol, petrol, edible oils, bitumen	x	√	√	√	√
Originated from gases like LPG, CNG, H ₂	x x		√	√	√
Electrical Fires	x x		√	√	√

Legend : √ Can be used
 x Not to be used


Note : Fire extinguishing equipment must be checked at least once a year and after every use by an authorized person. The equipment must have an inspection label on which the next inspection date is given. Type of extinguisher shall clearly be marked on it.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB "		
	C=@/ ; 5G		
TITLE	< 95@k ZG5: 9HM5B8` 9BJ =F CBA 9BHfk G9L` A 5B5; 9A 9BH`	DOCUMENT NO. BR/TS/049`	Page 24 of 59
			REVISION : 0
			EDITION : 1

ANNEXURE – D

Indicative List of Statutory Acts & Rules Relating to HSE


- The Indian Explosives Act and Rules
- The Motor Vehicle Act and Central Motor Vehicle Rules
- The Factories Act and concerned Factory Rules
- The Petroleum Act and Petroleum Rules
- The Workmen Compensation Act
- The Gas Cylinder Rules and the Static & Mobile Pressure Vessels Rules.
- The Indian Electricity Act and Rules
- The Indian Boiler Act and Regulations
- The Water (Prevention & Control & Pollution) Act
- The Water (Prevention & Control of Pollution) Cess Act
- The Mines & Minerals (Regulation & Development) Act
- The Air (Prevention & Control of Pollution) Act
- The Atomic Energy Act
- The Radiation Protection Rules
- The Indian Fisheries Act
- The Indian Forest Act
- The Wild Life (Protection) Act
- The Environment (Protection) Act and Rules
- The Hazardous Wastes (Management & Handling) Rules
- The Manufacturing, Storage & import of Hazardous Chemicals Rules
- The Public Liability Act
- The Building and Other Construction Workers (Regulation of Employment and Condition of service) Act
- Other statutory acts Like EPF, ESIS, Minimum Wage Act.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G''		
TITLE	<95@H<ZG5: 9HM5B8' 9BJ=F CBA 9BHfk G9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 25 of 59
			REVISION : 0
			EDITION : 1


ANNEXURE – E

CONSTRUCTION HAZARDS, THEIR EFFECTS & PREVENTIVE MEASURES


ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
(A) EXCAVATION Pit Excavation up to 3.0m	➤ Falling into pit	➤ Personal injury	➤ Provide guard rails/ barricade with warning signal. ➤ Provide at least two entries/exits. ➤ Provide escape ladders.
	➤ Earth Collapse	➤ Suffocation / Breathlessness ➤ Buried	➤ Provide suitable size of shoring and strutting, if required. ➤ Keep soil heaps away from the edge equivalent to 1.5m or depth of pit whichever is more. ➤ Don't allow vehicles to operate too close to excavated areas. Maintain at least 2m distance from edge of cut. ➤ Maintain sufficient angle of repose. Provide slope not less than 1:1 and suitable bench of 0.5m width at every 1.5m depth of excavation in all soils except hard rock. ➤ Battering/benching the sides.
	➤ Contact with buried electric cables ➤ Gas/ Oil Pipelines	➤ Electrocution ➤ Explosion	➤ Obtain permission from competent authorities, prior to excavation, if required. ➤ Locate the position of buried utilities by referring to plant drawings. ➤ Start digging manually to locate the exact position of buried utilities and thereafter use

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB ..		
	C=@/ ; 5G		
TITLE	< 95@H-kžG5: 9HM5B8` 9BJ =FCBA 9BHfkG9L` A 5B5; 9A 9BH`	DOCUMENT NO. BR/TS/049	Page 26 of 59
			REVISION : 0
			EDITION : 1


ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			mechanical means.
Pit Excavation beyond 3.0m	➤ Same as above plus ➤ Flooding due to excessive rain/ underground water	➤ Can cause drowning situation	➤ Prevent ingress of water ➤ Provide ring buoys ➤ Identify and provide suitable size dewatering pump or well point system
	➤ Digging in the vicinity of existing Building/ Structure	➤ Building/ Structure may collapse ➤ Loss of health & wealth	➤ Obtain prior approval of excavation method from local authorities ➤ Use under-pining method ➤ Construct retaining wall side by side
	➤ Movement of vehicles / equipments close to the edge of cut.	➤ May cause cave-in or slides ➤ Persons may get buried	➤ Barricade the excavated area with proper lighting arrangements ➤ Maintain at least 2m distance from edge of cut and use stop block to prevent over-run. ➤ Strengthen shoring and strutting
Narrow deep excavations for pipelines, etc.	➤ Same as above plus ➤ Frequent cave-in or slides	➤ May cause severe injuries or prove fatal	➤ Battering/benching of sides ➤ Provide escape ladders
	➤ Flooding due to Hydrostatic testing	➤ May arise drowning situation	➤ Same as above plus ➤ Bail out accumulated water ➤ Maintain adequate ventilation
Rock excavation by blasting	➤ Improper handling of explosives	➤ May prove fatal	➤ Ensure proper storage, handling & carrying of explosives by trained personnel. ➤ Comply with the applicable explosive acts & rules.
	➤ Uncontrolled explosion	➤ May cause severe injuries or prove fatal	➤ Allow only authorized persons to perform blasting operations. ➤ Smoking and open

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB ``		
	C=@/ ; 5G`		
TITLE	< 95@H< žG5: 9HM5B8` 9BJ =F CBA 9BHfk G9L` A 5B5; 9A 9BH`	DOCUMENT NO. BR/TS/049`	Page 27 of 59
			REVISION : 0
			EDITION : 1


ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			flames are to be strictly prohibited.
	➤ Scattering of stone pieces in atmosphere	➤ Can hurt people	➤ Use PPE like goggles, face mask, helmets etc.
Rock excavating by blasting (Contd)	➤ Entrapping of persons/ animals.	➤ May cause severe injuries or prove fatal	➤ Barricade the area with red flags and blow siren before blasting.
	➤ Mis fire	➤ May explode suddenly	➤ Do not return to site for at least 20 minutes or unless announced safe by designated person.
Piling Work	➤ Failure of pile-driving equipment	➤ Can hurt people	➤ Inspect Piling rigs and pulley blocks before the beginning of each shift.
	➤ Noise pollution	➤ Can cause deafness ➤ and psychological imbalance	➤ Use personal protective equipments like ear plugs, muffs, etc.
	➤ Extruding rods / casing	➤ Can hurt people	➤ Barricade the area ➤ an install sign boards ➤ Provide first-aid
	➤ Working in the vicinity of 'Live-Electricity'	➤ Can cause electrocution / asphyxiation	➤ Keep sufficient distance from Live-Electricity as per IS code. ➤ Shut off the supply, if possible ➤ Provide artificial/rescue breathing to he injured.
(B) CONCRETING	➤ Air pollution by cement	➤ May affect Respiratory System	➤ Wear respirators or cover mouth and nose with wet cloth.
	➤ Handling of ingredients	➤ Hand s may get injured	➤ Use gloves and other PPE.
	➤ Pr otruding reinforcement rods.	➤ Feet may get injured	➤ Use Safety shoes. ➤ Provide platform above reinforcement for movement of workers.
	➤ Ear thing of electrical mixers,	➤ Can cause electrocution / asphyxiation	➤ Ensure earthing of equipments and proper functioning of

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 'H97<B=75@GD97= =75H-CB ''		
	C=@/ ' ; 5G''		
TITLE	< 95@H<žG5: 9HM5B8' 9BJ =FCBA 9BHfk G9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 28 of 59
			REVISION : 0
			EDITION : 1


ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
	vibrators, etc. not done		electrical circuit before commencement of work.
	➤ Falling of materials from height	➤ Persons may get injured	➤ Use hard hats ➤ Remove surplus material immediately from work place ➤ Ensure lighting arrangements during night hours.
	➤ Continuous pouring by same gang	➤ Cause tiredness of workers and may lead to accident.	➤ Insist on shift pattern ➤ Provide adequate rest to workers between subsequent pours.
	➤ Revolving or concrete mixer/ vibrators	➤ Parts of body or clothes may get entrapped.	➤ Allow only mixers with hopper ➤ Provide safety cages around moving motors ➤ Ensure proper mechanical locking of vibrator
Super-structure	➤ Same as above plus ➤ Deflection in props or shuttering material	➤ Shuttering / props may collapse and prove fatal	➤ Avoid excessive stacking on shuttering material ➤ Check the design and strength of shuttering material before commencement of work ➤ Rectify immediately the deflection noted during concreting
	➤ Passage to work place	➤ Improperly tied and designed props / planks may collapse	➤ Ensure the stability and strength of passage before commencement of work ➤ Do not overload and under the passage.
(C) REINFORCEMENT	➤ Cur tailment and binding of rods	➤ Persons may get injured	➤ Use PPE like gloves, shoes, helmets, etc. ➤ Avoid usage of shift tools
	➤ Car rying of rods for short distance/ at	➤ Wo rkers may injure their hands and shoulders	➤ Pr ovide suitable pads on shoulders and use safety

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB ''		
	C=@/ `; 5G`		
TITLE	< 95@H< ZG5: 9HM5B8` 9BJ =F CBA 9BHfk G9L` A 5B5; 9A 9BH`	DOCUMENT NO. BR/TS/049	Page 29 of 59
			REVISION : 0
			EDITION : 1


ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
	heights		<ul style="list-style-type: none"> gloves. ➤ Tie up rods in easily liftable bundles ➤ Ensure proper staging.
	➤ Checking of clear distance/cover with hands	➤ Rods may cut or injure the finger	➤ Use measuring devices tape, measuring rods, etc.
	➤ Hitting projected rods and standing on cantilever rods	➤ Persons may get injured and fall down	<ul style="list-style-type: none"> ➤ Use safety shoes and avoid standing unnecessarily on cantilever rods ➤ Avoid wearing loose clothes
	➤ F alling of material from height	➤ May prove fatal	<ul style="list-style-type: none"> ➤ Use helmets ➤ Provide safety nets
	➤ Transportation of rods by trucks /trailers	➤ Protruded rods may hit the persons	<ul style="list-style-type: none"> ➤ Use red flags/lights at the ends ➤ Do not protrude the rods in front of or by the side of driver's cabin. ➤ Do not extend the rods 1/3rd of deck length or 1.5 m which is less
(D) WELDING AND GAS CUTTING	➤ W elding radiates invisible ultraviolet and infrared rays	➤ Radiation can damage eyes and skin.	<ul style="list-style-type: none"> ➤ Use specified shielding devices and other PPE of correct specifications ➤ Avoid throated tungsten electrodes for GTAW.
	➤ Improper placement of oxygen and acetylene cylinders	➤ Explosion may occur	<ul style="list-style-type: none"> ➤ Move out any leaking cylinder ➤ Keep cylinder in vertical position ➤ Use trolley for transportation of cylinders and chain them ➤ Use flash back arrestors
	➤ Leakage / cuts in hoses	➤ May cause fire	<ul style="list-style-type: none"> ➤ Purge regulators immediately and then turn off ➤ Never use grease or

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB "		
	C=@/ ; 5G		
TITLE	< 95@k zG5: 9HM5B8` 9BJ =F CBA 9BHfk G9L` A 5B5; 9A 9BH`	DOCUMENT NO. BR/TS/049	Page 30 of 59
			REVISION : 0
			EDITION : 1


ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			oil on oxygen line connections and copper fittings on acetylene lines ➤ Inspect regularly gas carrying hoses ➤ Always use red hose for acetylene & other fuel gases and black for oxygen.
	➤ Opening-up of cylinder	➤ Cylinder may burst	➤ Always stand back from the regulator while opening the cylinder ➤ Turn valve slowly to avoid bursting ➤ Cover the lug terminals to prevent short circuiting.
	➤ Welding of tanks, container or pipes storing flammable liquids	➤ Explosion may occur	➤ Empty & purge them before welding ➤ Never attach the ground cable to tanks, container or pipe storing flammable liquids ➤ Never use LPG for gas cutting
(E) RADIOGRAPHY	➤ Ionizing Radiation	➤ Radiations may react with the skin and can cause cancer, skin irritation, dermatitis, etc.	➤ Ensure safety regulations as per BARC/AERB before commencement of job. ➤ Cordon off the area and install Radiation warning symbols ➤ Restrict the entry of unauthorized persons ➤ Wear appropriate PPE and film badges issued by BARC/AERB
	➤ Transportation and Storage of Radiography source	➤ Same as above	➤ Never touch or handle radiography source with hands ➤ Store radiography source inside a pit in an exclusive isolated

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	< 95@HkZG5: 9HM5B8' 9BJ =F CBA 9BHfk G9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 31 of 59
			REVISION : 0
			EDITION : 1


ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			<p>storage room with lock and key arrangement. The pit should be approved by BARC/AERB</p> <ul style="list-style-type: none"> ➤ Radiography source should never be carried either in passenger bus or in a passenger compartment of trains. ➤ BARC/AERB have to be informed before source movement. ➤ Permission from Director General of Civil Aviation is required for booking radio isotopes with airlines.
	<ul style="list-style-type: none"> ➤ Loss of Radio isotope 	<ul style="list-style-type: none"> ➤ Same as above 	<ul style="list-style-type: none"> ➤ Try to locate with the help of Survey Meter. ➤ Inform BARC/AERB(*) <p>(*) Atomic Energy Regulatory Board (AERB), Bhabha Atomic Research Centre (BARC) Anushaktinagar, Mumbai – 400 094</p>
(F) ELECTRICAL INSTALLATION AND USAGE	<ul style="list-style-type: none"> ➤ Short circuiting 	<ul style="list-style-type: none"> ➤ Can cause Electrocutation or Fire 	<ul style="list-style-type: none"> ➤ Use rubberized hand gloves and other PPE ➤ Don't lay wires under carpets, mats or door ways. ➤ Allow only licensed electricians to perform on electrical facilities ➤ Use one socket for one appliance ➤ Ensure usage of only fully insulated wires or cables ➤ Don't place bare wire ends in a socket

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/'; 5G'		
TITLE	<95@kzG5: 9HM5B8' 9BJ =F CBA 9BHfk G9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 32 of 59
			REVISION : 0
			EDITION : 1


ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			<ul style="list-style-type: none"> ➤ Ensure earthing of machineries and equipments ➤ Do not use damaged cords and avoid temporary connections ➤ Use spark-proof/flame proof type field distribution boxes. ➤ Do not allow open/bare connections ➤ Provide all connections through ELCB ➤ Protect electrical cables / equipment's from water and naked flames ➤ Check all connections before energizing.
	➤ Overloading of Electrical System	➤ Bursting of system can occur which leads to fire	<ul style="list-style-type: none"> ➤ Display voltage and current ratings prominently with 'Danger' signs. ➤ Ensure approved cable size, voltage grade and type. ➤ Switch off the electrical utilities when not in use. ➤ Do not allow unauthorized connections. ➤ Ensure proper grid wise distribution of Power.
	➤ Improper laying of overhead and underground transmission lines / cables	➤ Can cause electrocution and prove fatal	<ul style="list-style-type: none"> ➤ Do not lay unarmored cable directly on ground, wall, roof of trees ➤ Maintain at least 3m distance from HT cables ➤ All temporary cables should be laid at least 750 mm below ground on 100 mm

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/'; 5G'		
TITLE	< 95@Hk žG5: 9HM5B8' 9BJ =F CBA 9BHfk G9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 33 of 59
			REVISION : 0
			EDITION : 1


ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			<p>fine sand overlying by brick soling</p> <p>➤ Provide proper sleeves at crossings/ intersections</p> <p>➤ Provide cable route markers indicating the type and depth of cables at intervals not exceeding 30m and at the diversions / termination.</p>
(G) FIRE PREVENTION AND PROTECTION	<p>➤ Sm all fires can become big ones and may spread to the surrounding areas</p>	<p>➤ Cause burn injuries and may prove fatal.</p>	<p>➤ In case a fire breaks out, press fire alarm system and shout "Fire, Fire"</p> <p>➤ Keep buckets full of sand & water/fire extinguishing equipment near hazardous locations</p> <p>➤ Confine smoking to 'Smoking Zones' only</p> <p>➤ Train people for using specific type of fire equipments under different classes of fire</p> <p>➤ Keep fire doors/ shutters, passages and exit doors unobstructed</p> <p>➤ Maintain good house keeping and first-aid boxes (for detail refer Annex-2)</p> <p>➤ Don't obstruct access to Fire extinguishers</p> <p>➤ Do not use elevators for evacuation during fire</p> <p>➤ Maintain lightening arrestors for elevated structures</p> <p>➤ Stop all electrical motors with internal combustion.</p> <p>➤ Move the vehicles from dangerous</p>

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97 =75H-CB ''		
	C=@/ `; 5G`		
TITLE	< 95@4k žG5: 9HM5B8` 9BJ =F CBA 9BHfk G9L` A 5B5; 9A 9BH`	DOCUMENT NO. BR/TS/049	Page 34 of 59
			REVISION : 0
			EDITION : 1


ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			locations. ➤ Remove the load hanging from the crane booms. ➤ Remain out of the danger areas.
	➤ Improper selection of Fire Extinguisher	➤ It may not extinguish the fire	➤ Ensure usage of correct fire extinguisher meant for the specified fire (for details refer Appendix-C) ➤ Do not attempt to extinguish Oil and electric fires with water. Use foam cylinders/CO ₂ /sand or earth.
	➤ Improper storage of highly inflammable substances	➤ Same as above	➤ Maintain safe distance of flammable substances from source of ignition ➤ Restrict the distribution of flammable materials to only min. necessary amount ➤ Construct specifically designed fuel storage facilities ➤ Keep chemicals in cool and dry place away from hat. Ensure adequate ventilation ➤ Before welding operation, remove or shield the flammable material properly ➤ Store flammable materials in stable racks, correctly labeled preferably with catchments trays. ➤ Wipe off the spills immediately

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	< 95@HkžG5: 9HM5B8' 9BJ =F CBA 9BHfkG9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 35 of 59
			REVISION : 0
			EDITION : 1


ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
	➤ Short circuiting of electrical system	➤ Same as above ➤ Can cause Electrocution	➤ Don't lay wires under carpets, mats or door ways ➤ Use one socket for one appliance ➤ Use only fully insulated wires or cables ➤ Do not allow open/bare connections ➤ Provide all connections through ELCB ➤ Ensure earthing of machineries and equipments
(H) VEHICULAR MOVEMENT	➤ Crossing the Speed Limits (Rash driving)	➤ Personal injury	➤ Obey speed limits and traffic rules strictly ➤ Always expect the unexpected and be a defensive drive ➤ Use seat belts/helmets ➤ Blow horn at intersections and during overtaking operations. ➤ Maintain the vehicle in good condition ➤ Do not overtake on curves, bridges and slopes
	➤ Adverse weather condition	➤ Same as above	➤ Read the road ahead and ride to the left ➤ Keep the wind screen and lights clean ➤ Do not turn at speed ➤ Recognize the hazard, understand the defense and act correctly in time.
	➤ Consuming alcohol before and during he	➤ Same as above	➤ Alcohol and driving do not mix well. Either choose

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB "		
	C=@/ ' ; 5G'		
TITLE	< 95@H< žG5: 9HM5B8' 9BJ =FCBA 9BHfk G9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049'	Page 36 of 59
			REVISION : 0
			EDITION : 1


ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
	driving operation		<ul style="list-style-type: none"> ➤ alcohol or driving. ➤ If you have a choice between hitting a fixed object or an oncoming vehicle, hit the fixed object ➤ Quit the steering at once and become a passenger. Otherwise take sufficient rest and then drive. ➤ Do not force the driver to drive fast and round the clock ➤ Do not day dram while driving
	<ul style="list-style-type: none"> ➤ Falling objects / Mechanical failure 	<ul style="list-style-type: none"> ➤ May prove fatal 	<ul style="list-style-type: none"> ➤ Ensure effective braking system, adequate visibility for the drives, reverse warning alarm. ➤ Proper maintenance of the vehicle as per manufacturer instructions
(I) PROOF TESTING (HYDROSTATIC/ PNEUMATIC TESTING	<ul style="list-style-type: none"> ➤ Bursting of piping ➤ Collapse of tanks ➤ Tanks flying off 	<ul style="list-style-type: none"> ➤ May cause injury and prove fatal 	<ul style="list-style-type: none"> ➤ Prepare test procedure & obtain CONSULTANT/ Owner's approval ➤ Provide separate gauge for pressurizing pump and piping/equipment ➤ Check the calibration status of all pressure gauges, dead weight testers and temperature recorders ➤ Take dial readings at suitable defined intervals and ensure most of them fall between 40-60% of the gauge scale range ➤ Provide safety relief valve (set at

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	< 95@H< žG5: 9HM5B8' 9BJ =F CBA 9BH'fkG9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 37 of 59
			REVISION : 0
			EDITION : 1


ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			<p>pressure slightly higher than test pressure) while testing with air/nitrogen</p> <p>➤ Ensure necessary precautions, stepwise increase in pressure, tightening of bolts/ nuts, grouting, etc. before and during testing</p> <p>➤ Keep the vents open before opening any valve while draining out of water used for hydro testing of tanks</p> <p>➤ Pneumatic testing involves the hazard of released energy stored in compressed gas. Specific care must therefore be taken to minimize the chance of brittle failure during a pneumatic leak test. Test temperature is important in this regard and must be considered when the designer chooses the material of construction</p> <p>➤ A pressure relief device shall be provided, having a set pressure not higher than the test pressure plus the lesser of 345 KPa (50 psi) or 10% of the test pressure. The gas used as test fluid, if not air, shall be nonflammable and nontoxic.</p>
(J) WORKING AT HEIGHTS	➤ Person can fall down	➤ May sustain severe injuries or	➤ Provide guard rails/ barricade at the

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97 < B=75@GD97 = 75H-CB "		
	C=@/ ' ; 5G		
TITLE	< 95@H k ž G5: 9HM5B8 9BJ =F CBA 9BHfk G9L A 5B5; 9A 9BH	DOCUMENT NO. BR/TS/049	Page 38 of 59
			REVISION : 0
			EDITION : 1


ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
		prove fatal	work place ➤ Use PPE like safety belts, full body harness, life line, helmets, safety shoes, etc. ➤ Obtain a permit before starting the work at height above 3 meters ➤ Fall arrest systems like safety nets, etc. must be installed ➤ Provide adequate working space (min. 0.6 m) ➤ Tie/weld working platform with fixed support ➤ Use roof top walk ladder while working on a slopping roofs ➤ Avoid movement on beams
		➤ May hit the scrap / material stacked at the ground or in between	➤ Keep the work place neat and clean ➤ Remove the scrap immediately
	➤ Material can fall down	➤ May hit the workers working at lower levels and prove fatal.	➤ Same as above plus ➤ Do not throw or drop material or equipment from height ➤ All tools to be carried in a toolkit bags or on working uniform ➤ Remove scrap from the planks ➤ Ensure wearing of helmet by the workers at low level
(K) CONFINED SPACES	➤ Suffocation / drowning	➤ Unconsciousness, death	➤ Use respiratory devices, if required ➤ Avoid over crowding inside a confined space ➤ Provide Exhaust Fans for ventilation ➤ Do not wear loose clothes, neck ties,

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB "		
	C=@/ ; 5G		
TITLE	< 95@H-žG5: 9HM5B8` 9BJ =F CBA 9BHfk G9L` A 5B5; 9A 9BH`	DOCUMENT NO. BR/TS/049`	Page 39 of 59
			REVISION : 0
			EDITION : 1


ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			etc. ➤ Fulfill conditions of the permit. ➤ Check for presence of hydrocarbons, O ₂ level ➤ Obtain work permit before entering a confined space ➤ Ensure that the connected piping of the equipment which is to be opened is pressure free, fluid has been drained, vents are open and piping is positively isolated by a blind flange
	➤ Presence of foul smell and toxic substances	➤ Inhalation can pose threat to life.	➤ Same as above plus ➤ Check for hydrocarbon and Aromatic compounds before entering a confined space ➤ Depute one person outside the confined space for continuous monitoring and for extending help in case of an emergency
	➤ Ignition / flame can cause fire	➤ Person may sustain burn injuries or explosion may occur	➤ Keep fire extinguishers at a hand distance ➤ Remove surplus material and scrap immediately ➤ Do not smoke inside a confined space ➤ Do not allow gas cylinders inside a confined space ➤ Use low voltage (24V) lamps for lighting ➤ Use tools with air motors or electric tools with max.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 'H97<B=75@GD97= =75H-CB ''		
	C=@/ ' ; 5G'		
TITLE	< 95@H< Z'G5: 9HM5B8' 9BJ =F CBA 9BHfk G9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 40 of 59
			REVISION : 0
			EDITION : 1


ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			voltage of 24V ➤ Remove all equipments at the end of the day
(L) HANDLING AND LIFTING EQUIPMENTS	➤ Failure of load lifting and moving equipments	➤ Can cause accident and prove fatal	➤ Avoid standing under the lifted load and within the operating radius of cranes ➤ Check periodically oil, brakes, gears, horns and tyre pressure of all moving machinery ➤ Check quality, size and condition of all chain pulley blocks, slings, U-clamps, D-shackles, wire ropes, etc. ➤ Allow crane to move only on hard, firm and leveled ground ➤ Allow lifting slings as short as possible and check gunny packings at the friction points ➤ Do not allow crane to tilt its boom while moving ➤ Install Safe Load Indicator ➤ Ensure certification by applicable authority.
	➤ Overloading of lifting equipments	➤ Can cause electrocution and fire	➤ Safe lifting capacity of derricks and winches written on them shall be got verified. ➤ The max safe working load shall be marked on all lifting equipments ➤ Check the weight of columns and other heavy items painted on them and accordingly decide about the crane

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB "		
	C=@/ ; 5G		
TITLE	< 95@k ZG5: 9HM5B8 9BJ =F CBA 9BHfk G9L A 5B5; 9A 9BH	DOCUMENT NO. BR/TS/049	Page 41 of 59
			REVISION : 0
			EDITION : 1


ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			capacity, boom and angle of erection ➤ Allow only trained operators and riggers during crane operation
	➤ Overhead electrical wires	➤ Can cause electrocution and fire	➤ Do not allow boom or other parts of crane to come within 3 m reach of overhead HT cables ➤ Hook and load being lifted shall preferably remain in full visibility of crane operator.
(M) SCAFFOLDING, FORMWORK AND LADDERS	➤ Person can fall down	➤ Person may sustain severe injuries and prove fatal	➤ Provide guard rails for working at height ➤ Face ladder while climbing and use both hands ➤ Ladders shall extend about 1m above landing for easy access and tying up purpose ➤ Do not place ladders against movable objects and maintain base at ¼ unit of the working length of the ladder ➤ Suspended scaffolds shall not be less than 500 mm wide and tied properly with ropes ➤ No loose planks shall be allowed ➤ Use PPE, like helmets, safety shoes, etc.
	➤ Failure of scaffolding material	➤ Same as above	➤ Inspect visually all scaffolding materials for stability and anchoring with permanent structures. ➤ Design scaffolding

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	< 95@H<ZG5: 9HM5B8' 9BJ =F CBA 9BHfk G9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 42 of 59
			REVISION : 0
			EDITION : 1

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
			<p>for max. load carrying capacity</p> <p>➤ Scaffolding planks shall not be less than 50x250 mm full thickness lumber or equivalent. These shall be cleared or secured and must extend over the end supports by at least 150mm and not more than 300 mm</p> <p>➤ Don't overload the scaffolds</p> <p>➤ Do not splice short ladders to make a longer one. Vertical ladders shall not exceed 6m.</p>
	➤ Material can fall down	➤ Persons working at lower level gets injured.	<p>➤ Remove excess material and scrap immediately</p> <p>➤ Carry the tools in a tool-kit bag only</p> <p>➤ Provide safety nets</p>
(N) STRUCTURAL WORKS	➤ Personal negligence and danger of fall	➤ Can cause injury or casualty	<p>➤ Do not take rest inside rooms built for welding machines or electrical distribution system</p> <p>➤ Avoid walking on beams at height</p> <p>➤ Wear helmet with chin strap and safety belts when working at height</p> <p>➤ Use hand gloves and goggles during grinding operations</p> <p>➤ Cover or mark the sharp and projected edges</p> <p>➤ Do not stand within the operating radius of cranes</p>
	➤ Lifting / slipping of	➤ Same as above	➤ Do not stand under the lifted load

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	< 95@4k ZG5: 9HM5B8' 9BJ =F CBA 9BHfk G9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 43 of 59
			REVISION : 0
			EDITION : 1

ACTIVITY	TYPE OF HAZARD	EFFECT OF HAZARD	PREVENTIVE MEASURES
	material		<ul style="list-style-type: none"> ➤ Stack properly all the materials. Avoid slippage during handling ➤ Control longer pieces lifted up by cranes from both ends ➤ Remove loose materials from height ➤ Ensure tightening of all nuts and bolts
(O) PIPELINE WORKS	<ul style="list-style-type: none"> ➤ Erection / lowering failure 	<ul style="list-style-type: none"> ➤ Can cause injury 	<ul style="list-style-type: none"> ➤ Do not stand under the lifted Load ➤ Do not allow any person to come within the radii of the side boom handling pipes ➤ Check the load carrying capacity of the lifting tools and tackles ➤ Use safe Load Indicators ➤ Use appropriate PPEs
	<ul style="list-style-type: none"> ➤ Other 	<ul style="list-style-type: none"> ➤ Same as above 	<ul style="list-style-type: none"> ➤ Wear gum boots in marshy areas ➤ Allow only one person to perform signaling operations while lowering of pipes ➤ Provide night caps on pipes ➤ Provide end covers on pipes for stoppage of pigs while testing/cleaning operations.

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97 < B=75@GD97 = 75H-CB "		
	C=@/ ; 5G		
TITLE	< 95@H-ZG5: 9HM5B8 9BJ-F CBA 9BHfk G9L A 5B5; 9A 9BH	DOCUMENT NO. BR/TS/049	Page 44 of 59
			REVISION : 0
			EDITION : 1

FORMAT NO. : HSE-1, REV. 0


HSE CHECKLIST CUM COMPLIANCE REPORT (1/6)

Project: _____
 Date: _____
 Inspection By: _____
 Frequency : Fortnightly Job


Contractor : _____
 Owner : _____
 Report No. : _____
 No : _____

Note: write 'NA' wherever the item is not applicable


SL. NO.	ITEM	YES	NO	REMARKS	ACTION
1	HOUSEKEEPING				
a)	Waste containers provided and used				
b)	Sanitary facilities adequate and clean				
c)	Passageways and Walkways clear				
d)	General neatness of working areas				
e) O	thers				
2	PERSONNEL PROTECTIVE EQUIPMENT				
a)	Goggles; Shields				
b)	Face protection				
c)	Hearing protection				
d)	Safety shoes				
e)	Hand protection				
f)	Respiratory Masks etc.				
g)	Safety Belts				
h)	Safety Helmet/Hard Hat				
I) Oth	ers				
3	EXCAVATIONS/OPENINGS				
a)	Openings properly covered or barricaded				
b)	Excavations shored				
c)	Excavations barricaded				
d)	Overnight lighting provided				
e) O	thers				
4	WELDING & GAS CUTTING				
a)	Gas cylinders chained upright				
b)	Cables and hoses not obstructing				
c)	Screens or shields used				
d)	Flammable materials protected				
e)	Fire extinguisher(s) accessible				
f) O	thers				
5	SCAFFOLDING				
a)	Fully decked platforms				
b)	Guard and intermediate rails in place				

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97 < B=75@GD97 = 75H-CB "		
	C=@/ ; 5G		
TITLE	< 95@H k ZG5: 9HM5B8 9BJ =F CBA 9BHfk G9L A 5B5; 9A 9BH	DOCUMENT NO. BR/TS/049	Page 45 of 59
			REVISION : 0
			EDITION : 1

SL. NO.	ITEM	YES	NO	REMARKS	ACTION
c)	Toe boards in place				
d)	Adequate shoring				
e)	Adequate access				
f) O	thers				
6	LADDERS				
a)	Extension side rails 1m above				
b)	Top of landing				
c)	Properly secured				
d)	Angle + 70 from horizontal				
e) O	thers				
7	HOISTS, CRANES AND DERRICKS				
a)	Condition of cables and sheaves OK				
b)	Condition of slings, chains, hooks and eyes OK				
c)	Inspection and maintenance logs maintained				
d)	Outriggers used				
e)	Signs/barricades provided				
f)	Signals observed and understood				
g)	Qualified operators				
h) O	thers				
8	MACHINERY, TOOLS AND EQUIPMENT				
a)	Proper instruction				
b)	Safety devices				
c)	Proper cords				
d)	Inspection and maintenance				
e) O	thers				
9	VEHICLE AND TRAFFIC				
a)	Rules and regulations observed				
b)	Inspection and maintenance				
c)	Licensed drivers				
d) O	thers				
10	TEMPORARY FACILITIES				
a)	Emergency instructions posted				
b)	Fire extinguishers provided				
c)	Fire-aid equipment available				
d)	Secured against storm damage				
e)	General neatness				
f)	In accordance with electrical requirements				
g) O	thers				
11	FIRE PREVENTION				
a)	Personnel instructed				
b)	Fire extinguishers checked				
c)	No smoking in Prohibited Areas				
d)	Hydrants Clear				


BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 'H97< B=75@GD97= =75H-CB ''		
	C=@/ ; 5G'		
TITLE	< 95@H<žG5: 9H-M5B8' 9BJ =F CBA 9BHfk G9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 46 of 59
			REVISION : 0
			EDITION : 1

SL. NO.	ITEM	YES	NO	REMARKS	ACTION
e) O	thers				
12	ELECTRICAL				
a)	Use of 3-core armoured cables				
b)	Usage of 'All insulated' or 'double insulated' electrical tools				
c)	All electrical connection are routed through ELCB				
d)	Natural Earthing at the source of power (main DB)				
e)	Continuity and tightness of earth conductor				
f)	Covering of junction boxes, panels and other energized wiring places				
g)	Ground fault circuit interrupters provided				
h)	Prevention of tripping hazards				
i) O	thers				
13	HANDLING AND STORAGE OF MATERIALS				
a)	Properly stored or stacked				
b)	Passageways clear				
c) Others					
14	FLAMMABLE GASES AND LIQUIDS				
a)	Containers clearly identified				
b)	Proper storage				
c)	Fire extinguishers nearby				
d) O	thers				
15	WORKING AT HEIGHT				
a)	Erection plan and work permit obtained				
b)	Safety nets				
c)	Full body harness and lanyards; chute lines				
d)	Health Check record available for workers going up?				
e) O	thers				
16	CONFINED SPACE				
a)	Work permit obtained				
b)	Test for toxic gas and sufficient availability of oxygen conducted				
c)	At least one person outside the confined space for monitoring deputed				
d)	Availability of sufficient means of entry, exit and ventilation				
e)	Fire extinguishers and first-aid facility ensured				
f)	Lighting provision made by using 24V lamps				
g)	Proper usage of PPEs ensured				
17	RADIOGRAPHY				
a)	Proper storage and handling of source as per BARC / AREB guidelines				
b)	Working permit obtained				
c)	Cordoning of the area done				

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 'H97< B=75@GD97= =75H-CB ''		
	C=@/ ; 5G'		
TITLE	< 95@H< ŽG5: 9HM5B8' 9BJ =F CBA 9BH'fk G9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 47 of 59
			REVISION : 0
			EDITION : 1

SL. NO.	ITEM	YES	NO	REMARKS	ACTION
d)	Use of appropriate PPE's ensured				
e)	Proper training to workers/supervisors imparted				
f)	Minimum occupancy of workplace ensured				
18	HEALTH CHECKS				
a)	Workers medically examined and found to fit for working : i) At heights ii) In confined space.				
b)	Availability of First-aid facilities				
c)	Proper sanitation at site, office and labour camps				
d)	Arrangement of medical facilities				
e)	Measures for dealing with illness				
f)	Availability of Portable drinking water for workmen & staff				
g)	Provision of crèches for children				
h)	Stand by vehicle available for evacuation of injured.				
19	ENVIRONMENT				
a)	Chemical and other effluents properly disposed				
b)	Cleaning liquid of pipes disposed off properly				
c)	Seawater used for hydro-testing disposed off as per agreed procedure				
d)	Lubricant Waste/Engine oils properly disposed				
e)	Waste from Canteen, offices, sanitation etc. disposed properly				
f)	Disposal of surplus earth, stripping materials, oily rags and combustible materials done properly				
g)	Green belt protection				

Signature of Resident
Engineer with Seal

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97< B=75@GD97= =75H-CB `` C=@/ ; 5G`		
TITLE	<95@H-kzG5: 9HM5B8` 9BJ =F CBA 9BHfk G9L` A 5B5; 9A 9BH`	DOCUMENT NO. BR/TS/049	Page 48 of 59 REVISION : 0 EDITION : 1

FORMAT NO. : HSE-2, REV. 0

ACCIDENT / INCIDENT REPORT
(To be submitted by Contractor after every Accident / Incident within 24 hours)

Report No: _____
 Date: _____

Name of Site:- _____
 CONTRACTOR _____

Type of Accident / Incident : ☐ Fatal ☐ Other Lost Time ☐ Non Loss Time ☐ First-Aid case

NAME OF THE INJURED.....
 AGE
 FATHER'S NAME.....
 SUB-CONTRACTOR M/S.....
 DATE & TIME OF ACCIDENT.....
 LOCATION

BRIEF DESCRIPTION OF ACCIDENT

CAUSE OF ACCIDENT

NATURE OF INJURY/DAMAGE

MEDICAL AID PROVIDED/ACTIONS TAKEN

INTIMATION TO LOCAL AUTHORITIES (IF APPLICABLE)


DATE: SI
 W

GNATURE OF CONTRACTOR
 ITH SEAL

To : OWNER.....
 : RCM/SITE-IN-CHARGE, B&R 3

1 COPY
 COPIES

→ Divisional Head (Constn.) through
 → RCM Project Manager, through RCM

BRIDGE AND ROOF CO. (I) LTD.	GH5B85F 8 H97 < B=75@GD97 = 75H-CB ..		
	C=@/ ; 5G		
TITLE	< 95@H < zG5: 9HM5B8 9BJ =F CBA 9BHfk G9L A 5B5; 9A 9BH	DOCUMENT NO. BR/TS/049	Page 49 of 59
			REVISION : 0
			EDITION : 1

FORMAT NO. : HSE-3, REV. 0

SUPPLEMENTARY ACCIDENT / INCIDENT INVESTIGATION REPORT

Supplementary to Report No: _____ (Copy enclosed)

Project: _____ Sit e: _____
 Name of Work : _____ Date: _____
 Contractor: _____ Work Order / LOI No. : _____

NAME OF THE INJURED
 AGE :
 SUB-CONTRACTOR M/S.....
 DATE & TIME OF ACCIDENT / INCIDENT
 LOCATION.....

BRIEF DESCRIPTION & CAUSE OF A ACCIDENT/ INCIDENT

NATURAL OF INJURY/DAMAGE

COMMENTS FROM MEDICAL PRACTITIONER WHO ATTENDED THE VICTIM/INJURED

SUGGESTED IMPROVEMENT IN THE WORKING CONDITION IF ANY

LOSS OF MANHOURS AND IMPACT ON SITE WORKS

ANY OTHER COMMENT BY SAFETY OFFICER.


DATE: SI
W

GNATURE OF CONTRACTOR
ITH SEAL

To : OWNER.....
 : RCM/SITE-IN-CHARGE, B&R 3

1 COPY
 COPIES

→ Divisional Head (Constn.) through
 → RCM Project Manager , through RCM

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB'' C=@/ ; 5G'		
TITLE	<95@HkZG5: 9HM5B8' 9BJ -F CBA 9BHfkG9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR#TG#\$49'	Page 50 of 59 REVISION : 0 EDITION : 1

FORMAT NO. : HSE-4, REV. 0

NEAR MISS INCIDENT – SUGGESTED PROFORMA

Name of Site : _____ Report No: _____
 Name of Work : _____ Date : _____
 Contractor : _____

INCIDENT REPORTED BY :

DATE & TIME OF INCIDENT :

LOCATION :

BRIEF DESCRIPTION OF INCIDENT

PROBABLE CAUSE OF INCIDENT

SUGGESTED CORRECTIVE ACTION

STEPS TAKEN TO AVOID RECURRENCE

YES ☐ NO ☐


DATE:

SIGNATURE OF CONTRACTOR
WITH SEAL

To : OWNER.....
: RCM/SITE-IN-CHARGE

1 COPY
3 COPIES

→ Divisional Head (Constn.) through RCM
 → Project Manager, through RCM

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8 H97 < B=75@GD97 = 75H-CB		
	C=@/ ; 5G		
TITLE	< 95@H < zG5: 9HM5B8 9BJ =F CBA 9BHfk G9L A 5B5; 9A 9BH	DOCUMENT NO. BR/TS/049	Page 51 of 59
			REVISION : 0
			EDITION : 1

FORMAT NO. : HSE-5, REV. 0

MONTHLY HEALTH, SAFETY & ENVIRONMENT (HSE) REPORT
(To be submitted by each Contractor)


Actual Work Start Date: _____ For the Month of: _____
 Project: _____ Report No: _____
 Name of the Contractor: _____ Status as on: _____
 Name of Work: _____ Name of Safety Officer: _____

ITEM		UPTO PREVIOUS MONTH	THIS MONTH	CUMU- LATIVE
a)	Average number of Staff & Workmen (average daily headcount, not man days)			
b)	Manhours Worked			
c)	Number of HSE meeting organized at site			
d)	Number of HSE awareness programmes conducted at site			
e)	Number of Lost Time Accidents (LTA)	Fatal		
		Other LTA		
f)	Number of Loss time Injuries (LTI)	Fatalities		
		Other LTI		
g)	Number of Loss Time Accidents			
h)	Number of First Aid Cases			
i)	Number of Near Miss Incidents			
j)	Man-days lost due to accidents			
k)	LTA Free Manhours i.e. Number of LTA free manhours from the Lst LTA			
l)	Compensation cases raised with Insurance			
m)	Compensation case resolved and paid to workmen			
n)	Whether workmen compensation policy taken	Y/N		
o)	Whether workmen compensation policy valid	Y/N		
p)	Whether workmen registered under ESI Act	Y/N		
Remark				

DATE: _____ Safety Officer /Resident Engineer

(Signature and Name)

To : OWNER
RCM (2 COPIES)

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G''		
TITLE	<95@HkZG5: 9HM5B8' 9BJ =F CBA 9BHfk G9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 52 of 59
			REVISION : 0
			EDITION : 1

FORMAT NO. : HSE-6, REV. 0


PERMIT FOR WORKING AT HEIGHT (ABOVE 2 METER)

Project Site : Sr. No.:
 Name of the work: Date:
 Name of Contractor : Nature of Work :
 Total No.of Workers: Exact location of work :
 Duration of work: from to

The following items have been checked and compliance shall be ensured during the currency of the permit:

Sl.	ITEM	DONE	NOT REQD.
1.	Equipment/Work Area inspected	<input type="checkbox"/>	<input type="checkbox"/>
2.	Considered hazard from other routine/non-routine operations and concerned person alerted	<input type="checkbox"/>	<input type="checkbox"/>
3.	ELCB provided	<input type="checkbox"/>	<input type="checkbox"/>
4.	Proper lighting provided	<input type="checkbox"/>	<input type="checkbox"/>
5.	Area cordoned off.	<input type="checkbox"/>	<input type="checkbox"/>
6.	Precautions against public traffic taken	<input type="checkbox"/>	<input type="checkbox"/>
7.	Sound Scaffolding provided	<input type="checkbox"/>	<input type="checkbox"/>
8.	Adequate protected Platform provided	<input type="checkbox"/>	<input type="checkbox"/>
9.	Access and Exit to the area (Ladder properly fixed)	<input type="checkbox"/>	<input type="checkbox"/>
10.	Floor Openings covered	<input type="checkbox"/>	<input type="checkbox"/>
11.	Safety Net provided	<input type="checkbox"/>	<input type="checkbox"/>
12.	Health check of personnel	<input type="checkbox"/>	<input type="checkbox"/>

- A. Following personal protective equipment are provided (mark) and used as relevant Safety helmet/Gloves/Goggles/Shoes/Face Shield/Life Line/Safety Belt/Safety Harness.
- B. This permit shall be available at the work site at all times.

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H<CB''		
	C=@/ ; 5G'		
TITLE	< 95@H< žG5: 9HM5B8' 9BJ =FCBA 9BH'fkG9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 53 of 59
			REVISION : 0
			EDITION : 1

- C. Permit shall be issued for maximum one week only (Monday to Sunday).
- D. This permit shall be applicable in non-operational areas.
- E. After completion of the work, used permits shall be preserved for record purposes.
- F. Additional precautions, if any

Permission is granted to work (See overleaf) = Yes/No


Name of Contractor's Supervisor
(Initiator)

Name of Contractor's Safety Officer
(Issuing Authority)

GRANT OF PERMIT AND EXTENSIONS

[illegible]

Additional safety instructions, if any.

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G		
TITLE	< 95@H<žG5: 9HM5B8' 9BJ =F CBA 9BH'fk G9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 54 of 59
			REVISION : 0
			EDITION : 1

FORMAT NO. : HSE-7, REV. 0

CONFINED SPACE ENTRY PERMIT


Project Site : Sr. No.:
Name of the work: Date:
Name of Contractor : Nature of Work :
Exact location of work :

Safety Requirements : POSITIVE ISOLATION OF THE VESSEL IS MANDATORY

(A) Has the equipment been ?					
Y	NR		Y	NR	
<input type="checkbox"/>	<input type="checkbox"/>	isolated from power / steam / air	<input type="checkbox"/>	<input type="checkbox"/>	water flushed &/or steamed
<input type="checkbox"/>	<input type="checkbox"/>	isolated from liquid or gases	<input type="checkbox"/>	<input type="checkbox"/>	Manways open & ventilated
<input type="checkbox"/>	<input type="checkbox"/>	depressurized &/or drained	<input type="checkbox"/>	<input type="checkbox"/>	cont. inset gas flow arranged
<input type="checkbox"/>	<input type="checkbox"/>	blanked / blinded / disconnected	<input type="checkbox"/>	<input type="checkbox"/>	adequately cooled
<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	Radiation sources removed
<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	Proper lighting provided

(B) Expected Residual Hazards					
Y	NR		Y	NR	
<input type="checkbox"/>	<input type="checkbox"/>	lack of O ₂	<input type="checkbox"/>	<input type="checkbox"/>	combustible gas / liquid
<input type="checkbox"/>	<input type="checkbox"/>	corrosive chemicals	<input type="checkbox"/>	<input type="checkbox"/>	pyrophoric iron / scales
<input type="checkbox"/>	<input type="checkbox"/>	Heat / stream / frost	<input type="checkbox"/>	<input type="checkbox"/>	high humidity
<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	H ₂ S / toxic gases
<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	electricity / static
<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	ionizing radiation

(C) Protective Measures					
Y	NR		Y	NR	
<input type="checkbox"/>	<input type="checkbox"/>	gloves	<input type="checkbox"/>	<input type="checkbox"/>	ear plug / muff
<input type="checkbox"/>	<input type="checkbox"/>	protective clothing	<input type="checkbox"/>	<input type="checkbox"/>	dust / gas / air line mask
<input type="checkbox"/>	<input type="checkbox"/>	Grounded air educator / blower / AC	<input type="checkbox"/>	<input type="checkbox"/>	attendant with SCBA / air mask
<input type="checkbox"/>	<input type="checkbox"/>	Fire fighting arrangements	<input type="checkbox"/>	<input type="checkbox"/>	safety harness & lifeline
<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	goggles / face shield
<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	personal gas alarm
<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	rescue equipment / team
<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	communication equipment

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8`H97<B=75@GD97= =75H-CB`		
	C=@/ `; 5G`		
TITLE	<95@HkžG5: 9HM5B8` 9BJ =F CBA 9BH'fk G9L` A 5B5; 9A 9BH`	DOCUMENT NO. BR/TS/049 `	Page 55 of 59
			REVISION : 0
			EDITION : 1


Authorization / Renewal (It is safe to enter the confirmed space)

Date	No.of Persons Allowed	Name of Persons allowed	Signature		Time		Signature
			Contractor's Supervisor	Contractor's Safety Officer	From	To	Workman

Permit Closure :

- (A) Entry ☐ was closed ☐ stopped ☐ will continue on
- (B) ☐ Site left in a safe condition
☐ Housekeeping done
- (C) Multi lock ☐ removed ☐ key transferred
☐ Ensured all men have come out ☐ Manways barricaded

Remarks, if any :

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G		
TITLE	<95@HkžG5: 9HM5B8' 9BJ =F CBA 9BHfk G9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 56 of 59
			REVISION : 0
			EDITION : 1

FORMAT NO. : HSE-8, REV. 0

RADIATION WORK PERMIT

Project : Sr. No.:
 Name of the work : Date:
 Name of Contractor : Job No. :

Location of work :

Source Strength :

Cordoned distance (m) :

Name of Radiographing agency :

Approved by Owner

☐

The following items have been checked & compliance shall be ensured during currency of the permit :

S. No.	Item Description	Done
1.	Safety regulations as per BARC/AERB ensured while source in use/ in transit & during storage.	<input type="checkbox"/>
2.	Area cordoned off.	<input type="checkbox"/>
3.	Lighting arrangements for working during nights ensured.	<input type="checkbox"/>
4.	Warning signs / flash lights installed.	<input type="checkbox"/>
5.	Cold work permit taken (if applicable)	<input type="checkbox"/>
6.	PPEs like film badges, dosimeters used.	<input type="checkbox"/>

Additional precautions, if any _____

(Radiography Agency's BARC / AREB authorized Supervisor)

(Contractor's Safety Officer)

Permission is granted.


Permit is valid from _____ AM/PM _____ Date to _____ AM/PM _____
 Date

(Signature of permit issuing authority)

Name :

Designation :

Date :


BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G		
TITLE	< 95@Hk žG5: 9HM5B8' 9BJ =F CBA 9BH'fk G9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 57 of 59
			REVISION : 0
			EDITION : 1

Permit renewal :

Permit extended upto		Additional precautions required, if any.	Sign of issuing authority with date
Date	Time		

Work completed / stopped / area cleared at _____ Hrs. of Date _____

(Sign of permit issuing authority)
Name :

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8'H97<B=75@GD97= =75HCB''		
	C=@/ ; 5G		
TITLE	< 95@k žG5: 9HM5B8' 9BJ =F CBA 9BHfk G9L' A 5B5; 9A 9BH'	DOCUMENT NO. BR/TS/049	Page 58 of 59
			REVISION : 0
			EDITION : 1

FORMAT NO. : HSE-9, REV. 0

RADIATION WORK PERMIT

Project : Sr. No.:
 Name of the work : Date:
 Name of Contractor : Job No. :

Name of Contractor :

Line No. / Equipment No. /Structure to be dismantled :

Location details of dismantling / demolition with sketch : (Clearly indicate the area)

The following items have been checked & compliance shall be ensured during currency of the permit :

S. No.	Item Description	Done	Not Applicable
1.	Services like power, gas supply, water, etc. disconnected.	<input type="checkbox"/>	<input type="checkbox"/>
2.	Dismantling / Demolishing method reviewed & approved.	<input type="checkbox"/>	<input type="checkbox"/>
3.	Usage of appropriate PPEs ensured.	<input type="checkbox"/>	<input type="checkbox"/>
4.	Precautions taken for neighboring structures	<input type="checkbox"/>	<input type="checkbox"/>
5.	First-Aid arrangements made	<input type="checkbox"/>	<input type="checkbox"/>
6.	Fire fighting arrangements ensured	<input type="checkbox"/>	<input type="checkbox"/>
7.	Precautions taken for blasting	<input type="checkbox"/>	<input type="checkbox"/>

(Contractor's Supervisor)


(Contractor's Safety Officer)

Permission is granted.

(Permit issuing authority)

Name :

Date :

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8`H97<B=75@GD97= =75H-CB`		
	C=@/ `; 5G		
TITLE	< 95@HkžG5: 9HM5B8` 9BJ =F CBA 9BH`fkG9L` A 5B5; 9A 9BH`	DOCUMENT NO. BR/TS/049`	Page 59 of 59
			REVISION : 0
			EDITION : 1

Completion Report :

Dismantling / Demolishing is completed on _____ Date at _____ Hrs.

Materials / debris transported to identified location ☐

Tagging completed (as applicable) ☐

Services like power, gas supply, water, etc. restored ☐

(Permit issuing authority)


SPECIFICATION FOR QUALITY ASSURANCE SYSTEMS REQUIREMENTS

SPECIFICATION NO.: BR/TS/050



**(OIL & GAS)
BRIDGE AND ROOF CO.(I) LTD.**


DF9D5F98 '6 M	7 <97 ?98 '6 M	5DDFCJ98 '6 M	GGI 9 85 H9 '
---------------	----------------	---------------	---------------

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8 H97 < B=75@GD97 = =75H-CB "		
	C=@/ ` ; 5G`		
TITLE	EI 5@-HM5GGI F 5B79` GMG H9A GF 9EI = F 9A 9BHG`	DOCUMENT NO. BR/TS/050`	Page 1 of 1
			REVISION : 0
			EDITION : 1

C O N T E N T S

<u>Sl.No.</u>	<u>Description</u>
1.0	INTRODUCTION
2.0	DEFINITIONS
3.0	CONTRACTORS SCOPE OF WORK
4.0	QUALITY ASSURANCE REQUIREMENTS

FORMAT FOR QUALITY PLAN	FORMAT 00001
FORMAT FOR OBSERVATION ON	FORMAT 00002

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8 'H97< B=75@GD97= =75H-CB ''		
	C=@/ ` ; 5G		
TITLE	E I 5@HM5GGI F 5B79' GMGH9A GF 9EI =F 9A 9BHG'	DOCUMENT NO. BR/TS/050 '	Page 1 of 7
			REVISION : 0
			EDITION : 1

1.0 INTRODUCTION

This specification establishes the Quality Assurance Requirements to be met by the sub-contractors (including turnkey Contractors) and their sub-vendors.

In case of any conflict between this specification and other provisions of the contract/ purchase order, the same shall be brought to the notice of B AND R, at the stage of bidding and shall be resolved with B AND R, prior to the placement of order.

2.0 DEFINITION

Bidder

For the purpose of this specification, the word "Bidder" means the person(s), firm, company or organisation who is under the process of being contracted by Consultant/ Owner for delivery of some products (including service). The word is considered synonymous to supplier, contractor or vendor.

Correction

Action taken to eliminate the detected non-conformity.

Refers to repair, rework or adjustment and relates to the disposition of an existing non-conformity.

Corrective Action

Action taken to eliminate the causes of an existing non-conformity, defect or other undesirable situation in order to prevent recurrence.

Preventive Action


Action taken to eliminate the causes of a potential non-conformity, defect or other undesirable situation in order to prevent its recurrence.

Process

Set of inter-related resources and activities which transform inputs into outputs.

Special Process

Processes requiring pre-qualification of their process capability.

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8 H97< B=75@GD97= 75H-CB ..		
	C=@/ ; 5G		
TITLE	EI 5@HM5GGI F 5B79` GMGH9A GF 9EI =F 9A 9BHG`	DOCUMENT NO. BR/TS/050	Page 2 of 7
			REVISION : 0
			EDITION : 1

3.0 **CONTRACTORS SCOPE OF WORK**

3.1 **Prior to award of contract**

The bidder shall understand scope of work, drawings, specifications and standards etc., attached to the tender/ enquiry document, before he makes an offer.

The bidder shall submit milestone chart showing the time required for each milestone activity and linkages between different milestone activities along with overall time period required to complete the entire scope of work.

The bidder shall develop and submit manpower and resource deployment chart.


The bidder shall submit, along with the bid, a manual or equivalent document describing/ indicating/ addressing various control/ check points for the purpose of quality assurance and the responsibilities of various functions responsible for quality assurance.

3.2 **After the award of contract**

The bidder shall submit the schedule for submission of following documents in the kick-off meeting or within two weeks of the placement of order, whichever is earlier.

- Detailed Bar Chart
- Quality plan for all activities, required to be done by the bidder, to accomplish offered scope of work.
- Inspection and test plans, covering various control aspects.
- Job procedures as required by Consultant/ Owner.
- Procurement schedule for items to be supplied by contractor covering inspection of the same.

Various documents submitted by the bidder shall be finalised in consultation with Consultant. Here it shall be presumed that once a bidder has made an offer, he has understood the requirements given in this specification and agrees to comply with them in totality unless otherwise categorically so indicated during pre-award stage through agreed deviation/ exception request. All Quality Assurance Plan (QAP) documents shall be reviewed by concerned functional groups of Consultant and the bidder shall be required to incorporate all comments within the framework of this specification at this stage of the contract. It is also obligatory on the part of the bidder that obtains approval on every Quality Assurance Plan (QAP) documents, before he starts using a particular document for delivery of contracted scope of work. Participation of Consultant/ Owner in review/ approval of quality plan/ QAP documents does not absolve the contractor of his contractual obligations towards specified and intended use of the product (or service) provided/ to be provided by him under the contract.

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8 'H97<B=75@GD97= =75H-CB''		
	C=@/ ` ; 5G		
TITLE	EI 5@HM5GGI F 5B79' GMGH9A GF 9EI =F 9A 9BHG'	DOCUMENT NO. BR/TS/050	Page 3 of 7
			REVISION : 0
			EDITION : 1

3.3 During job execution

During job execution, the bidder shall fully comply with all quality document submitted and finalised/ agreed against the requirements of this specification. Approval of Consultant on all these documents shall be sought before start of work.

Bidder shall produce sufficient quality records on controlled/ agreed forms such that requirements given in this specification are objectively/ demonstrable.

Bidder shall facilitate Consultant/ Owner during quality/ technical audits at his works/ sites.


Bidder shall discharge all responsibilities towards enforcement of this specification on all his sub-contractors for any part of the scope which is sub-contracted.

4.0 QUALITY ASSURANCE SYSTEM REQUIREMENTS


- 4.1 The bidder shall nominate an overall incharge of the contract titled as "Project Manager" for the scope of work of agreed contract. The name of this person shall be duly intimated to Consultant including all subsequent changes, if any. Consultant shall correspond only with the project manager of the bidder on all matters of the project. The project manager of the bidder shall be responsible for co-ordination and management of activities with bidder's organisation and all sub-vendors appointed by the bidder.

After award of work, the bidder may review augmentation of manpower and resources deployment chart (submitted earlier), detail it out, if so consented by Consultant/ Owner and resubmit the same as "issued for effective implementation of the project".


- 4.2 The bidder shall plan the contract scope of work on quality plan format such that no major variation is expected during delivery of contract scope of work. These quality plan shall be made on enclosed format complete in all respect. The quality plan shall be assumed to be detailing bidder's understanding and planning for the contract/ offered scope of work. The bidder shall plan the type of resources including various work methodology which he agrees to utilize for delivery of contract scope of work.
- 4.3 The bidder is required to review the contract at all appropriate stages to evaluate his capabilities with respect to timely and quality completion of all activities pertaining to contracted scope of work and shall report for constraints, if any to Consultant/ Owner.
- 4.4 The design activities, if any, performed during delivery of contract scope of work shall be so controlled that the outputs is reliable enough. It is expected that during development of design, the bidder shall take recourse to detailed checking, inter departmental reviews and documented verification methods.

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB`		
	C=@/ ` ; 5G		
TITLE	E I 5@HM5GGI F 5B79` GMGH9A GF 9EI =F 9A 9BHG`	DOCUMENT NO. BR/TS/050 `	Page 4 of 7
			REVISION : 0
			EDITION : 1

- 4.5 For all documents which the bidder is likely to utilise for delivery of contract scope of work, a system must exist which assures that latest/ required version(s) of the document(s) is available at all location/ point of use.
- 4.6 In case the bidder decides to sub-contract any part/ full of the contract scope of work (without prejudice to main Contractual condition), the bidder shall :
- Evaluate the technical and financial capabilities and past performance of the sub-contractor(s) and their products and/ or services before awarding them with the sub-contracted scope of work. Selection of a sub-contractor should meet Consultant approval in documented form.
 - Requirement of this specification shall be enforced on sub- contracted agency also. The bidder shall choose sub-contractor based on their capability to meet requirements of this specification also.
- Note: It may so happen that, in a given situation, a sub-contractor may not have a system meeting the requirements of this specification. In all such eventualities, bidder may lend his system to sub- contractor for the contract such that sub-contractor effectively meets the requirements of this specification. In all such cases Consultant shall be duly informed.
- 4.7 Bidder shall establish adequate methodology such that the materials supplied by the Owner/ Consultant shall be adequately preserved, handled and made use of for the purpose for which they are provided.
- 4.8 All output delivered against contract scope of work shall be suitably identified in such a manner that either through identification or some other means, sufficient traceability is maintained which permits effective resolution of any problem reported in the outputs.
- 4.9 Critical activities shall be identified and the bidder is required to have documented methodologies which he is going to utilize for carrying out such activities under the contract scope of work. Wherever it is difficult to fully inspect or verify the output (special process), bidder shall pre-qualify, the performers and methodologies.
- 4.10 All inspections carried out by the bidder's surveillance/ inspection staff shall be conformity to quality plans and/ or inspection and test plans. All inspection results shall be duly documented on controlled/ agreed forms such that results can be co-related to specific product, that was inspected/ tested.
- 4.11 All inspection, measuring & test equipments (IMTEs) shall be duly calibrated as per National/ International standards/ codes and only calibrated and certified IMTEs shall be utilized for delivery of contract scope of work.

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB''		
	C=@/ `; 5G		
TITLE	EI 5@HM5GGI F 5B79' GMGH9A GF 9EI =F 9A 9BHG'	DOCUMENT NO. BR/TS/050 '	Page 5 of 7
			REVISION : 0
			EDITION : 1


- 4.12 All outputs/ products delivered against contract scope of work shall be duly marked such that their inspection status is clearly evident during all stages/ period of the contract.
- 4.13 All non-conformities (NCs) found by the contractor's inspection/ surveillance staff shall be duly recorded, including their disposal action. The deficiencies observed during stage of the product, shall be recorded and resolved suitably. Effective corrective and preventive action shall be implemented by the bidder for all repetitive NCs, including deficiencies.
- 4.14 All deficiencies noticed by Consultant/ Owner representative(s) shall be recorded on a controlled form (Format No. 00002). Such deficiencies shall be analysed by the bidder and effective and appropriate correction, corrective and preventive actions shall be implemented. Bidder shall intimate Consultant/ Owner of all such corrective and preventive action implemented by him.
- 4.15 Bidder shall establish appropriate methodologies for safe and effective handling, storage, preservation of various materials/ inputs encountered during delivery of contract scope of work.
- 4.16 Bidder shall prepare sufficient records for various processes carried out by him for delivery of contract scope of work such that requirements of this specification are objectively demonstrable. In case Consultant/ Owner finds that enough objective evidence/ recording is not available for any particular process, bidder shall be obliged to make additional records so as to provide sufficient objective evidence. The decision of Consultant/ Owner shall be final and binding on such issues.
- 4.17 The bidder shall arrange internal quality audits at quarterly intervals, to independently assess the conformance by various performers to the requirements of this specification. The findings of such assessment shall be duly recorded and a copy shall be sent to Consultant/ Owner for review.
- 4.18 For all special processes, bidder shall deploy only qualified performers. Wherever Consultant/ Owner observes any deficiency, the bidder shall arrange the adequate training to the performer(s) before any further delivery of work.

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8 'H97<B=75@GD97= =75H-CB ''		
	C=@/ ' ; 5G'		
TITLE	EI 5@-HM5GGI F 5B79' GMGH9A GF 9EI =F 9A 9BHG'	DOCUMENT NO. BR/TS/050 '	Page 6 of 7
			REVISION : 0
			EDITION : 1

: CFA 5HĒ \$\$\$\$%

Bidder's Quality Plan			Project Name :			PO/ Contract Ref:				
General			Performing Functions			Inspection Functions			Audit Function	
Activity Description	Procedure Number	Code of Conformance	Performer	Checker	Reviewer/ Approver	Sampling Plan	Testing and Inspection Code	Type of (Approval) Surveillance	Audit Scope	Owner's/ Consultant Review/ Audit Requirement

- Note: 1) The bidder ensures that the filled up format conforms to minimum requirements on Quality Plan/ Quality Assurance, specified by Consultant on drawings/ standards/ specifications/ write-up.
- 2) The bidder confirms that document is issued for information/ approval of Owner/ Consultant for the project implementation

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	EI 5@HM5GGI F5B79' GMGH9A GF 9EI =F 9A 9BHG'	DOCUMENT NO. BR/TS/050	Page 7 of 7
			REVISION : 0
			EDITION : 1

OBSERVATION OF QUALITY ASPECTS

FORMAT – 00002

Job No. and Description Issued to : M/s		No.: Date :	
Location of Work : Item of Work :			
Details of Observation(Deficiency)		Recommended Course of Action	
		Time Allowed for Correction :	
Issued by : _____ Name of Signature of RCM			
Corrective Action taken report by Contractor/ Vendor : Date : Name and Signature			
Distribution (before resolution) : Project Manager Owner		CMC Inspection	Resident Construction Manager
Verification of Resolution by RCM/CMC: Date : Name of Signature			
Distribution (before resolution) : Project Manager Owner		CMC Inspection	Resident Construction Manager

GD97 = 75HCB

: CF

8C7I A 9BH5HCB : CF D=D9@B9

7CBGFI 7HCB

GD97 = 75HCB "BC". BR/TS/051




(OIL & GAS)
BRIDGE AND ROOF CO.(I) LTD.

DF9D5F98 '6 M

7 < 97 ? 98 '6 M

5DDFCJ98 '6 M

GGI 9 85H9

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G		
TITLE	8C7I A 9BH5H-CB': CF' D=D9@-B97CBGHFI 7H-CB'	DOCUMENT NO. BR/TS/051'	Page 1 of 6
			REVISION : 0
			EDITION : 1

1.0 **SCOPE**

- 1.1 This specification covers the minimum requirements of various records, reports and drawings for all aspects of pipeline construction to be prepared by Contractor and submitted to the Company at intervals as described in this specification and as directed by Company.
- 1.2 All document required to prepared and submitted by Contractor as per this specification shall be in addition to the various reports, records, methodology statement, calculation, drawings etc. to be submitted by the Contractor for Company's record, review or approval as per the requirements of all other specification included in the Contract between the Company and Contractor.
- 1.3 This specification shall be read in conjunction with the conditions of all specifications and document included in the Contract between Company and Contractor.

2.0 **RECORDS**


Contractor shall submit daily, weekly, monthly and after completion to the Company, various records and reports for Company's documentation purpose during and immediately after the construction. This shall as minimum include, but not limited to the following :

2.1 **Daily**

- Separate progress reports of all crews
- Daily welding results and repairs
- Actual weather conditions
- Application for deviations, if any
- Accidents
- Damages
- Activities required from Company
- Materials Receipts
- Urgently required materials

2.2 **Weekly**

- Up-to-date list of confirmed site instruction issued by Company
- Materials 'taken over'
- Material defects and repairs
- Outstanding activities of Company

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G		
TITLE	8C7I A 9BH5H-CB': CF' D=D9@-B97CBGHFI 7H-CB'	DOCUMENT NO. BR/TS/051'	Page 2 of 6
			REVISION : 0
			EDITION : 1


- List of installed markers, chainage
- Required approval from Company
- Progress planned
- Reports of manning of all crews, equipment and plant
- Report of equipment and plant
- Report of accidents
- Report of damages
- Report of acquired release, permits
- Priced variations
- Required materials for next month

2.3 Monthly

- Progress report for payment, safety report, report of accidents, security report, health and environment report, material balance, approved deviations.

2.4 Further, Contractor shall supply (for approval if required to the Company with document such as but not limited :

- Organogram for construction work.
- Bio-data of key personnel (including foremen).
- (Revised) list of address of personnel in particular of medical staff, safety and security offers.
- (Revised) list of approved coaters.
- (Revised) list of approved sub-contractors.
- Time schedule.
- Acquired permits and/ or approvals from Authorities, if any.
- Minutes of meeting with Company with comments, if any.
- Material certificates, material receipt.
- Guarantee from vendors and sub-contractor.
- Calculations, temporary works, bouyance, blasting.
- Drawings issued by Contractor.
- Vendors drawings.
- As-built of route maps, alignment sheet s, details drawings and isometric drawings.
- Procedures such as surveying, stacking, fencing.
- Welding procedure qualification records, radiographic procedure qualification, welder qualification.
- Coating procedure.
- Installation of crossings.
- Hydrostatic testing.
- Blasting.

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	8C7I A 9BH5H-CB': CF' D=D9@-B9'7CBGHFI 7H-CB'	DOCUMENT NO. BR/TS/051'	Page 3 of 6
			REVISION : 0
			EDITION : 1

- Radiographic report alongwith original radiographs
- Pipe and welding book.
- Reports
 - Material tests (coating, welding, painting)
 - Computerised Potential Logging Test
 - Water Samples
 - Cleaning, Pigging Report before Hydrostatic Test
 - Hydrostatic Test
 - Calibration Test
 - Blasting Trials
 - Equipment certificate (dead weight tester, instruments, vessels, equipment)
 - Manuals
 - Major water crossings
 - Waste disposal
 - Disposal of water after hydrostatic test.

2.5 Contractor shall submit to company colour photographs of various construction activities/ operations at regular intervals. Size, number and frequency of the photographs shall be mutually agreed upon at a later stage. Also Contractor shall make video recordings of all operations right from the start of construction till the completion of the work, covering to the extent as instructed by Company and submit to Company. Upon completion of the work, Contractor shall submit edited master tape plus six copies of video recording in VHS formats or any format ordered by the Company. The duration of video recording shall be of ½ hour and shall cover all aspects of the job.


3.0 **AS-BUILT DRAWINGS AND PIPE BOOK**

3.1 **General**

Contractor shall prepare "as-built" drawings of all by or on behalf of Company issued drawings and of all Contractor work drawings including vendor drawing, such as but not limited to :

For Pipeline Section :

- Route Maps
- Alignment Sheets
- Detail Drawings (road, railway, minor water crossings, major water crossings, valley crossings)

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G		
TITLE	8C7I A 9BH5H-CB': CF' D=D9@-B9'7CBGHFI 7H-CB'	DOCUMENT NO. BR/TS/051'	Page 4 of 6
			REVISION : 0
			EDITION : 1

- Isometric drawings of installation
- Special installation

Further Contractor shall prepare a pipe Weld Book.

If required by the Company, Contractor shall update the diskettes for drawings issued for construction of the job.

3.2 “As-Built” Drawings


Contractor shall prepare a complete set of “as-built” drawings. From the start of construction, Contractor shall on daily basis process any changes in two sets of drawings. Deleted parts shall be indicated in red, new parts in blue, remarks in green and unchanged parts in yellow. Said drawings shall be kept at site and be available to Company at all times. Contractor shall prepare “as-built” drawings based on these data. On completion of the work, one revised film transparency of all drawing made “as-built” by Contractor containing the “as-built” information shall be handed over to Company as well as one complete set of CD ROM/ floppy diskettes as specified by Company.

Contractor shall prepare and submit a specimen of the layout of the drawings for Company's approval.

The required measurement for “as-built” drawing shall be executed by Contractor by experienced, qualified surveyors.

The surveyors shall daily take care of all measurement required such as but not limited to:

- Horizontal location of pipeline with regard to deviations and Permanent Grid Pillars.
- Vertical Level with regard to Mean Sea Level of pipeline and grade.
- Location and type of bends, fittings etc. and grades, points of intersection.
- Change of wall thickness, materials.
- Location and details of valves, insulating flanges, fencing.
- Location and details of crossing pipes, vents.
- Location and type of coating.
- Location and type of weighting, anchoring.
- Location and type of markers.
- Location of further appurtenance (Pig-Signallers)
- Location of ROU and of pipeline with respect to ROU.
- Type of soil.

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	8C7I A 9BH5H-CB': CF' D=D9@-B9'7CBGHFI 7H-CB'	DOCUMENT NO. BR/TS/051'	Page 5 of 6
			REVISION : 0
			EDITION : 1

- Type of rock
- Type of blasting and ripping.
- Sand padding.
- Type of road pavement.
- Details of bank protection, number of insulators, seals.

Contractor shall also prepare isometric drawings of all installation (facilitates) etc. for which the data as mentioned in or required for the Pipe and Welding Book can be identified and these drawings can also be used for material accounting.

3.3 Nameplates of Equipment

All permanent equipment supplied and installed by Contractor shall be provided with plates by Contractor. All texts shall be submitted to Company for approval before plates may be manufactured.

3.4 Pipe Book


Every page of the pipe and Welding Book shall mention:

- Data relevant to the project and section thereof.
- Sequential number.
- Length brought forward (for pipes and other materials).
- Length to bring forward (for pipes and other materials).

Alignment sheet number and at least the location thereon of two welds on every page of the pipe Book.

Further,

- Diameter of pipeline
- Length of each pipe
- Wall thickness
- Pipe number
- Heat number, certificate number
- Cut and re-numbered pipe ends
- Coating type
- Date of stringing
- Date of welding
- Weld number
- Welder number
- Direction of working

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G		
TITLE	8C7I A 9BH5H-CB': CF' D=D9@-B9'7CBGHFI 7H-CB'	DOCUMENT NO. BR/TS/051'	Page 6 of 6
			REVISION : 0
			EDITION : 1

- Type of welding, electrodes, diameter of electrode etc.
- Heat treatment
- Equipment used for radiography
- Limits of water crossings
- Test pressure and date of test.

In order to achieve this, Contractor shall identify all pipe elements. Sample format of Pipe Book shall be submitted for Company approval.

3.5 As-Built Documents

Contractor shall prepare all documents in the prescribed format as indicated below. In addition to the hard copies, softcopies of final documents shall also be submitted in electronic media i.e. CD / DVD format.

Software used for the preparation of these documents shall be as follows:

<u>Type document</u>	<u>Software</u>
a) Reports/ Documents	MS Office
b) Drawings	Auto CAD

For the purpose of preparation of as- built drawings, Contractor shall update the "Issued for construction" drawings issued by the Company. It shall be the Contractor's responsibility to convert the drawings furnished by the Company in hard copy into CAD drawings including scanning, digitising and converting the drawings into a suitable format compatible with the AutoCAD and above. As- built drawings shall be prepared only on AutoCAD drawings.

GD97 = 75 HCB

: CF

: 9 @ > C= BH'7 C5 H= B; G' C: 'D= D9 @ B9

: CF' < 88 '7 F C G G= B; '

GD97 = 75 HCB' BC". 'BR/TS/052'




(OIL & GAS)
BRIDGE AND ROOF CO.(I) LTD.

DF9D5F98'6M

7<97?98'6M


5DDFCJ98'6M

=GGI 9 85 H9'

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	FIELD JOINT COATINGS OF PIPELINE FOR HDD CROSSING	DOCUMENT NO. BR/TS/052	Page 1 of 1
			REVISION : 0
			EDITION : 1

7 'C'B'H'9'B'H'G

- 1.0 SCOPE
- 2.0 REFERENCE DOCUMENTS
- 3.0 SPECIFICATION FOR FIELD JOINT COATING MATERIAL
- 4.0 APPLICATION PROCEDURE
- 5.0 INSPECTION
- 6.0 TESTING
- 7.0 REPAIR OF FIELD JOINT COATING
- 8.0 REPAIR OF PIPE COATING DEFECTS
- 9.0 DOCUMENT

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	FIELD JOINT COATINGS OF PIPELINE FOR HDD CROSSING	DOCUMENT NO. BR/TS/052	Page 1 of 13
			REVISION : 0
			EDITION : 1

1.0 G7 CD9

1.1 ; YbYfU`

This specification covers the minimum requirement for application of anti-corrosion field joints coating on welded pipe section and field tie-in joints referred to here in after as Joint(s). The contractor shall perform all work in accordance with this specification, latest pipeline coating practices and to the full satisfaction of the Owner. The anti-corrosion pipe joint coating shall be compatible with yard applied, Ultra Violet (UV) radiation protected, 3 layer side extruded polyethylene coating conforming to DIN-30670. The sleeve width shall be suitable for cut back of 120 ± 20 mm to be left at both the ends of coated pipes. The job includes supply of all materials equipment, consumables, labour, supervision, quality control, inspection repairs.

1.2 A Ubdck YfZA UHfjU` '9ei jda Ybhi

1.2.1 The Contractor shall supply wrap around heat shrinkable sleeves which is composed of two parts such as adhesive coated wrap around and a curable modified epoxy primer alongwith applicator pads.

1.2.2 The supply of wrap around heat shrinkable sleeve shall be under Contractor's scope.

1.2.3 The Contractor shall provide all skilled/ unskilled personnel required for execution of this work.


1.2.4 The joint coating operation starting from cleaning and surface preparation till application of joint coating and wrapping of the pipe joints shall be performed under the supervision of skilled personnel who are well versed in the work.

1.2.5 Contractor shall at his own cost provide a fully equipped laboratory and test facilities with adequate inventory to carry out tests required for procedure qualification and during regular production, for testing of joint coating system.

2.0 F9: 9F9B79`8C7I A9BHG

2.1 Provision of the following documents/ codes shall generally be followed for standard of specification and workmanship.

- DIN – 30672 : Corrosion protection tapes and Heat Shrinkable Sleeves.
- SIS – 055900 : Pictorial surface preparation standard for painting steel surfaces.
- SSPC – SP1 : Steel structure painting council – Solvent Cleaning.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	FIELD JOINT COATINGS OF PIPELINE FOR HDD CROSSING	DOCUMENT NO. BR/TS/052	Page 2 of 13
			REVISION : 0
			EDITION : 1

2.2 In case of conflict between the requirements of this specification and that of above referred documents/ codes, the requirements of this specifications shall govern.

3.0 **GD97 = 75 HCB : CF : 9 @ > C-BH7 C5 HB ; A5 H9 F 5 @**

3.1 ; YbYfU

This scope covers the minimum requirement of materials, equipment required for installation of field joint coating by wraparound fibre-reinforcement heat-shrinkable sleeve used for corrosion protection and sealing of field joints in pipelines that are forced through the soil by Horizontal Directional Drilling technique. The sleeves shall be suitable for 3LPE/FBE coated pipes operating up to 60°C continuously.

3.1.1 Each Joint Coating System shall consist of :

- For HDD Joint Coating fiber glass reinforced heat shrinkable sleeve certified to Stress class C60 type CANUSA-TBK or COVALENCE / DIRAX shall be used. Directional drilling kit, multilayer sleeve system or equivalent to be approved by Owner / Engineer.
- Only coating material C-60 Class as per EN 12068 and DVGW certified (wrapping tape and heat shrinkable material) will be accepted for all material to be coated.
- A solvent-free, two component liquid epoxy primer
- A specifically designed wear cone
- A clamping belt

3.1.2 **G`YYj Y`6 UW]b[**


The heat shrinkable sleeves shall be manufactured from minimum 1.0 mm thick radiation cross linked, thermally stabilized, UV -resistant heat-shrinkable fabric, composed of a fibre glass reinforcement and polyolefin fibres, embedded in a polyolefin matrix.

3.1.3 **G`YYj Y`5 X\ YgJj Y**

The inner surface of the sleeves shall be coated with a controlled thickness of minimum 1mm of adhesive which in combination with the modified epoxy primer, will bond to and seal to the steel pipe and common yard applied medium temperature yard coatings.

3.1.4 **9 dcl mDf]a Yf**

The Epoxy primer shall be a solvent free, modified two components liquid epoxy type primer, which is applied to cleaned and dry steel surface. When the sleeve coatings,

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	FIELD JOINT COATINGS OF PIPELINE FOR HDD CROSSING	DOCUMENT NO. BR/TS/052	Page 3 of 13
			REVISION : 0
			EDITION : 1

comes in contact with the liquid primer during installation, a strong bond is formed upon full curing of the system.

3.2 DfcdYfhYg'cZ: jY'X'>c]bh7 cUhb['A Uhf]U'


The pipe sleeves furnished under this specification shall be tested and shall meet the requirements specified in the table below:-

3.2.1 <YUHG f]b_U'Y'G'YYj Y'a Uhf]U'

Property	Test Method	7 cbX]h]cb'	Requirement
Cold Crack	ISO 4675		Below 40°C
Chemical resistance	ISO 175	168 hrs. immersion on either 0.1 N NaCl @ 23°C, 0.1N H ₂ SO ₄ @ 23°C, 0.1 N NaOH @ 23°C, Fuel oil @ 23°C. Petroleum jelly @ 70°C	
Followed by test for bursting strength	ISO 3303	23°C	1100 N Min.
Thermal ageing	ISO 188	150°C 168 hrs.	1700 N Min.
Followed by test for bursting strength	ISO 3303	23°C	

3.2.2 5X\ Yg]j Y'a Uhf]U'

Property	HYgh A Yh cX'	7 cbX]h]cb'	FYei jfYa Ybh
Softening point	ASTM E28		85°C minimum
Peel Strength	DIN 30672	23°C. CHS* 100 mm/ min. 60°C	200 N/cm minimum 60 N/ cm
Peel Strength After immersion for 4 weeks at 23°C~NaOH pH12 H ₂ SO ₄ pH2 ground water solution:- 1.2% H ₃ PO ₄ 1.6% KOH	DIN 30672	23°C. CHS* 100 mm/ min.	200 N/cm minimum

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		 <i>Building Nation Since 1920</i>
	OIL & GAS		
TITLE	FIELD JOINT COATINGS OF PIPELINE FOR HDD CROSSING	DOCUMENT NO. BR/TS/052	Page 4 of 13
			REVISION : 0
			EDITION : 1

Property	HYgh A Yh cX'	7 cbX]h]cb'	F Yei JfYa Ybh
1.2NaCl 1.0% Fe ₂ O ₃			
Peel Strength after conditioning for 30 cycles from -30°C to 60°C	DIN 30672	23°C. CHS* 100 mm/ min.	60 N/cm minimum
Shear strength	ISO 4587	23°C. CHS* 50 mm/ min.	200 N/cm ² minimum
Corrosive effect	ASTM D 2671	120°C. 16 hrs.	No corrosion

3.2.3

DfJa Yf'A Uhf]U


Property	Test Method	7 cbX]h]cb'	F Yei JfYa Ybh
Density	ASTM D1084	23 +/- 0.5 ⁰ C Part A: 2 rpm, spindle #6 Part B: 20rpm, spindle #3	Part A: 60+/- 30 Pas Part B: 1.55+/-0.55 Pas
Mixing ratio	By weight By volume	23°C	100:40 100:60
Shear strength	ISO 4587	23°C. CHS* 50 mm/ min.	1000 N/cm ² minimum

f'7 < G'1'7 fcgg' < YUX' GdYYX'

3.2.4

: i bW]cbU'DfcdYfh]Yg'

G'' Bc''	Property	HYghA Yh cX'	7 cbX]h]cb	F Yei JfYa Ybh
a)	Impact resistance	DIN 30672	23°C. Class C	No holidays when tested at 20 KV
b)	Penetration resistance	DIN 30672	60°C. Class C	Minimum 70% of original resistance thickness left; no holidays when tested at 20 KV
c)	Specific coating resistance	DIN 30672	23°C.	10 ⁸ Ohm sq. m minimum; no oxidation on pipe surface

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	FIELD JOINT COATINGS OF PIPELINE FOR HDD CROSSING	DOCUMENT NO. BR/TS/052	Page 5 of 13
			REVISION : 0
			EDITION : 1

G ¹ Bc ¹	Property	HYghA Yh cX ¹	7 cbX]hcb	F Yei JfYa Ybhi
d)	Cathodic disbondment resistance	ASTM G42	60°C. 30 days	15 mm increase in radius of disbondment max.
e)	Resistance to split propagation	TEST METHOD-1*		No cut propagation
f)	Resistance to circumferential edge loading	TEST METHOD-2*		50 KN minimum
g)	Resistance to local edge loading (chisel test)	TEST METHOD-3*		6 KN minimum

†HYghA Yh cXg¹

3.3

HYghA Yh cXg

3.3.1

F Yg]ghUbW¹hc¹gd¹]hdfcdU¹ U]cb¹†HYghA Yh cX¹!%&

A rectangular piece of 50mm width by 150 mm length shall be cut from the material as delivered. A 5mm long, clean cut shall be made mid-way in the piece along once of the long edges perpendicular to this edge. The sample shall be mounted on a clamp that holds it securely and avoids any shrinking during testing.

The assembly shall be placed in an air-circulating oven present at 170⁰C.


After 15 minutes, the sample shall be removed from the oven, allowed to cool down to room temperature and examined for cut propagation.

This test simulates the unlikely event when the sleeve gets cut during the installation phase. Sleeves based upon extruded polyelfin show a distinct tendency to propagate the cut along the total width of the sleeve. Sleeves suitable for HDD works shall not exhibit this behaviour.

3.3.2

F Yg]ghUbW¹hc¹V]fW a ZYfYb]U¹YX[¹Y¹cUX]b[¹†HYghA Yh cX¹!&L

The sleeve shall be installed on a DN 200 three -layer PE coated steel pipe piece. A thick wall steel ring that fits a DN 200 three-layer PE coated steel pipe with a tolerance of 0.2+-0.2 mm shall be positioned against the front edge of the wear cone sleeve and then pushed towards the sleeve system at a constant speed of 5 mm/ min over a distance of 50 mm. The forces necessary shall continuously be registered. The minimum required force shall be less than 50 KN.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	FIELD JOINT COATINGS OF PIPELINE FOR HDD CROSSING	DOCUMENT NO. BR/TS/052	Page 6 of 13
			REVISION : 0
			EDITION : 1

During the pushing or pulling operation, any obstacle protruding from the smooth pipe surface is loaded by the surrounding soil that passes by. This test simulates the shear forces that are exerted on to the sleeve by rigid soil type.

3.3.3

F Yg]ghUbWV'hc`cWU`YX[Y`cUX]b['f7\]gY`hYgh`HYghA YH cX'! 'L'

The sleeve shall be installed on a DN 200 three-layer-PE coated steel pipe piece.

A chisel as depicted in Figure -1 shall be positioned against the front edge of the wear cone sleeve and, pushed parallel to the pipe surface towards the sleeve system at a constant speed of 5mm/ min over a distance of 50 mm. The forces necessary shall continuously be registered. The minimum required force should not be less than 6 KN.

During the pushing or pulling operation, the pipe may traverse soil area containing solid particles, such as stones, pebbles or crushed rock. These particles tend to rip away the pipe coating locally. Any obstacle protruding from the smooth pipe surface is lifted, leading to soil undercutting. This test determines the resistance of sleeve against this type of abuse.

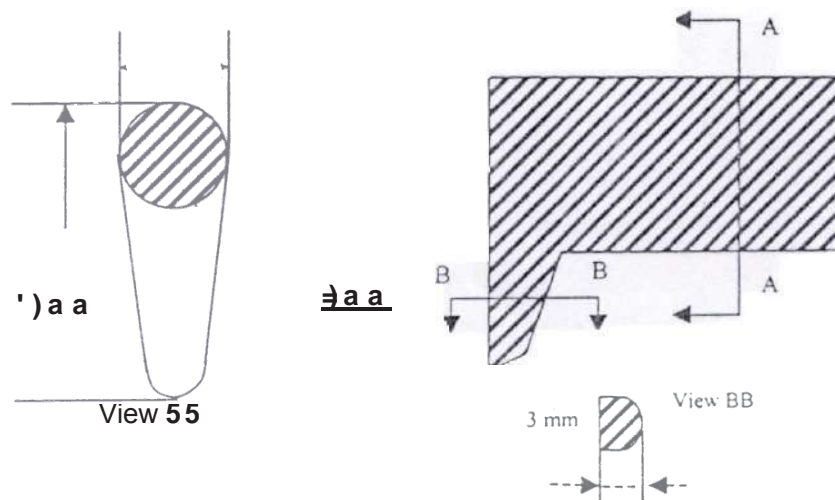



Figure- 1 Chisel

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	FIELD JOINT COATINGS OF PIPELINE FOR HDD CROSSING	DOCUMENT NO. BR/TS/052	Page 7 of 13
			REVISION : 0
			EDITION : 1

3.4 **Ei UJZWHjcb'Zcf'7 cblfUWcfB'gi dd'JYX'A UHfjUg'UbX'R Yjf'A Ubi ZWHi fYf''**

3.4.1 Prior to procurement of coating materials, Contractor shall furnish the following information for qualification of the Manufacturer and material:

- a. Complete descriptive technical catalogs describing the materials offered along with samples of corrosion coating materials, its properties and application instruction as applicable specifically to the project.
- b. Reference list of previous supplies, in last 5 years, of the similar material or manufacturer shall be notified to Company, whose approval in writing of all charges shall be obtained before the materials are manufactured.

3.4.2 Contractor shall ensure that the coating materials supplied by him are properly packed and clearly marked with the following :-

- Manufacturer's name
- Material Qualification Certificate Number
- Batch Number
- Date of Manufacturing and date of expiry

3.4.3 Prior to shipment of materials from the Manufacturer's Works. Contractor shall furnish the following documents:

- a. Test certificate/results as per Manufacturer's Quality Control Procedure for each batch of materials complying with the requirements of relevant sub-clauses of clause no. 3.2 of the this specification.
- b. Specific application instructions with pictorial illustrations.
- c. Specific storage and handling instructions.

3.4.4 All documents shall be in English language only.


3.5 **GhcfUj Y'cZA UHfjUg'**

Material shall be stored in sheltered storage by the Contractor in the manufacturer's original packing and away from direct sunlight and in accordance with manufacturer's instructions.

4.0 **5DD@75HCB'DFC798I F9'**

4.1 **; YbYfU''**

- a) The application procedure shall be in accordance with manufacturer's instruction and the minimum requirements required below whichever are the most stringent and shall be demonstrated to and approved by the Owner.


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	FIELD JOINT COATINGS OF PIPELINE FOR HDD CROSSING	DOCUMENT NO. BR/TS/052	Page 8 of 13
			REVISION : 0
			EDITION : 1

- b) Contractor shall provide and maintain mobile facilities which contains all necessary tools, propane torches, epoxy primer pumps, silicon rollers, testing instruments, equipment, and spares for cleaning, coating, repairs, inspection and testing.
- c) Contractor shall furnish sufficient number of the following equipment and the required spares as a minimum for inspection and testing purpose for each crew :
- Fully automatic full circle adjustable holiday detector with audio and visual output signal for inspection of coating.
 - Portable Tensile Strength Tester
 - Digital Thermometer
 - Solid state digital thickness gauge for measuring thickness of joint coating.

4.2

Preparation of Joint Surface

- a) The Contractor shall thoroughly clean and dry the joint surface by power tool cleaning in accordance with SSPC-SP1. The complete procedure and details of equipment used shall be prepared by the Contractor for Owner's approval prior to commencement of joint coating work.
- b) Prior to cleaning operation, Contractor shall visually examine the joint surface area and shall ensure that all defects, flats and other damages have been repaired or removed.
- c) Where oil, grease or other materials detrimental to the finished coating is present, it shall be removed with a continuous removal solvents cleaning system to remove completely all such materials in accordance with SSPC-SP1.
- d) The standard of finish for cleaned pipe surface shall conform to SA 2½ of Swedish Standard SIS-055900 latest edition. The degree of preparation required to obtain an end product that fulfil the requirements of this specification may not be sufficiently covered and is not limited by SIS-055900. Surface of pipe after shot blasting shall be have an anchor pattern of 50 to 70 microns. This shall be measured by a suitable instrument such as Elecometer.
- e) Piper temperature immediately prior to blasting shall be minimum 20°C. At no time shall be blast cleaning be performed when the relative humidity exceeds 85%. Surface temperature must be at least 3°C above the dew point temperature.
- f) The abrasive blast material shall be free of impurities and inclusions, water and oil. All abrasives shall be removed after blast by brush or vacuum type

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	FIELD JOINT COATINGS OF PIPELINE FOR HDD CROSSING	DOCUMENT NO. BR/TS/052	Page 9 of 13
			REVISION : 0
			EDITION : 1


cleaner prior to applying joint coating. The abrasive shall be stored in a dry condition and maintained dry during use.

- g) The compressed air for blasting shall be free of water and oil. Contractor to verify air cleanliness at the start of the work and every four hours thereafter. Separators and the traps shall be provided at the compressor and blasting station. Separators and traps shall be checked daily for effective moisture and oil removal during coating operations.
- h) The ends of existing line pipe protective coating shall be inspected and chamfered. Unbonded portions of the coating shall be removed and then suitably trimmed. Portions where parent coating is removed shall be thoroughly cleaned as specified.
- i) Pipe shall be visually inspected by Contractor immediately after blast cleaning for surface defects such as slivers, laminations, leafing, scores, indentation slugs or any other defects considered injurious to the coating integrity. Such defects shall be reported to Owner and on permission from Owner, such defects shall be removed by filling or grinding in such a way as not to "blue" the steel.

4.3

DfcWXi fY

- a) The application procedure shall be in accordance with manufacturers instruction and the minimum requirements specified below whichever are the most stringent and shall be demonstrated to and approved by the owner.
- b) Applicators for coating application shall be given necessary instructions and training before start of work by the CONTRACTOR. To verify and qualify the application procedures, all coating applied during the qualification test, shall be removed for destructive testing until the requirements stated in sections 'Inspection' and 'testing' of this specification are met.
- c) Prior to surface cleaning, the surface shall be completely dry. An effective heating equipment which shall not give rise to deposits shall be used. Care shall be taken to avoid damage to existing coating.
- d) All pipe joint surfaces shall be thoroughly examined before the application of the coating in order to ensure that the surfaces are free of oil, grease, rust, mud, earth or any other foreign matter.
- e) Liquid epoxy primer shall be applied on the joints immediately after the completion of heating operation.
- f) The heat shrink sleeve is then wraparound the joint while the primer is still wet and shall overlap the existing pipe coating by minimum 100 mm on each side.


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		 <i>Building Nation Since 1920</i>
	OIL & GAS		
TITLE	FIELD JOINT COATINGS OF PIPELINE FOR HDD CROSSING	DOCUMENT NO. BR/TS/052	Page 10 of 13
			REVISION : 0
			EDITION : 1

- g) The wraparound sleeve is shrunk on pipe joint with a propane torch moved back and forth over the surface when heated above 125°C, the sleeve shall shrink tightly around the substrate on to the wet-primer. At the time of application of the primer, the pipe surface temperature shall be at least 60°C at every point. To check this, approved temperature indicators shall be used. temperature indicating crayons shall not be used.
- h) The wraparound sleeve shall be entirely wrapped around the pipe positioning the closure patch off to one side of the pipe in 10m or 2 O'clock position, with edge of the undergoing layer facing upward and an overlap of min. 100 mm.
- i) Heat shrinking shall be procedure shall be applied to shrink the sleeve in such a manner that all entrapped air is removed using gloved hands and hand rollers. The complete shrinking of entire sleeves shall be obtained without undue heating of existing pipe coating and providing due bonding between pipe, sleeve and pipe coating. A thermochrome paint shall be applied a an closure patch to indicate that sufficient heat/ temperature has been obtained. The joint coating shall have wear cone applied over the leading edge of the sleeve and the clamping belt tightened over it.
- j) Application of Wear Cone - The leading edge will be given an extra wear cone. Start by heating the leading edge area of the main sleeve to 70°C. Wrap the leading edge sleeve over the transition Mill coating. Ensure that the closure is placed away from the main sleeve closure Shrink the leading edge sleeve.
- k) Application of Metal Belt - The metal belt shall be applied over the wear cone sleeve. The metal belt will be tightened using the strapper tool supplied by the manufacturer.
- l) Sufficient manpower working on opposite sides of each pipe joint are required for installation of the sleeve.
- m) The installed sleeve shall not be disturbed until the adhesive has solidified.

5.0 ~~BGD97 HCB~~

5.1 For wraparound coating, a visual inspection shall be carried out for the following :

- Mastic extrusion on either ends of the sleeves shall be examined
- There shall be no sign of punctures or pinholes or bond failure. The external appearance of the sleeves shall be smooth, free of dimples, air entrapment or void formation.
- Weld bead profile shall be visible over the sleeves.
- The entire closure patch shall have changed colour uniformly.


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	FIELD JOINT COATINGS OF PIPELINE FOR HDD CROSSING	DOCUMENT NO. BR/TS/052	Page 11 of 13
			REVISION : 0
			EDITION : 1

5.2 **हॉलिडे डिटेक्टर**

- 5.2.1 The Holiday Detector used shall be checked and calibrated daily with an accurate D.C. voltmeter. The detector electrode shall be in direct contact with the surface of coating to be inspected.
- 5.2.2 The entire surface of the joint section shall be inspected by means of a full circle Holiday Detector approved by OWNER set to DC Voltage of at least 25 kV for wraparound sleeves. Inspection of the heat shrink sleeve coating shall be conducted only after the joint has cooled below + 50°C.
- 5.2.3 All the coated joints shall be subjected to Holiday Detection test.
- 5.2.4 An installed sleeve with more than two holiday shall be stripped and a new one be installed.

6.0 **हॉलिडे टेस्ट**

- OWNER reserves the right to test one out of every 30 joint coating subject to a minimum of 2 joints. CONTRACTOR shall provide all assistance in removing and testing of field joint coatings. From each test sleeve, one or more strips of size 25 mm x 200 mm shall be cut one perpendicular to the pipe axis and slowly peeled off. This test shall be conducted between either sleeve and metal or sleeve and mill coating as per direction of Owner/ Engineer-in-charge.
- The required peel strength shall be 60 N/cm (min.) at 23°C. The system shall fail only in the adhesive layer. No failure either in adhesion to steel or adhesion to backing shall be permitted. The adhesive layer that remains on the pipe surface shall be free of voids resulting from air or gas inclusion.
- If the sleeve taken away for test does not meet the requirement of clause 6.0 (b), the adjacent two sleeves do not meet the requirements of clause 6.0 (b) the field joint coating shall be stopped until OWNER is satisfied with application methods.
- For the test tensile strength, two parallel incisions spaced 1 CM. Apart are made right down to the surface of the steel. A further incision shall then be at right angles to the first angles to the first two incisions. With the aid of a 1 cm. Wide knife the coating is lifted over a length of about 2 cm. And clamped into the tensile tester, where upon a uniform pull is exerted at an angle of 90 degree. The tensile strength shall be more than a 2500psi.
- Coating thickness shall be checked by non destructive method for each field joint.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	FIELD JOINT COATINGS OF PIPELINE FOR HDD CROSSING	DOCUMENT NO. BR/TS/052	Page 12 of 13
			REVISION : 0
			EDITION : 1

7.0 **F9D5-F'C: : 9@>C-BH7C5HB:**

+ "% **2UZYX't]bh]g'XYHWHX'hc'VY'i bUWYdHUV'Y'UZyf']bgdYW]cb'UbX'hYgh]b['Ug'dYf' WU' gY'bc''* '\$'cZH]g'gdYW]WU]cb''H Y7CBHF57HCF'g\ U''ZUh\]g'ck b'Wtgh'.**

- determine the cause of the faulty results of the coatings.
- mobilise the services of expert of manufactures, if required.
- test to the complete satisfaction of the OWNER, already completed field joint coatings.
- stop joint coating until remedial measures are taken against the causes of such failures, to the complete satisfaction of the OWNER.

7.2 CONTRACTOR shall replace all the joints coating found or expected to be unacceptable as per clause no. 6.0 of this specification.

7.3 CONTRACTOR shall, at his own cost repair all areas where the coating has been removed for testing by the OWNER or by the CONTRACTOR to the complete satisfaction of the OWNER.

7.4 The upright edges of the damaged areas shall be chamfered, in addition to the steel shall be free from rust, dirt, oil and grease. The coating around the damaged area shall be roughened. After thorough mixing (in accordance with the recommendations of the manufacturer) the filler shall be applied, to sufficient Thickness with the aid of stooping knife, whilst observing ample overlap hardening. The material will require the approval of OWNER.


7.5 After the coating work on welded joints and repairs to the coating have been completed, The coating area as a whole shall be tested with spark-tester before pull back/ lowering/jacking the pipeline.

7.6 Company shall be entitled to check the coating on buried pipelines or parts of pipelines with equipment such as the "Pearson meter" and the resistance meter. If the coating defects are established, the Contractor shall be responsible for excavation at such points, repairing the coating, spark testing and backfilling the excavations without extra charge.

8.0 **F9D5-F'C: 'D=D9'7C5HB; '89: 97HG**

8.1 Any defect or damage in pipe coating observed till incorporation on permanent works shall be rectified by the Contractor at his risk and cost. However, for repair of damaged coating observed during taking over of Owner supplied pipe, if any, shall be paid extra in accordance with the relevant items of Schedule of Rates.

8.2 Field repair of coated pipes shall be carried out by using same type of wraparound sleeves used for joint coating.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	FIELD JOINT COATINGS OF PIPELINE FOR HDD CROSSING	DOCUMENT NO. BR/TS/052	Page 13 of 13
			REVISION : 0
			EDITION : 1

8.3 The repair procedure shall be same as specified herein above for application of anti-corrosion field joint coating on welded pipe.

9.0 **8C7I A9BH5HCB**

9.1 Prior to start the coating works at site Contractor shall furnish following Owner/Consultant's approved documents in addition to that mentioned in clause no. 3.4 of this specification.

- Procedure for field joint coating & their repair
- Procedure for repair of pipe line coating defects
- Procedure qualification record
- Inspection test plan
- Inspection format

9.2 Final submission of all documents after finish the work shall be as per relevant specification & SCC enclosed with the tender or as per direction of Engineer-in-charge.

SPECIFICATION FOR PIPELINE CROSSINGS USING HORIZONTAL DIRECTIONAL DRILLING METHOD

SPECIFICATION NO.: BR/TS/053




**(OIL & GAS)
BRIDGE AND ROOF CO.(I) LTD.**

DF9D5F98 '6 M

7<97?98 '6 M


5DDFCJ98 '6 M

GGI 9 85H9 '.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPELINE CROSSINGS USING HORIZONTAL DIRECTIONAL DRILLING METHOD	DOCUMENT NO. BR/TS/053	Page 1 of 1
			REVISION : 0
			EDITION : 1

CONTENTS

<u>SL.NO.</u>	<u>DESCRIPTION</u>
1.0	SCOPE
2.0	REFERENCE DOCUMENTS
3.0	DESIGN AND ENGINEERING
4.0	CONSTRUCTION
5.0	DOCUMENTATION

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPELINE CROSSINGS USING HORIZONTAL DIRECTIONAL DRILLING METHOD	DOCUMENT NO. BR/TS/053	Page 1 of 11
			REVISION : 0
			EDITION : 1

1.0 **SCOPE**

- 1.1 This specification covers the minimum requirements for various activities to be carried out by the Contractor for the engineering and construction of pipeline crossing using directional drilling method.
- 1.2 This specification shall be read in conjunction with the requirements of specification and other documents included in the CONTRACT between owner and Contractor.
- 1.3 Contractor shall, execute the work in compliance with laws, by laws, ordinance and regulations. Contractor shall provide all services, labour, inclusive of supervision thereof, supply of all materials (excluding Owner supplied Material), equipment, appliances etc..
- 1.4 Contractor shall take full responsibility for the stability and safety of all operation and methods involved in the work.
- 1.5 Contractor shall be deemed to have inspected and examined the work area and its surroundings and to have satisfied himself as far as practicable with the surface conditions, hydrological and climatic conditions, the extent and nature of the work and materials necessary for the completion of the work, and the means of access to the work area.
- 1.6 Contractor shall be deemed to have obtained all necessary information with regard to risks, contingencies and all other circumstances, which may influence the work.
- 1.7 Contractor shall, in connection with the work, provide and maintain at his own costs all lights, guards, fencing, as necessary or directed by Owner or their representative.
- 1.8 For the purpose of this specification, the following definitions shall hold.
- The words 'Shall' and 'Must' are mandatory.
 - The words 'Should', 'May' and 'Will' are non mandatory, advisory, or recommendatory.
- 1.9 Contractor shall provide free of charge reasonable facilities to Owner's personnel to witness all stages of construction.

2.0 **REFERENCE DOCUMENTS**

Reference has been made in this specification to the latest edition (edition enforce at the time of issue of enquiry) of the following codes, standards and specifications :

- a. ASME B 31.4 : Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids.
- b. ASME B 31.8 : Gas Transmission and Distribution Piping Systems.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		The logo consists of a green circle with a horizontal bar across the middle. Inside the circle, the text 'बी एण्ड आर' is written in Devanagari script above the text 'B AND R' in bold English. Below the circle, the tagline 'Building Nation Since 1920' is written in a smaller font.
	OIL & GAS		
TITLE	PIPELINE CROSSINGS USING HORIZONTAL DIRECTIONAL DRILLING METHOD	DOCUMENT NO. BR/TS/053	Page 2 of 11
			REVISION : 0
			EDITION : 1

- c. OISD 226 : Natural Gas Transmission Pipeline and City Gas Distribution Network.
- d. B AND R's Standards : Navigable Waterway Pipeline Crossing Warning Sign BR/S/05/21/10
- e. B AND R's Standards : Standard Specification for Pipeline Construction BR/S/05/21/01

In case of conflict between the requirements of this specification and the above referred documents, the requirements of this specification shall govern.

3.0 **DESIGN AND ENGINEERING**

3.1 The limits of each crossing shall be determined by the Contractor on the basis of crossing profile based on survey drawings, design, equipment, installation technique and site condition. Contractor shall furnish all engineering design calculation and crossing drawings etc. to owner for their approval prior to execution of the work.

3.2 Within the entire limits of crossing, the minimum cover to top of coated pipe shall be as specified in the Special Conditions of Contract (SCC).

However, wherever the drilled length for a crossing includes the crossings of obstacles such as roads, railroads, canals, streams, etc. The following minimum requirements of cover to the pipe shall be satisfied unless specified otherwise in the scope of work in SCC.

For Road Crossing : 1.4 m from top of road to top of pipe.


For railroad crossing : 1.7 m from base of Rail to top of pipe.

For canal crossing : 1.5 m from lowest bed level to top of pipe.

In case the pipeline crosses other utilities, viz., other pipelines, sewers, drain pipes, water mains, telephone conduits and other underground structures, the pipeline shall be installed with at least 500 mm free clearance from the obstacle or as specified in the drawing or such greater minimum distance as may be required by authorities having jurisdiction. Also in all cases, the minimum covers specified above shall be maintained within the entire limits of crossing.

3.3 The entry and exit points of the pipeline at ground level shall not come within the limits of crossing as defined in the crossing drawings.

3.4 Contractor shall carry out calculations for determining the maximum permissible overburden on pipe, to check that the empty pipeline is safe from collapse at any point along the drilled crossing section. Contractor shall submit these calculations to Owner for approval.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPELINE CROSSINGS USING HORIZONTAL DIRECTIONAL DRILLING METHOD	DOCUMENT NO. BR/TS/053	Page 3 of 11
			REVISION : 0
			EDITION : 1

3.5 Pipeline Axis

The plane containing the pipeline route axis shall be perpendicular to the horizontal plane. There shall be no bending of the pipeline route axis at depths shall lower than 2 meters below ground level.

3.6 Back-reamed hole and Pipeline Interface

3.6.1 Contractor shall derive combination of:

- Back-reamed hole diameter
- Bentonite density
- Pipeline submerged weight in bentonite (and means to achieve that weight)

to optimise the crossing design in terms of pipeline stresses and power requirement

3.6.2 Contractor shall indicated what maximum shear stress in the pipeline coating will result from his choice of above parameters and other characteristics described in this section.

3.6.3 Contractor shall furnish all calculations for Owner's approval. If shear stress in pipe coating is, in the opinion of Owner, beyond the permissible limits, Contractor shall revise his choice of parameters to reduce shear stress on pipe coating to permissible value.

3.7 Contractor shall determine in the minimum allowable elastic bend radius for pipe from the following consideration:


3.7.1 Maximum Longitudinal Stress During Installation

Total maximum longitudinal stress in the pipeline due to tension and bending at any location shall not exceed 90 % of the SM S of the pipe material.

Contractor shall, in order to check this requirement, evaluate the maximum tensile forces to which the pipeline is subjected to at any phase of its installation during the pulling operation.

3.7.2. Maximum Equivalent Stress During Final Hydrostatic Test

After installation, the pipeline shall be hydrostatically tested to a minimum test pressure equal to 1.4 times the design pressure or at a pressure stipulated in the Special Conditions of Contract whichever is higher. However, during hydrostatic testing, the combined equivalent stress in the pipeline due to bending and test pressure shall not exceed 90 % of the SM S of pipe material.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPELINE CROSSINGS USING HORIZONTAL DIRECTIONAL DRILLING METHOD	DOCUMENT NO. BR/TS/053	Page 4 of 11
			REVISION : 0
			EDITION : 1

3.7.3 Maximum Equivalent Stress During Service

Permissible values of maximum equivalent stress during services shall be governed by the requirements of ANSI B 31.8/B 31. 4 as applicable. The details of pipeline operating parameters are provided in the Special Conditions of Contract.

3.7.4 The minimum allowable radius of curvature for the pipeline shall be the highest value of the minimum pipeline elastic radius as computed from the considerations outlined in clause 2.7.1 to 2.7.3 above after correction for drilling inaccuracies or multiplication by the factor 1.85. whichever results in the highest permissible value of minimum elastic bend radius.

3.7.5 Contractor shall submit all calculations for Company's approval alongwith procedure.

3.8 **Pipeline Configuration along the Support String Before Entry Point**

3.8.1 Contractor shall determine the required pipeline configuration in order to allow smooth pull in the crossing entry point and admissible stress in the supported pipeline string. Pipeline combined stress shall not exceed 95 of the specified minimum yield strength for line pipe material.

3.8.2 Contractor shall furnish all calculation and specify the number of required supports, description of the supports, their co-ordinates and capacity in metric tons.

3.8.3 Contractor shall also furnish a drawing of the launching ramp indicating the pipeline configuration.

3.8.4 The distance between each roller shall also be specified and justified.


3.9 Contractor shall, based on result of design and engineering carried out by him, prepare construction drawings for the crossing and shall submit the same for Owner's approval. Construction drawings shall indicate the pipeline profile with levels furnished at sufficient intervals for proper control during construction. Other relevant details viz., entry and exit angles, radius of bends, etc. shall also be indicated. Contractor shall also calculated the total length of pipe line required as well as the maximum tension required on the pull head of the rig.

3.10 All construction works shall be carried out in accordance with the construction drawings approved by Owner.

3.11 Before commencement of any field work, Contractor shall furnish for Owner's approval all design calculations and construction drawings as stipulated in the above clauses.

4.0 **CONSTRUCTION**

Contractor shall comply with all the conditions and requirements issued by Authorities having jurisdiction in the area where the work is to be performed.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPELINE CROSSINGS USING HORIZONTAL DIRECTIONAL DRILLING METHOD	DOCUMENT NO. BR/TS/053	Page 5 of 11
			REVISION : 0
			EDITION : 1

If no public road exists, Contractor shall arrange on his own for access to his work area at no extra cost to owner.

4.1.0 **Installation Procedure**

4.1.1 Contractor shall, before commencing any work at site, submit for Owner's approval a detailed installation procedure.

4.1.2 The installation procedure as a minimum shall include the following:

a) **Project Organisation Chart:**

This shall indicate Contractor's organisational set-up at site and manpower deployment.

b) Details of fabrication yard and launching areas.

c) **Details of Equipment :**

Contractor shall furnish the complete list of all equipment to be deployed for preparation of pipe string and installation of crossing. Technical characteristics and capacity of each equipment including instrumentation, monitoring and control equipment shall be furnished in details.

d) Pipeline string preparation details (hauling, stringing, welding etc.)

e) Hydrostatic test procedure (pre and post installation)

f) Disposal methodology of bentonite slurry.

g) Method of installation covering all steps of construction, viz. Rig up, Pilot hole, Back-Reaming, Pulling Down, Backfilling etc.

h) Calculation for maximum pulling force on the rig and recommended maximum pulling velocity.


i) Time schedule for construction.

4.1.3 The time schedule shall be in accordance with overall time schedule for the project.

4.1.4 Approval by Owner of the methods used by Contractor shall in no way relieve Contractor from the sole responsibility for safe and satisfactory installation, working and operational use of the pipeline crossing.

4.2 **Pipe String Preparation**

Complete pipe string shall be prepared as a single string for pulling. Welding,

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPELINE CROSSINGS USING HORIZONTAL DIRECTIONAL DRILLING METHOD	DOCUMENT NO. BR/TS/053	Page 6 of 11
			REVISION : 0
			EDITION : 1

radiographic inspection of joints and joint coating of the string shall be performed in accordance with the respective applicable specifications included in the Contract document.

4.3 Pre-testing

4.3.1 Contractor shall hydrostatically pre-test the complete pipe string of each crossing before installation as per approved procedure for a minimum period of 24 hours.

4.3.2 After pre-testing, joint coating of the welds shall be done as per specification for specific field joint coating of pipeline for HDD crossing included in the contract document

4.3.3 The section of the pipeline corresponding to the crossing shall, before installation, be subjected to hydrostatic test pressure as stipulated in the Special Conditions of Contract. During the test, Contractor shall check all welds for leakage. Failure, if any, during the test shall be rectified by the Contractor.

4.4 Gauging

4.4.1 Before pre and post installation hydrostatic testing, Contractor shall prove the diameter of the pipeline by passing a gauging pig through the pipeline. The gauging pig shall have a diameter equal to 95% of the nominal internal diameter of the pipe. Contractor shall supply and install all temporary scraper launchers/ receivers and other equipment, piping and materials and consumables required for the purpose.

4.5 Installation

4.7.1 Installation shall be done in accordance with approved installation procedure.


4.7.2 The lateral offset of the actual exit point of the pilot hole from the calculated and theoretical exit point shall not exceed half per cent (0.5%) of the length of the crossing.

4.7.3 The length tolerance shall not exceed one per cent of the crossing length, subject to the condition that the actual exit point shall not be within the limits of crossing as defined in the approved drawings.

4.7.4 Back reaming shall be done separately from the pipeline pulling operation. The size of the back-reamed hole shall be adequate (approximately 1.5 times the pipeline diameter) to allow enough clearance for a smooth pull-back of the pipeline.

4.7.5 Contractor shall be responsible for maintaining the drilled hole till such time the pipeline is pulled in.

4.7.6 During pulling operation, the buoyancy of the pipeline shall be controlled by suitable approved methods so as to maintain the buoyancy as close as possible to zero during pull-back in order to reduce friction forces of the pipeline in the hole.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPELINE CROSSINGS USING HORIZONTAL DIRECTIONAL DRILLING METHOD	DOCUMENT NO. BR/TS/053	Page 7 of 11
			REVISION : 0
			EDITION : 1

4.7.7 Bentonite slurry of specified viscosity shall be pumped into the hole, preventing the wall from collapsing and protecting the pipeline coating.

4.6 **Contractor shall be responsible for the integrity of the corrosion coating.**


4.6.1 Before pull-back operation, megger test shall be done for the entire pipeline (externally corrosion coated) string made for crossing by HDD method.

4.6.2 After pull-back operation to ensure the integrity of pipeline coating, again megger test shall be done for the bored string before tied-in to the mainline pipe. The megger value before & after pulling operation of the pipeline string shall be nearly same and acceptable to Owner.

4.6.3 However, if, in Owner's opinion, the integrity of external corrosion coating of bored pipeline string is not established by above (Clause No. 3.6.1 & 3.6.2), then further in order to ensure the integrity of coating of the bored pipeline string, megger test of the coating shall be carried out in accordance with the following steps:

- a) The test must be carried out before the bored pipe is tied-in to the mainline pipe
- b) Measure the natural potential of the bored pipe at both ends.
- c) Set up the temporary impressed current system with a digital multimeter connected to measure the output current. Position the test electrode anode as far from the bored pipe as interconnecting cable will allow and no closer than 10 meters.
- d) Place the reference electrode at the remote end (opposite to impressed current system) to monitor the bored pipe potential
- e) Impress a current into the bored pipe start at zero amp. and increase slowly until the bored pipe potential is depressed to 1.5 V with respect to the reference electrode.
- f) Note the current from the digital multimeter and calculate the current density.
- g) The desirable value of calculated current density should be less than 70 micro ampere per square meter of drilled pipe surface in contact with the soil.

4.6.4 If Contractor again fails to establish the integrity of coating of the bored pipeline string and the same is not acceptable to Owner, the above works shall not be continued further until the cause analysed and rectified by the Contractor to the entire satisfaction of Owner.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPELINE CROSSINGS USING HORIZONTAL DIRECTIONAL DRILLING METHOD	DOCUMENT NO. BR/TS/053	Page 8 of 11
			REVISION : 0
			EDITION : 1


4.7 Final Hydrostatic Test

4.7.1 The complete crossing section shall be tested after installation. The test pressure shall be as stipulated in the Special Conditions of Contract. After temperature stabilisation, pressure shall be retained in the pipeline for a period of 6 hours and recorded by manothermograph. The hydrostatic testing shall be carried out in accordance with approved procedures and specification detailed elsewhere in the document.

4.7.2 Test Procedure

Contractor shall prepare for Company's approval a hydrostatic test procedure manual for pre-testing and post-installation testing of pipeline. The test procedure manual shall include, but shall not be limited to, the following items:

- a. For the pipe section to be tested, a diagram indicating all fittings, vents, valves, temporary connections, relevant elevations and ratings. The diagram shall also indicate injection locations and intake and discharge lines.
- b. Estimated amount of test water, water source, including required concentration of corrosion inhibitors and additives, procedure for inhibitor injection and control of concentration.
- c. Filling and flushing procedures, including a complete description of all proposed equipment and instruments (including spares), their location and set-up.
- d. The type and sequence of pigs and the pig tracking system for cleaning and removal of air pockets, pig inspection procedures, including procedure to be followed in case the gauging pig indicates damage.
- e. Procedures for levelling and stabilisation after filling and for pressurisation and to allow for temperature stabilisation.
- f. Pressure testing procedure including a complete description of all proposed equipment and instruments (including spares), their location and set-up, and proposed system for observation and recording of data during the pressure test.
- g. All calculations including air-volume calculations and pressure change due to temperature change calculations.
- h. Procedure for detection and location of leaks.
- i. Procedure for safe dewatering the pipeline section after testing, including a complete description of all proposed equipment and instruments (including spares), their location and set-up, the type and sequence of pigs and the pig tracking system along with the pig specifications.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPELINE CROSSINGS USING HORIZONTAL DIRECTIONAL DRILLING METHOD	DOCUMENT NO. BR/TS/053	Page 9 of 11
			REVISION : 0
			EDITION : 1

j. Forms for recording the testing data.


- 4.7.3 Contractor shall furnish all necessary equipment & instrumentation for performing the work including all temporary piping, hydro test header and scraper launcher / receiver etc.
- 4.7.4 The test medium shall be fresh water to be arranged by the Contractor. The water to be used shall be filtered, shall not be contaminated, and free from sand or silt. Contractor shall submit laboratory test reports of water used for testing. Contractor shall provide Company approved corrosion inhibitors, oxygen scavengers and bactericides to be added to the test water. Contractor shall furnish and install all temporary piping, which may be necessary to connect from source of water to its pumps and manifolds / tankage.
- 4.7.5 Before filling operation, Contractor shall clean the pipeline by air driven pigs provided with spring loaded brushes and cups to remove all mill scale, rust / sand from the internal of pipe sections.
- 4.7.6 The hydrostatic test shall be considered as positive if pressure has kept a constant value throughout the test duration, except for changes due to temperature effects, and there is no abrupt pressure drop throughout the test duration.

If test section fails to maintain the specified test pressure after isolation, Contractor shall determine by search the location of leakage or failure. All leaks and failures within the pipe wall or longitudinal seam shall be repaired by replacement of entire joint or joints in which leakage or failure occurs. In those cases where leaks occur in circumferential welds the method of repair shall be determined by Company. Contractor shall comply with instructions of the Company whether to replace a section of the line pipe that includes the line leak or whether to repair the circumferential weld. This repair should, however, meet the requirements of welding specification contained herein. Where failures occur in pipeline field bends, bends shall be replaced with same degree of bends. After completion of repairs, the hydrostatic test shall be repeated in full, as per the approved procedures.

All work of reinstating line pipe, to replace failures, shall be done in accordance with the specifications contained herein.

Contractor shall haul and stockpile all damaged and defective pipes to storage locations designated by the Company. All cracks and splits resulting from failures shall be coated with an application of grease to preserve the characteristics of failures from corrosion. Joints of failed pipes shall be marked with paint, with a tag indicating failure details, date and location of failure and pressure at which failure occurred.

- 4.7.7 After completion of successful hydrotest of the above portion, the pipeline shall be capped and buried. Pipeline end position on the banks shall be marked on the ground by installing location markers on both banks approved by Company.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPELINE CROSSINGS USING HORIZONTAL DIRECTIONAL DRILLING METHOD	DOCUMENT NO. BR/TS/053	Page 10 of 11
			REVISION : 0
			EDITION : 1

4.8 Permanent Pipeline Markers

On both banks of each river crossing, Contractor shall install a Navigable Waterway Pipeline Crossing Warning Sign in accordance with Std. No. MEC/S/05/21/05. Contractor shall supply all materials and fabricate and install the markers as per reference drawing. Wherever feasible, the pipeline markers shall be installed on the embankments, however, exact location shall be decided based on site conditions and as directed by Company.

4.9 Fencing

Wherever specified, Contractor shall supply all materials and install G.I. Wire Chain link security fencing of size 10 m x 10 m x 25 m high with lockable steel gate around the pipe ends and test stations for temporary C.P. on both sides of each river crossing.

4.10 Idle Time Preservation of Pipeline

When so stated in the Contract, Contractor shall supply all materials and consumable including water and inhibitor and shall install all piping connections, valves, instrumentation, etc., and perform all works for preservation of pipeline by pressurization with inhibited water. Contractor shall use approved inhibitors and shall determine the required dosages of inhibitors and pressure for idle time preservation of the pipeline for a period of maximum six months from the date of completion of construction. Corrosion inhibitors and dosages shall be subject to Company's approval prior to use.

4.11 Final Clean up


4.11.1 After completion of construction, Contractor shall clear the site of all balance material and debris and bentonite slurry. All balance pipe lengths shall be returned to Owner's designated stock yard(s). Site/ ROW shall be cleared to the complete satisfaction of the land owner's and authorities having jurisdiction. All such works shall be done at no extra cost to Owner. The Owner shall be indemnified against any/ all claims arising as a result thereof.

4.11.2 Contractor shall arrange for safe disposal of all surplus soil and bentonite slurry & corrosion inhibited test water so as to avoid any harm to the environment / occupants at locations duly approved by authorities and pollution control boards having jurisdiction and/or as instructed by Company without any extra cost.

5.0 DOCUMENTATION

5.1 In addition to the documents specified elsewhere in this specification. Contractor shall submit to the Owner the following documents/ records.

- Copies of the permits obtained from authorities having jurisdiction.


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	PIPELINE CROSSINGS USING HORIZONTAL DIRECTIONAL DRILLING METHOD	DOCUMENT NO. BR/TS/053	Page 11 of 11
			REVISION : 0
			EDITION : 1

- Records of pre and post installation hydrostatic testing.
- Record of non-destructive testing of welds.
- Detailed drilling log and downhole data, including, but not limited to, the following :
 - i) Torque and pulling/pushing force
 - ii) Data on drilling fluid.
 - Density
 - Type of mud and additive employed.
 - Mixing, pumping and cleaning.
- Wash and drill pipe data, viz.,
 - i) Dimension and material properties.
 - ii) Data on API classification.
 - iii) Age of and type of inspection previously carried out on these pipes.
- Permits obtained from authorities having jurisdiction for the various works.
- Plan & profile of the drilled hole along with the water level variations.
- Records of hydrostatic pre-testing and final testing.
- Record of Non Destructive Testing of welds.
- Clearance certificates from the landowners and Authorities having jurisdiction regarding satisfactory clean-up and restoration of pipeline RoU and work areas.
- Clearance certificate from the land owners and authorities having jurisdiction regarding satisfactory clean-up and restoration of the pipeline ROW and work sites.

5.2 After completion of construction, Contractor shall prepare and furnish six sets of copies and two sets of reproducible of 'As-built' for the crossings. As built drawings shall, as a minimum include the following information

- True profile of the crossing along the pipeline.
- True profile of the pipeline as installed and the depth of cover to top of pipe at regular intervals.
- Location of entry and exit point and angles of entry and exit alongwith lateral offset of exit point from the original pipeline alignment.
- Location and angle of field bends
- Location of pipeline markers.
- All As-Built drawings shall be prepared using software AutoCAD Release 2000 or above. Manually drafted drawings are not acceptable to Company. In addition, to the hard copies, as-built drawings shall also be submitted in electronic media i.e. CD / DVD.

5.3 All documents shall be in English language.

BRIDGE AND ROOF CO.(I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR WARNING MATS	 ब्री एण्ड आर B AND R <small>Building Nation Since 1920</small>
TECHNICAL SPECIFICATION NO. : BR/TS/054		REV-0	Page 1 of 4




PROCESS & PIPING DESIGN SECTION BRIDGE AND ROOF CO.(I) LTD.

TECHNICAL SPECIFICATION FOR WARNING MATS


SPECIFICATION NO. : BR/TS/054

DF9D5F98`6 M	7<97?98`6 M	5DDFCJ98`6 M	GGI 9 85H9`.
--------------	-------------	--------------	--------------

BRIDGE AND ROOF CO.(I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR WARNING MATS	 Building Nation Since 1920
TECHNICAL SPECIFICATION NO. : BR/TS/054		REV-0	Page 2 of 4

GD97 = 7 5 H-CB : CF D9 5 BH-FC89BH K 5 FB-B; A5 HG
: CF D-D9 @B9

Purpose	:	For using as a warning sign for Underground Pipeline
Width	:	D + 300 mm, D – Dia of Line Pipe
Thickness	:	1.0 mm thick
Material of the mat	:	The material shall be of high density Polyethylene of virgin quality and non Biodegradable type. It shall have Non Hazardous, Non Toxic and Anti – Rodent properties.
Colour of the mat	:	Golden Yellow with letters printed in RED of non-deletable type with high abrasion resistant.
Art Work	:	A sample piece of 30mm wide and 200mm long of every batch shall be checked by immersing in 20% solution of Ammonium Sulphide for period of 2 weeks at a temperature of 15°C for colour intactness of the strip. Copy of Art work is enclosed at Page 4. H Y 5fh k cf _'g\ U'' VY df]bhX']b'9 b[']g\ ' UbX'`cWU` 'Ub[i U Y UHfbUj Y miUhYj Yfm%a If X]ghUbWV''
Mechanical Properties of HDPE		
Tensile Strength	:	Minimum 200 kg/cm ²
Elongation at Break	:	Minimum 175%
Bundle Length	:	1.0 mm thick warning mat shall be supplied as 100 mtrs length in each bundle packed in PE Woven sack material.
Tests	:	Minimum following test has to be done with each batch of warning mat <ul style="list-style-type: none"> ➤ Tensile Strength test ➤ Elongation test ➤ Impact Strength test ➤ Color fastness test ➤ Heat Stability test ➤ Print Stability test


BRIDGE AND ROOF CO.(I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR WARNING MATS	 <small>Building Nation Since 1920</small>
TECHNICAL SPECIFICATION NO. : BR/TS/054		REV-0	Page 3 of 4

- Oxidation Induction test
- ESCR test
- Melt Flow Rate test
- Anti-Rodent Test.
- UV Stabilizer Test
- DSC Scan Test of Raw Material & Finish Goods.

Test Certificates : Vendor has to submit the all test certificates to Purchaser

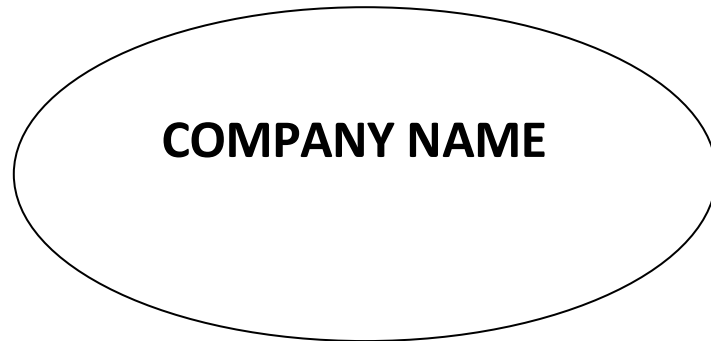
Inspection : The manufacturer has to submit the QAP before commencement of production. Inspection of the material will be done at vendor's works by Client / Consultant Representative. Vendor has to submit all test reports before inspection call. Any test failed during the inspection for the offered lot, the total lot will be rejected.

Documentation : Vendor shall submit all test reports including document regarding Toxicology data & ROHS compliance, documentary evidence regarding Non-biocide product, value of Lethal Dosage (LD), value of % dermal toxicity, details of active ingredient in the product and final inspection reports along with the supply of materials.

BRIDGE AND ROOF CO.(I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR WARNING MATS	
TECHNICAL SPECIFICATION NO. : BR/TS/054		REV-0	Page 4 of 4

<= <'DF9GGI F9'; 5 G'D=D9 @B9''69 @CK''

CLIENT NAME



COMPANY NAME

IN EMERGENCY PLEASE CONTACT

PHONE NOS.


**SPECIFICATION
FOR
SEAMLESS FITTINGS & FLANGES
[SIZE UPTO DN 400 mm (16'') NB]**

SPECIFICATION NO.: BR/TS/055




**(OIL & GAS)
BRIDGE AND ROOF CO.(I) LTD.**

DF9D5F98`6 M	7<97?98`6 M	5DDFCJ98`6 M	GGI 9 85H9`
--------------	-------------	--------------	-------------

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8`H97<B=75@GD97= =75H-CB`		
	C=@/ `; 5G`		
TITLE	G95A @9GG: =HH-B; G/ ` : @5B; 9G`GG=N9'I DHC`8B`(\$` a a`f%*ÎtB6Q	DOCUMENT NO. BR/TS/055`	Page 1 of 1
			REVISION : 0
			EDITION : 1

C O N T E N T S

<u>SL.NO.</u>	<u>DESCRIPTION</u>
1.0	SCOPE
2.0	REFERENCE DOCUMENTS
3.0	MANUFACTURER'S QUALIFICATION
4.0	MATERIALS
5.0	DESIGN AND MANUFACTURE
6.0	INSPECTION AND TESTS
7.0	TEST CERTIFICATES
8.0	PAINTING, MARKING AND SHIPMENT
9.0	DOCUMENTATION

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8 'H97<B=75@GD97= =75H-CB ''		
	C=@/ ; 5G		
TITLE	G95A @9GG: =HH-B; G/ ' : @5B; 9G'G=N9'I DHC '8B'('\$\$' a a 'f%' I t B6Q	DOCUMENT NO. BR/TS/055	Page 1 of 5
			REVISION : 0
			EDITION : 1

1.0 SCOPE


This specification covers the minimum requirements for the design, manufacture and supply of following carbon steel flanges and fittings of size upto DN 400 mm (16") to be installed in onshore pipeline systems handling non-sour hydrocarbons in liquid or gaseous phase including Liquefied Petroleum Gas (LPG) :

- Flanges such as welding neck flanges, blind flanges, spectacle blinds, spacers and blinds etc.
- Seamless fittings such as tees, elbows, reducers, caps, outlets etc.

2.0 REFERENCE DOCUMENTS

2.1 Reference has been made in this specification to the latest edition (edition enforce at the time of issue of enquiry) of the following Codes, Standards and Specifications :

ASME B31.4	-	Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids
ASME B31.8	-	Gas Transmission and Distribution Piping Systems
ASME B16.5	-	Pipe Flanges and Flanged Fittings
ASME B16.9	-	Factory Made Wrought Steel Butt Welding Fittings
ASME B 16.11	-	Forged Steel Fittings, Socket Welding and Threaded
ASME B 16.48	-	Steel Line Blanks
ASME Sec VIII	-	Boiler and Pressure Vessel Code - Rules for Construction of Pressure Vessels
ASME Sec IX	-	Boiler and Pressure Vessel Code - Welding and Brazing Qualifications
ASTM A 370	-	Standard Test Methods and Definitions for Mechanical Testing of Steel Products.
MSS-SP-25	-	Standard Marking System for Valves, Fittings, Flanges and Unions

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8 H97<B=75@GD97= 75H-CB		
	C=@/ ; 5G		
TITLE	G95A @9GG: =HH-B; G/ : @5B; 9G @N9I DHC 8B (\$\$ a a f% I t B6Q	DOCUMENT NO. BR/TS/055	Page 2 of 5
			REVISION : 0
			EDITION : 1

MSS-SP-97 - Forged Carbon Steel Branch Outlet Fittings - Socket Welding, Threaded and Butt welding Ends.

2.2 In case of conflict between the requirements of this specification and the requirements of above referred Codes and Standards, the requirements of this specification shall govern.

3.0 MANUFACTURER'S QUALIFICATION

Manufacturer who intends bidding for fittings must possess the records of a successful proof test, in accordance with the provisions of ASME B16.9 / MSS-SP-75 as applicable.

4.0 MATERIAL

4.1 The Carbon Steel used in the manufacture of flanges and fittings shall be fully killed. Material for flanges and fittings shall comply with the material standard indicated in the Purchase Requisition. In addition, the material shall also meet the requirements specified hereinafter.

4.2 Each heat of steel used for the manufacture of flanges and fittings shall have Carbon Equivalent (CE) not greater than 0.45 calculated from check analysis in accordance with the following formula:


$$CE = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}$$

Carbon contents on check analysis shall not exceed 0.22%.

4.3 For flanges and fittings specified to be used for Gas service or LPG service, Charpy V-notch test shall be conducted on each heat of steel. Unless specified otherwise, the Charpy V-notch test shall be conducted at 0°C in accordance with the impact test provisions of ASTM A 370 for flanges and fittings.

The average absorbed impact energy values of three full-sized specimens shall be 27 joules. The minimum impact energy value of any one specimen of the three specimens analysed as above, shall not be less than 22 Joules.

When Low Temperature Carbon Steel (LTCS) materials are specified for flanges and fittings in Purchase Requisition, the Charpy V-notch test requirements of applicable material standard shall be complied with.

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8 'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	G95A @9GG: =HH-B; G/ ' : @5B; 9G'CG=N9I DHC 8B'(\$\$' a a 'f%# I t B6Q	DOCUMENT NO. BR/TS/055	Page 3 of 5
			REVISION : 0
			EDITION : 1

4.4 For flanges and fittings specified to be used for Gas service or LPG service, Hardness test shall be carried out in accordance with ASTM A 370. Hardness testing shall cover at least 10% per item, per size, per heat, per manufacturing method. A full thickness cross section shall be taken for this purpose and the maximum hardness shall not exceed 248 HV₁₀.

4.5 In case of RTJ (Ring Type Joint) flanges, the groove hardness shall be minimum 140 BHN. Ring Joint flanges shall have octagonal section of Ring Joint.

5.0 DESIGN AND MANUFACTURE

5.1 Flanges such as weld neck flanges and blind flanges shall conform to the requirements of ASME B16.5.

5.2 Spectacle blind and spacer & blind shall conform to the requirements of ASME B 16.48.

5.3 Fittings such as tees, elbows, reducers, etc. shall be seam less type and shall conform to ASME B16.9 for sizes DN 50 mm (2") to DN 400 mm (16") (both sizes included) and ASME B 16.11 for sizes below DN 50 mm (2").

5.4 Fittings such as weldolets, sockolets, nippolets, etc. shall be manufactured in accordance with MSS-SP-97.


5.5 Type, face and face finish of flanges shall be as specified in Purchase Requisition.

5.6 Flanges and fittings manufactured from bar stock are not acceptable.

5.7 All butt weld ends shall be bevelled as per ASME B 16.5 / ASME B 16.9 / MSS-SP-97 as applicable.

5.8 Repair by welding on flanges and fittings is not permitted.

5.9 Stub-in or pipe to pipe connection shall not be used in the manufacture of tees. Tees shall be manufactured by forging or extrusion methods. The longitudinal weld seam shall be kept at 90° from the extrusion. Fittings shall not have any circumferential joint.

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8 'H97<B=75@GD97= =75H-CB ''		
	C=@/ ; 5G'		
TITLE	G95A @9GG: =HH-B; G/ ' : @5B; 9G'G=N9'I DHC 8B' (\$\$' a a f% I L B6Q	DOCUMENT NO. BR/TS/055	Page 4 of 5
			REVISION : 0
			EDITION : 1

6.0 INSPECTION AND TESTS

6.1 The Manufacturer shall perform all inspections and tests as per the requirement of this specification and the relevant codes, prior to shipment at his works. Such inspections and tests shall be, not but limited to the following :

- All flanges and fittings shall be visually inspected. The internal and external surfaces of the flanges and fittings shall be free from any strikes, gauges and other detrimental defects.
- Dimensional checks shall be carried out on finished products as per ASME B16.5 for flanges, ASME B16.48 for spacers and blinds and ASM E B16.9 / MSS-SP-97 as applicable for fittings and as per this specification.
- Chemical composition and mechanical properties shall be checked as per relevant material standards and this specification, for each heat of steel used.
- All finished wrought weld ends subject to welding in field, shall be 100% tested for lamination type defects by ultrasonic test. Any lamination larger than 6.35 mm shall not be acceptable.


6.2 Purchaser's Inspector reserves the right to perform stage wise inspection and witness tests, as indicated in clause 6.1 of this specification at Manufacturer's Works prior to shipment. Manufacturer shall give reasonable notice' of time and shall provide, without charge, reasonable access and facilities required for inspection, to the Purchaser's Inspector.

Inspection and tests performed / witnessed by Purchaser's Inspector shall in no way relieve the Manufacturer's obligation to perform the required inspection and tests.

7.0 TEST CERTIFICATES

Manufacturer shall furnish the following certificates:

- Test certificates relevant to the chemical analysis and mechanical properties of the materials used for manufacture of flanges and fittings as per relevant standards and this specification.
- Test Reports on non destructive testing.
- Certificates for each fitting stating that it is capable of withstanding without leakage a test pressure, which results in a hoop stress equivalent to 100 % of

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G''		
TITLE	G95A @9GG: =HH-B; G/ ' : @5B; 9G'CG=N9I DHC '8B'(\$\$' a a 'f% I t B6Q	DOCUMENT NO. BR/TS/055	Page 5 of 5
			REVISION : 0
			EDITION : 1

the specified minimum yield strength for the pipe with which the fitting is to be attached without impairment of serviceability.

8.0 PAINTING, MARKING AND SHIPMENT

- 8.1 After all inspection and tests required have been carried out; all external surfaces shall be thoroughly cleaned to remove grease, dust and rust and shall be applied with standard mill coating for protection against corrosion during transit and storage. The coating shall be easily removable in the field.
- 8.2 Ends of all fittings and weld neck flanges shall be suit ably protected to avoid any damage during transit. Metallic or high impact plastic bevel protectors shall be provided for fittings and flanges. Flange face shall be suitably protected to avoid any damage during transit.
- 8.3 All flanges and fittings shall be marked as per applicable dimension / manufacturing standard.

9.0 DOCUMENTATION

Documentation to be submitted by Manufacturer to Company is summarized below. Number of Copies (Hard copies / soft copies et c.) shall be as indicated in CONTRACT document / Material Requisition.

- 9.1 At the time of bidding, Manufacturer shall submit the following documents:
- Reference list of previous supplies of similar fittings of similar specification.
 - Clausewise list of deviations from this specification, if any.
 - Brief description of the manufacturing and quality control facilities at Manufacturer's works.
 - Manufacturer's qualification requirement as per clause 3.0 of this specification.
 - Quality Assurance Plan (QAP) enclosed with this tender duly signed, stamped and accepted.
- 9.2 Prior to shipment, the Manufacturer shall submit test certificates as listed in clause 7.0 of this specification.
- 9.3 All documents shall be in English Language only.


SPECIFICATION FOR FLANGES AND WELDED FITTINGS SIZE DN 450 mm (18) AND ABOVE

SPECIFICATION NO. BR/TS/055A




**(OIL & GAS)
BRIDGE AND ROOF CO.(I) LTD.**

DF9D5F98`6 M	7<97?98`6 M	5DDFCJ98`6 M	GGI 9 85H9`
--------------	-------------	--------------	-------------

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8 'H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G''		
TITLE	: @5B; 9G'5B8'K 9@898' : =H-H-B; G'GG-N9'8B'() \$'a a ' f% ÎL'5B8'56CJ 9Q	DOCUMENT NO. BR/TS/055A	Page 1 of 1
			REVISION : 0
			EDITION : 1

C O N T E N T S

<u>SL.NO.</u>	<u>DESCRIPTION</u>
1.0	SCOPE
2.0	REFERENCE DOCUMENTS
3.0	MANUFACTURER'S QUALIFICATION
4.0	MATERIALS
5.0	DESIGN AND MANUFACTURE
6.0	INSPECTION AND TESTS
7.0	TEST CERTIFICATES
8.0	PAINTING, MARKING AND SHIPMENT
9.0	DOCUMENTATION

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		 BAND R <i>Building Nation Since 1920</i>
	C=@/ ; 5G'		
TITLE	: @5B; 9G'5B8'K 9@898' : =H+B; G'G-N9'8B'() \$'a a' f% ÎL'5B8'56CJ 9Q	DOCUMENT NO. BR/TS/055A	Page 1 of 7
			REVISION : 0
			EDITION : 1

1.0

SCOPE

This specification covers the minimum requirements for the design, manufacture and supply of following items to be installed in pipeline system handling hydrocarbons in liquid or gaseous phase including Liquefied Petroleum Gas (LPG) :

- Carbon Steel Welded Fittings 450 mm (18") NB and above, such as tees, elbows, reducers, caps, outlets etc.
- Carbon Steel Flanges 450mm (18") NB and above, such as welding neck flanges, blind flanges, spectacle blind, spacers & blinds etc.

This specification does not cover the above mentioned items which are to be installed in pipeline system handling sour hydrocarbons (liquid/ gas) service as defined in NACE Standard MR-01-75.


2.0

REFERENCE DOCUMENTS

2.1

Reference has been made in this specification to the latest edition (edition enforce at the time of issue of enquiry) of the following Codes, Standards and Specifications :

ASME B31.4	-	Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids
ASME B31.8	-	Gas Transmission and Distribution Piping Systems
ASME B16.5	-	Pipe Flanges and Flanged Fittings
ASME B16.9	-	Factory Made Wrought Steel Butt Welding Fittings
ASME B 16.11	-	Forged Steel Fittings, Socket Welding and Threaded
ASME B 16.48	-	Steel Line Blanks
ASME Sec VIII	-	Boiler and Pressure Vessel Code - Rules for Construction of Pressure Vessels
ASME Sec IX	-	Boiler and Pressure Vessel Code - Welding and Brazing Qualifications
ASTM A 370	-	Standard Test Methods and Definitions for Mechanical Testing of Steel Products.

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G''		
TITLE	: @5B; 9G'5B8'K 9@898' : =H-H; G'G-N9'8B'() \$'a a' f% Î 5B8'56CJ 9Q	DOCUMENT NO. BR/TS/055A'	Page 2 of 7
			REVISION : 0
			EDITION : 1

- | | | |
|-----------|---|--|
| MSS-SP-44 | - | Steel Pipeline Flanges 22" & 26" and above. |
| MSS-SP-25 | - | Standard Marking System for Valves, Fittings, Flanges and Unions |
| MSS-SP-97 | - | Forged Carbon Steel Branch Outlet Fittings - Socket Welding, Threaded and Butt welding Ends. |

2.2 In case of conflict between the requirements of this specification and the requirements of above referred Codes and Standards, the requirements of this specification shall govern.

3.0 MANUFACTURER S QUALIFICATION

The design of fittings shall be established by mathematical analysis contained in ASME Sec. VIII/ ASME B31.3. The design of fittings for which mathematical analysis is not available shall be established by proof testing. These records shall be submitted at the time of bidding, qualifying the complete range of fittings offered. Manufacturer who intends bidding for fittings must posses the records of a successful proof test in accordance with the provisions of ASME B16.9 and/ or MSS-SP-75. These records shall be submitted at the time of bidding, qualifying the complete range of fittings offered. Failure to submit such records at the time of bidding may become a cause of rejection of the offer.


4.0 MATERIALS

4.1 The steel used in the manufacture of fittings and flanges shall be fully killed carbon steel with a grain size of ASTM 7 or finer as defined in ASTM E112. This requirement shall not apply to quenched and tempered fittings. The basic material for fittings and flanges shall be as indicated in the Material Requisition. Additionally, the material shall also meet the requirements specified hereinafter.

4.2 Each heat of steel used for the manufacture of fittings and flanges shall have carbon equivalent (CE) not greater than 0.45 calculated from check analysis in accordance with the following formula:

$$CE = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}$$

4.3 Carbon contents on check analysis shall not exceed 0.22%.

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8 'H97<B=75@GD97= =75H-CB''		
	C=@/ ' ; 5G'		
TITLE	: @5B; 9G'5B8'K 9@898' : =H+B; G'G=N98B'() \$'a a ' f% ÎL'5B8'56CJ 9Q	DOCUMENT NO. BR/TS/055A'	Page 3 of 7
			REVISION : 0
			EDITION : 1

- 4.4 For flanges and fittings specified to be used for Gas service or LPG service, Charpy V-notch test shall be conducted on each heat of steel. Unless specified otherwise, the Charpy V-notch test shall be conducted at 0°C in accordance with the impact test provisions of ASTM A 370 for flanges and MSS-SP-75 for all fittings.


The average absorbed impact energy values of three full-sized specimens shall be 27 joules. The minimum impact energy value of any one specimen of the three specimens analysed as above, shall not be less than 22 Joules.

When Low Temperature Carbon Steel (LTCS) materials are specified in Material Requisition for flanges and fittings, the Charpy V-notch test requirements of applicable material standard shall be complied with.

- 4.5 Hardness test shall be carried out as per ASTM A370 for each heat of steel used. A full thickness cross-section shall be taken for this purpose and the maximum hardness of base metal, weld metal and heat affected zone shall not exceed 248 HV₁₀. Hardness testing shall cover at least 10% per item, per size, per heat, per manufacturing method.
- 4.6 One transverse guided weld bend test shall be performed for each lot of welded fittings produced from the same heat in accordance with provisions of MSS-SP-75. The dimension "A" in guided bend test shall not exceed 4.0 times the nominal wall thickness and dimension "B" shall be equal to A+2t+3.2mm, where "t" is nominal wall thickness.
- 4.7 One transverse weld tensile test shall be conducted on each heat/ lot of welded fittings in accordance with the requirements of MSS-SP-75.
- 4.8 In case of RTJ (Ring Type Joint) flanges, the groove hardness shall be minimum 140 BHN. Ring Joint flanges shall have octagonal section of Ring Joint.

5.0 **DESIGN AND MANUFACTURE**


- 5.1 Flanges such as weld neck flanges and blind flanges shall conform to the requirements of ASME B16.5 upto size DN 600mm (24") excluding DN 550mm (22"), MSS-SP-44 for sizes DN 550mm (22") and ASME B16.47 for sizes DN 650mm (26") and above.
- 5.2 Spectacle blind and Spacer & blind shall conform to the requirements of API 590 upto sizes DN 600mm (24"). For sizes above DN 650mm (26") and above, Spectacle blind and Spacer & blind shall conform to Manufacturer's standard.

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8 'H97< B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	: @5B; 9G'5B8'K 9@898' : =HHB; G'GG-N9'8B'() \$'a a ' f% ÎL'5B8'56CJ 9Q	DOCUMENT NO. BR/TS/055A'	Page 4 of 7
			REVISION : 0
			EDITION : 1

- 5.3 Type, face and face finish of flanges shall be as specified in Material Requisition.
- 5.4 Fittings such as tees, elbows and reducers shall be either welded or seamless type. All fittings shall comply with the requirements of MSS-SP-75. Fittings such as weldolets etc. shall be manufactured in accordance with MSS-SP-97.
- 5.5 Tees shall be manufactured by forging or extrusion method. Stub-in or pipe to pipe connection shall not be used in the manufacture of tees. The longitudinal weld seam shall be kept at 90° from the extrusion. Fittings shall not have any circumferential weld joint.
- 5.6 All butt weld ends shall be bevelled as per ASME B16.5/ MSS-SP-44/ ASME B16.47 as applicable for flanges and MSS-SP-75 / MSS-SP-97 as applicable for fittings.
- 5.7 Inside weld projection for welded fitting shall not exceed 1.6 mm. The reinforcement of inside weld seam shall be removed for a distance of 100mm from each end of welded fittings.
- 5.8 All welds shall be made by welders and welding procedures qualified in accordance with provisions of ASME Sec. IX. The procedure qualification shall include impact test for weld/ heat affected zone, hardness test and guided bend test and shall meet the requirements of Clauses 4.4, 4.5 and 4.6 of this specification, respectively.
- 5.9 Repair by welding on flanges and parent metal of fittings is not allowed. Repair of weld seam by welding shall be carried out by welders and welding procedures duly qualified as per ASME Section IX and API 1104 and records for each repair shall be maintained. Repair welding procedure qualification shall include all tests which are applicable for regular production welding procedure qualification.

6.0 INSPECTION AND TESTS

- 6.1 The Manufacturer shall perform all inspections and tests as per the requirement of this specification and the relevant codes, prior to shipment at his works. Such inspections and tests shall be, but not limited to, the following :
- 6.1.1 All fittings and flanges shall be visually inspected. The internal and external surfaces of the fittings shall be free from any strikes, gouges, burrs and other detrimental defects.
- 6.1.2 Dimensional checks shall be carried out on finished products as per ASME B16.5/ MSS-SP-44/ ASME B16.47 as applicable for flanges and ASME B16.9/ MSS-SP-75 /

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8 'H97<B=75@GD97= =75H-CB ``		
	C=@/ ; 5G`		
TITLE	: @5B; 9G'5B8 'K 9@898` : =H+B; G'G-N9'8B'() \$'a a` f% Î 5B8 '56CJ 9Q	DOCUMENT NO. BR/TS/055A`	Page 5 of 7
			REVISION : 0
			EDITION : 1


MSS-SP-97 as applicable for fittings and as per this specification. Fittings not covered in MSS-SP-75 shall be checked as per Manufacturer's standard.

6.1.3 Chemical composition and mechanical properties shall be checked as per relevant material standards and this specification, for each heat of steel used.

6.1.4 The non-destructive inspection shall be carried out as given below :

- a) All butt and repair welds for welded fittings shall be examined 100% by radiography. Acceptance limits shall be as per API 1104.
- b) When elbows of size $\geq 18"$ NB are manufactured, the first elbow of each radius, diameter and wall thickness shall be ultrasonically checked for sufficient wall thickness in areas where a minimum wall thickness is to be expected. This shall be followed by random inspection of one out of every three elbows of the same radius, diameter and wall thickness.
- c) All finished wrought weld ends shall be 100% tested for lamination type defects by ultrasonic test. Any lamination larger than 6.35mm shall not be acceptable.
- d) Magnetic particle or liquid penetrant examination shall be performed on cold formed butt welding tees with extruded outlets, that are subjected to an extreme fiber elongation of greater than 5% shall be carried out as per the Supplementary Requirement SR3 of MSS-SP-75.
- e) Welds which cannot be inspected by radiographic methods shall be checked by ultrasonic or magnetic particle methods. Acceptance criteria shall be as per ASME Section VIII Appendix 12 and Appendix 6, respectively.

6.2 Purchaser's Inspector reserves the right to perform stagewise inspection and witness tests, as indicated in Clause 6.1 of this specification at Manufacturer's Works prior to shipment. Manufacturer shall give reasonable notice of time and shall provide, without charge, reasonable access and facilities required for inspection, to the Purchaser's Inspector. Inspection and tests performed/ witnessed by Purchaser's Inspector shall in no way relieve the Manufacturer's obligation to perform the required inspection and tests.

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8 H97<B=75@GD97= =75H-CB''		
	C=@/ ; 5G'		
TITLE	: @5B; 9G'5B8'K 9@898' : =H+B; G'G-N9'8B'() \$'a a' f% Î 5B8'56CJ 9Q	DOCUMENT NO. BR/TS/055A'	Page 6 of 7
			REVISION : 0
			EDITION : 1

7.0

TEST CERTIFICATES

Manufacturer shall furnish the following certificates :

- Test certificates relevant to the chemical and mechanical properties of the materials used for manufacture of flanges and fittings as per relevant standards and this specification.
- Test Reports on radiography, ultrasonic inspection and magnetic particle examination.
- Test reports of heat treatment carried out as per the specification.
- Welding procedures and welders' qualification reports.
- Test certificates for each fitting stating that it is capable of withstanding without leakage a test pressure which results in a hoop stress equivalent to 100% of the specified minimum yield strength for the pipe with which the fitting is to be attached without impairment of serviceability.

8.0

PAINTING, MARKING AND SHIPMENT

8.1

After all required inspection and tests have been carried out, all external surfaces shall be thoroughly cleaned to remove grease, dust & rust and shall be applied with standard mill coating for protection against corrosion during transit and storage. The coating shall be easily removable in the field. Manufacturer shall furnish the details of paint used at the time of bidding.

8.2

Ends of all fittings and weld neck flanges shall be suitably protected to avoid any damage during transit. Metallic or high impact plastic bevel protectors shall be provided for fittings and flanges. Flange face shall be suitably protected to avoid any damage during transit.


8.3

All fittings and flanges shall be marked as per applicable dimension / manufacturing standard.

8.4

Package shall be marked legibly with suitable marking ink to indicate the following :

- Manufacturer's Name
- Type of flange(s) and fittings(s)
- Nominal diameter, thickness and material grade
- Purchase order number and item serial number

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F 8 'H97< B=75@GD97= =75H-CB ``		 <i>Building Nation Since 1920</i>
	C=@/ ; 5G`		
TITLE	: @5B; 9G'5B8 'K 9@898` : =H+B; G'G-N9'8B'() \$'a a` f% ÎL'5B8 '56CJ 9Q	DOCUMENT NO. BR/TS/055A`	Page 7 of 7
			REVISION : 0
			EDITION : 1

9.0 DOCUMENTATION

9.1 Manufacturer shall furnish at the time of bidding, the following documents:

- Reference list of similar supplies including all relevant details, viz. Project, Year, Client, Location, Size and Service.
- Record of successful qualification test of fittings in compliance with the requirement of this specification.
- Brief description of the manufacturing, heat treatment and quality control facilities of the Manufacturer's Works.
- Clause-wise list of deviations from this specification, if any.

9.2 Within three weeks of placement of order, Manufacturer shall submit four copies of method of manufacture, testing and quality control procedure for raw material and finished product for Purchaser's approval.

Once the approval has been given by Purchaser, any changes in design, material and method of manufacture shall be notified to the Purchaser, whose approval in writing of all changes shall be obtained before the flanges and fittings are manufactured.

9.3 Within four weeks from the approval date, Manufacturer shall submit six copies of all documents as listed in Clause 9.2 of this specification.

9.4 Prior to shipment, the Manufacturer shall submit six copies of the test certificates as listed in Clause 7.0 of this specification.


9.5 All documents shall be in English Language only.

PROCESS & PIPING DESIGN SECTION
BRIDGE AND ROOF CO.(I) LTD.



TECHNICAL SPECIFICATION
FOR
ASSORTED PIPES


SPECIFICATION NO. : BR/TS/056

BRIDGE AND ROOF CO.(I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR ASSORTED PIPES	
TECHNICAL SPECIFICATION NO. : BR/TS/056		REV-0	PAGE 1 OF 9

CONTENTS

Sl.No.	Description	Page No.
1.0	GENERAL	2
2.0	IBR PIPES	4
3.0	H DROSTATIC TEST	5
4.0	MAR ING & DESPATCH	5
ANNEXURE-I :	H DROSTATIC TEST	7

Prepared By :	Checked By :	Approved By :
----------------------	---------------------	----------------------

BRIDGE AND ROOF CO.(I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR ASSORTED PIPES	
TECHNICAL SPECIFICATION NO. : BR/TS/056		REV-0	PAGE 2 OF 9

1.0 **GENERAL**

1.1 All pipes and their dimensions, tolerances, chemical composition, physical properties, heat treatment, hydrotest and other testing and marking requirements shall conform to the latest codes and standards specified in the Material Requisition (MR). Deviation(s), if any, shall be clearly highlighted in the offer.

1.2 **Testing**

1.2.1 Test reports shall be supplied for all mandatory tests as per the applicable material specifications. Test reports shall also be furnished for any supplementary tests as specified in the MR & Clauses 1.10 & 1.11.

1.2.2 Material test certificates (physical property, chemical composition & treatment report) shall also be furnished for the pipes supplied.


1.3 **Manufacturing Processes**

1.3.1 Steel made by Acid Bessemer Process shall not be acceptable.

1.3.2 All longitudinally welded pipes other than IS:3589 should employ automatic welding.

1.4 Pipe shall be supplied in single or double random length of 4 to 7 and 7 to 14 meters, respectively.

- 1.5
- a) Seamless and E.R.W. pipes shall not have any circumferential seam joint in a random length. However, in case of E.F.S.W. pipe, in one random length one welded circumferential seam of same quality as longitudinal weld is permitted. This weld shall be at least 2.5 m from either end. The longitudinal seams of the two portions shall be staggered by 90°. Single random length in such cases shall be 5 to 7m.
 - b) Unless otherwise mentioned in the respective material code, E.F.S.W. pipes ≤ 36 shall not have more than one longitudinal seam joint and E.F.S.W. pipes ≥ 36 shall not have more than two longitudinal seam joints.

BRIDGE AND ROOF CO.(I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR ASSORTED PIPES	
TECHNICAL SPECIFICATION NO. : BR/TS/056		REV-0	PAGE 3 OF 9

1.6 Pipe with screwed ends shall have NPT external thread per pipe threads conforming to ASME/ ANSI B1.20.1 upto 1.5 NB & IS:554 for 2 to 6 NB.

1.7 Pipe with bevelled ends shall be in accordance with ASME B16.25. Weld contours shall be as follows:

Material	Wall Thickness	Weld Contour
Carbon Steel (Except Low Temp. Carbon Steel)	Upto 22mm	Figure 2 Type A
	22mm	Figure 3 Type A
Alloy Steel Stainless Steel & Low Temp. Carbon Steel	Upto 10 mm	Figure 4
	10 mm & Upto 25 mm	Figure 5 Type A
	25 mm	Figure 6 Type A

1.8 Galvanized pipes shall be coated with zinc by hot dip process conforming to IS:4736/ ASTM A 153.

1.9 All austenitic stainless steel pipes shall be supplied in solution annealed condition.

1.10 **I.G.C. Test for Stainless Steels**

1.10.1 For all austenitic stainless steel pipes, intergranular corrosion test shall have to be conducted as per following:


ASTM A262 practice B with acceptance criteria of 60 mils/ year (max.)

OR

ASTM 262 practice E" with acceptance criteria of No cracks as observed from 20X magnification & Microscopic structure to be observed from 250X magnification .

1.10.2 When specifically asked for in MR for high temperature application of some grades of austenitic stainless steel (eg.SS 309, 310, 316, 316H etc.), ASTM A262 practice C with acceptance criteria of 15 mils/ year (max.) shall have to be conducted.

1.10.3 For the IGC test as described in 1.10.1 & 1.10.2, two sets of samples shall be drawn from each solution annealing lot one set corresponding to highest carbon content and the other corresponding to the highest pipe

BRIDGE AND ROOF CO.(I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR ASSORTED PIPES	
TECHNICAL SPECIFICATION NO. : BR/TS/056		REV-0	PAGE 4 OF 9

thickness. When testing in is conducted as per Practice E , photograph of microscopic structure shall be submitted for record.

- 1.11 All welded pipes indicated as CR O' & LT' in MR shall be impact tested per requirement and acceptance criteria of ASME B31.3. The impact test temperature shall be 196 C & -45 C for stainless steel and carbon steel, respectively, unless specifically mentioned otherwise in MR.
- 1.12 Pipes under NACE' category shall meet the requirements given in MR-01-75.
- 1.13 Specified heat treatment for carbon steel & alloy steel and solution annealing for stainless steel pipes shall be carried out after weld repairs. Number of weld repairs at the same spot shall be restricted to maximum two by approved repair procedure.
- 1.14 For black or galvanised pipes to IS:1239, the minimum percent age of elongation shall be 20 .

2.0 **IBR PIPES**


2.1 **IBR Documentation**

- 2.1.1 Pipes under purview of IBR shall be accompanied with IBR certificate original in Form IIIA, duly approved and countersigned by IBR a uthority/ local authority empowered by the Central Boiler Board of India. Photocopy of the original certificate duly attested by the local boiler inspector where the supplier is located is the minimum requirement for acceptance.
- 2.1.2 For materials 1 Cr- Mo (ASTM A335 Gr. P11/ A691 Gr. 1 Cr) & 2 Cr-1Mo (ASTM A335 Gr.P22/ A691 Gr. 2 Cr.), from III-A approved by IBR shall include the tabulation of E_t , S_c & S_r values for the entire temperature range given below. E_t , S_c & S_r values shall be such t hat throughout the temperature range

$$\begin{array}{rcl} E_t / 1.5 & \geq & \\ S_r / 1.5 & \geq & S_a \\ S_c & \geq & \end{array}$$

where,

S_A : Allowable stress at the working metal temperature.
 E_t : ield point (0.2 proof stress at the working metal temperature).

BRIDGE AND ROOF CO.(I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR ASSORTED PIPES	
TECHNICAL SPECIFICATION NO. : BR/TS/056		REV-0	PAGE 5 OF 9

S_c : The average stress to produce elongation of 1 (creep) in 1,00,000 hrs at the working metal temperature.
 S_r : The average stress to produce rupture in 1,00,000 hrs. at the working metal temperature and in no case more than 1.33 times the lowest stress to produce rupture at this temperature.

S_A (psi)	Temperature (°F)											
Material	500	600	650	700	750	800	850	900	950	1000	1050	1100
A335 Gr. P11	17200	16700	16200	15600	15200	15000	14500	12800	9300	6300	4200	2800
A 691 Gr. 1½ Cr	18900	18300	18000	17600	17300	16800	16300	15000	9900	6300	4200	2800
A335 Gr. P2/ A691 Gr. 2 ¼ Cr	17900	17900	17900	17900	17900	17800	14500	12800	10800	7800	5100	3200

Note: S_A values given above are as per ASME B31.3-1999. Values shall be as per the latest edition prevailing.

2.2 For carbon steel pipes under IBR, the chemical composition shall conform to the following

Carbon (max.) : 0.25
 Others (S, P, Mn) : As prescribed in IBR regulation.

The chemical composition as indicated in this clause is not applicable for pipes other than IBR services.

3.0 **HYDROSTATIC TEST**


Refer Annexure I.

4.0 **MARKING AND DESPATCH**


4.1 All pipes shall be marked in accordance with the applicable codes, standards and specifications. In addition, the purchase order number, the item code & special conditions like IBR, CR O, NACE, etc., shall also be marked.

4.2 Pipes under IBR, CR O, & NACE shall be painted in red stripes, light purple brown stripes & canary yellow stripes, respectively, longitudinally throughout the length for easy identification.

4.3 Paint or ink for marking shall not contain any harmful metal or metallic salts such as zinc, lead or copper which cause corrosive attack on heating.

BRIDGE AND ROOF CO.(I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR ASSORTED PIPES	
TECHNICAL SPECIFICATION NO. : BR/TS/056		REV-0	PAGE 6 OF 9

- 4.4 Pipes shall be dry, clean and free from moisture, dirt and loose foreign materials of any kind.
- 4.5 Pipes shall be protected from rust, corrosion and mechanical damage during transportation, shipment and storage.
- 4.6 Rust preventive used on machined surfaces to be welded shall be easily removable with a petroleum solvent and the same shall not be harmful to welding.
- 4.7 Both ends of the pipe shall be protected with the following material:
- | | | |
|--------------|---|-------------------------------|
| Plain end | : | Plastic cap |
| Bevel end | : | Wood, Metal or Plastic cover |
| Threaded end | : | Metal or Plastic threaded cap |
- 4.8 End protectors to be used on bevelled ends shall be securely and tightly attached with belt or wire.
- 4.9 Steel end protectors to be used on galvanised pipes shall be galvanised.

BRIDGE AND ROOF CO.(I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR ASSORTED PIPES	
TECHNICAL SPECIFICATION NO. : BR/TS/056		REV-0	PAGE 7 OF 9

ANNEXURE–I

3.0 HYDROSTATIC TEST

3.1 All pipes shall be hydrostatically tested.

3.2 The mill test pressure shall be as follows:

3.2.1 Seamless, E.R.W. & Spiral Welded

a) Carbon Steel

Material Standard	Test Pressure Standard
ASTM A 106 Gr. B	ASTM A 530
API 5L Gr. B, Seamless	API 5L
API 5L, E.R.W.	API 5L
API 5L, Spiral	API 5L
ASTM A333 Gr.3 & 6, Seamless	ASTM A 530
ASTM A 333 Gr. 3 & 6, E.R.W.	ASTM A 530

b) Seamless Alloy Steel


Material Standard	Test Pressure Standard
ASTM A335 GR.P1, P12, P11, P22, P5, P9	ASTM A 530
ASTM A268 TP 405, TP410	ASTM A530

c) Seamless Stainless Steel

Material Standard	Test Pressure Standard
ASTM A312 Gr.TP304, 304L, 304H, 316, 316L, 316H, 321, 347	ASTM A 530

d) Seamless Nickel Alloy

Material Standard	Test Pressure Standard
ASTM B161 UNS No.2200	ASTM B161
ASTM B165 UNS No.4400	ASTM B165
ASTM B167 UNS No.6600	ASTM B167
ASTM B407 UNS No.8800	ASTM B407

BRIDGE AND ROOF CO.(I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR ASSORTED PIPES	
TECHNICAL SPECIFICATION NO. : BR/TS/056		REV-0	PAGE 8 OF 9

e) Welded Nickel Alloy

Material Standard	Test Pressure Standard
ASTM B725 UNS No.2200, 4400	ASTM B725
ASTM B517 UNS No.6600	ASTM B517
ASTM B514 UNS No.8800	ASTM B514

3.2.2

Electric Fusion Welded

a) Carbon Steel & Alloy Steel E.FS.W. (16" & above)

Material Standard	Test Pressure Standard
API 5L Gr.B ASTM A 671 Gr.CC65, 70 (Cl.32) ASTM A 672 Gr.C60, 65, 70 (Cl.12,22) ASTM A 671 Gr.CF60, 65, 66, 70 (Cl.32) ASTM A 691 Gr. Cr, 1Cr, 1 Cr, 2 Cr, 5Cr, 9Cr (Cl.42)	P 2ST/ D S 90 of SM S (except for API 5L Gr.B) S 85 of SM S for API 5L Gr.B T Nominal Wall Thickness D O.D. of Pipe


b) Stainless Steel E.FS.W. (2" to 6")

The hydrostatic test pressure in kg/ cm² for the following materials shall be as given below:

Material Gr.1: ASTM A312 TP304/ 304H/ 316/ 316H/ 321/ 347 welded

Material Gr.2: ASTM A312 TP 304L/ 316L welded

Size	Pipe Schedule: S10		Pipe Schedule : S40		Pipe Schedule : S80	
	Material Gr.1	Material Gr.2	Material Gr.1	Material Gr.2	Material Gr.1	Material Gr.2
2	100	80	155	130	230	190
3	80	60	155	130	230	190
4	80	50	155	130	230	190
6	65	35	90	75	155	130


BRIDGE AND ROOF CO.(I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR ASSORTED PIPES	 बी एण्ड आर BAND R <small>Building Nations Since 1920</small>
TECHNICAL SPECIFICATION NO. : BR/TS/056		REV-0	PAGE 9 OF 9

c) Stainless Steel E.FS.W. (8" and above).

Material Standard	Test Pressure Standard
ASTM A358 TP 304L, 304, 304H, 316L, 316, 316H, 321, 347 (Classes 1, 3 & 4)	P 2ST/D S 85 of SM S T Nominal Wall Thickness D O.D. of Pipe
ASTM A358 TP 304L, 304, 304H, 316L, 316, 316H, 321, 347 (Classes 2 & 5)	P 2ST/D S 72 of SM S T Nominal Wall Thickness D O.D. of Pipe

3.2.3 Carbon Steel Pipes to IS Standards

Material Standard	Test Pressure Standard
IS :1239	IS :1239
IS :3589	IS :3589

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F8`H97<B75@GD97=75HCB		
	C=@/ `; 5G`		
TITLE	65@@J5@J9	DOCUMENT NO. BR/TS/057	Page 1 of 20
			REVISION : 0
			EDITION : 1


GH5 B8 5 F 8 'H97 < B=7 5 @
GD97 = 7 5 HCB
: CF
6 5 @@J5 @J9 G

GD97 = 7 5 HCB'BC". BR/TS/057




(OIL & GAS)
BRIDGE AND ROOF CO.(I) LTD.

DF9D5F98 '6 M	7 <97 ?98 '6 M	5 DDFCJ98 '6 M	=GGI 9 85 H9 '.
---------------	----------------	----------------	-----------------

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F8`H97<B75@GD97=75HCB		
	C=@/`;5G`		
TITLE	65@@J5@9	DOCUMENT NO. BR/TS/057	Page 2 of 20
			REVISION : 0
			EDITION : 1


5A9B8A9BH`GH5HI G

G" Bc"	7`U gY#DUfU[fUd\`# 5bbYI i fY`9I\ JV]h# 8fUk]b[`5a YbXYX	DU[Y Bc"	FYj "	8 UY	6 m		J Yf]ZYX	
					BUa Y	Gj["	BUa Y	Gj["

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F8`H97<B75@GD97=75HCB		
	C=@/ ; 5 G		
TITLE	65@@J5@9	DOCUMENT NO. BR/TS/057	Page 3 of 20
			REVISION : 0
			EDITION : 1


5VVfYj]Ujcbg .

ASME	:	American Society of Mechanical Engineers
ASTM	:	American Society for Testing and Materials
API	:	American Petroleum Institute
BHN	:	Brinell hardness number
DN	:	Nominal Size
HAZ	:	Heat Affected Zone
LC	:	Lock Close (valve locked in full close position)
LO	:	Lock Open (valve locked in full open position)
MSS-SP	:	Manufacturers Standardization Society – Standard Practice
NDT	:	Non Destructive Testing
NPS	:	Nominal Pipe Size
RTJ	:	Ring Type Joint
SSPC	:	Steel Structures Painting Council

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F8`H97<B75@GD97=75HCB		
	C=@/`;5G`		
TITLE	65@@J5@9	DOCUMENT NO. BR/TS/057	Page 4 of 20
			REVISION : 0
			EDITION : 1

7`C`B`H9`B`HG

G`Bc"	8 YgWjdHcb
1.0	SCOPE
2.0	REFERENCE DOCUMENTS
3.0	MATERIALS
4.0	DESIGN AND CONSTRUCTION
5.0	INSPECTION AND TESTS
6.0	EXTENT OF INSPECTION & TESTING
7.0	TEST CERTIFICATES
8.0	PAINTING, MARKING AND SHIPMENT
9.0	SPARES AND ACCESSORIES
10.0	DOCUMENTATION
11.0	GUARANTEE
FIGURE-1	VENT, DRAIN & SEALANT INJECTION DETAILS

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F8`H97<B75@GD97=75HCB		
	C=@/ `; 5G`		
TITLE	65@@J5@9	DOCUMENT NO. BR/TS/057	Page 5 of 20
			REVISION : 0
			EDITION : 1

1.0 G7CD9

This specification covers the minimum requirements for design, manufacture, testing and supply of carbon steel ball valves of size DN 50 mm (2") and above and ANSI pressure rating class 150 to 900 to be used in on-shore pipeline systems handling non-sour hydrocarbons in liquid or gaseous phase, including Liquefied Petroleum Gas (LPG).


This specification does not cover ball valves for sour hydrocarbon (liquid / gas) service as defined in NACE standard MR-01-75.

2.0 F9: 9F9B79`8C7I A9BHG

2.1 All valves shall be manufactured and supplied in accordance with the latest edition of American Petroleum Institute (API) Specification 6D / ISO 14313, with additions and modifications as indicated in the following sections of this specification.

2.2 Reference has also been made in this specification to the latest edition of the following Codes, Standards and Specifications:

ASME B 16.5	:	Pipe flanges and flanged fittings
ASME B 16.10	:	Face-to-face and end-to-end dimensions of valves
ASME B 16.25	:	Butt welding ends
ASME B 16.34	:	Valves – flanged, threaded and welding ends
ASME B16.47	:	Large diameter steel flanges
ASME B 31.3	:	Process piping
ASME B 31.4	:	Pipeline transportation systems for liquid hydrocarbons and other liquids
ASME B 31.8	:	Gas transmission and distribution piping systems
ASME Sec VIII	:	Boiler and pressure vessel code - Rules for construction of pressure vessels
ASME Sec IX	:	Boiler and pressure vessel code - Welding and brazing qualifications
ASTM A 370	:	Standard test methods and definitions for mechanical testing of steel products
ASTM B 733	:	Autocatalytic nickel phosphorous coating on metals
API 6FA	:	Fire test for valves

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F8`H97<B75@GD97=75HCB		
	C=@'; 5G`		
TITLE	65@@J5@9	DOCUMENT NO. BR/TS/057	Page 6 of 20
			REVISION : 0
			EDITION : 1

API 607	:	Fire test for soft-seated quarter-turn valves
API 1104	:	Welding of pipelines and related facilities
BS EN ISO 10497	:	Testing of valves – Fire type-testing requirements
MSS-SP-6	:	Standard finishes for contact faces of pipe flanges and connecting-end flanges of valves and fittings
MSS-SP-44	:	Steel pipeline flanges
SSPC-VIS-1	:	Steel structures painting council-visual standard

2.3 ~~It will be~~ between the requirements of this specification, API 6D and the Codes, Standards and Specifications referred in clause 2.2 above, the requirements of this specification shall govern. Order of precedence shall be as follows :

- Valve Data Sheets
- Material Requisition
- This Specification
- API 6D Specification
- Other Referred Codes & Standards
- Manufacturer's Standard

3.0 A5H9F5@G


3.1 Material for major components of the valves shall be as indicated in Valve Data Sheet. Other components shall be as per Manufacturer's standard (suitable for the service conditions indicated in Data Sheet) and shall be subject to approval by Purchaser. In addition, the material shall also meet the requirements specified hereinafter.

3.2 Carbon steel used for the manufacture of valves shall be fully killed.

3.3 The Carbon Equivalent (CE) of valve end connections which are subject to further field welding by Purchaser, shall not exceed 0.43% (as calculated by the following formula) on check analysis for each heat of steel used:

$$CE = \%C + \frac{\%Mn}{6} + \frac{\%Cr + \%Mo + \%V}{5} + \frac{\%Ni + \%Cu}{15}$$


3.4 For Valves specified to be used for Gas service or LPG service, Charpy V-notch test, on each heat of base material shall be conducted as per API 6D Clause 8.5, for all pressure containing parts such as body, end flanges and welding ends as well as bolting material for pressure containing parts. Unless stated otherwise, the Charpy V-notch test shall be conducted at 0 °C. Test procedure shall conform to ASTM A370. The average absorbed energy value of three full sized specimens shall be 27 J. The

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F8`H97<B75@GD97=75HCB		
	C=@` ; 5G`		
TITLE	65 @@J5 @9	DOCUMENT NO. BR/TS/057	Page 7 of 20
			REVISION : 0
			EDITION : 1

minimum impact energy value for any one specimen of the three specimens analysed as above, shall not be less than 22 J.

When Low Temperature Carbon Steel (LTCS) materials are specified in Valve Data Sheet or offered by Manufacturer, the Charpy V-notch test requirements of applicable material standard shall be complied with.

- 3.5 For all such valves where carbon steel is used as ball material, the ball shall have 75 micrometer (0.003 inch) thick Electroless Nickel Plating (ENP) as per ASTM B733 with following classification : SC2, Type II, Class 2. The hardness of plating shall be minimum 50 RC.
- 3.6 For valves specified to be used for Gas service or LPG service, hardness test shall be carried out as per ASTM A370 for each method of manufacture and each heat of steel used in the manufacture of valves. A full thickness cross-section shall be taken for this purpose and the maximum hardness of the materials of valve components shall not exceed 248 HV₁₀.
- 3.7 All process-wetted parts, metallic and non-metallic, shall be suitable for the fluids and service specified by the Purchaser. The service gas composition shall be as given elsewhere in the Material Requisition. In addition, Manufacturer shall confirm that all wetted parts are suitable for treated water / seawater environment, which may be used during field testing.
- 3.8 Non-metallic parts of the valves (including O-rings, soft seal etc.) intended for hydrocarbon gas service at pressures of PN 100 (600 #) and above shall be resistant to explosive decompression.
- 4.0 **89G7 B'5B8'7CBGHFI 7HCB**
- 4.1 Valve design shall meet the requirements of API 6D and other referred codes and shall be suitable for the service conditions indicated in Valve Data Sheet. The ASME Boiler & Pressure Vessel Code, Section VIII, Division 1, may be used to design the valve body. Allowable stress requirements shall comply with the provisions of ASME B31.3. In addition, corrosion allowance indicated in Valve Data Sheet shall be considered in valve design. However, the minimum wall thickness shall not be less than the minimum requirement of ASME B16.34. The Manufacturer shall have a valid license to use API 6D monogram for manufacture of ball valves.
- 4.2 For above ground valves, valve body design shall be either fully welded or bolted type, as indicated in Valve Data Sheet. Valve body joints with threads are not permitted.
- For buried valves, valve body design shall be fully welded type only. Valve body joints with bolts or threads are not permitted.
- 4.3 Ball shall be of single piece, solid type construction.

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F8`H97<B75@GD97=75HCB		
	C=@/`;5G		
TITLE	65@@J5@9	DOCUMENT NO. BR/TS/057	Page 8 of 20
			REVISION : 0
			EDITION : 1

- 4.4 Valves shall be Full Opening (FO) or Reduced Opening (RO) as indicated in Valve Data Sheet. FO valves shall be suitable for the passage of all types of pipeline scraper and inspection pigs on regular basis without causing damage to either the valve component or the pig. The FO valve shall provide an unobstructed profile for pigging operations in either direction. FO valves shall be designed to minimize accumulation of debris in the seat ring region to ensure that valve movement is not impeded.


The opening size of RO valves shall be corresponding to that of a FO valve of smaller nominal diameter as indicated in table below. For sizes of a particular rating not covered in API 6D, the opening sizes of the RO valve shall be as per Manufacturer's standard.

Bca]bU`JUj Y G]nY	Bca]bU`JUj Y G]nY Zcf`FYXi WXX CdYb]b[Bca]bU`JUj Y G]nY	Bca]bU`JUj Y G]nY Zcf`FYXi WXX CdYb]b[
8 B _{aa} `fBDG]bW YgŁ	8 B _{aa} `fBDG]bW YgŁ	8 B _{aa} `fBDG]bW YgŁ	8 B _{aa} `fBDG]bW YgŁ
50 (2)	50 (2)	600 (24)	500 (20)
80 (3)	50 (2)	650 (26)	550 (22)
100 (4)	80 (3)	700 (28)	600 (24)
150 (6)	100 (4)	750 (30)	600 (24)
200 (8)	150 (6)	800 (32)	650 (26)
250 (10)	200 (8)	850 (34)	700 (28)
300 (12)	250 (10)	900 (36)	750 (30)
350 (14)	250 (10)	950 (38)	800 (32)
400 (16)	300 (12)	1000 (40)	850 (34)
450 (18)	350 (14)	1050 (42)	900 (36)
500 (20)	400 (16)	1200 (48)	1050 (42)
550 (22)	450 (18)		


- 4.5 Ball mounting shall be trunnion / pivot type or as indicated in Valve Data Sheet. Ball mounting, either trunnion or floating, unless otherwise specified, shall be as follows.

G" Bc"	5BG=DfYggi fYFU]b[Bca]bU`JUj Y`G]nY fBDG]bW YgŁ	
		:`cU]b[`6U`	Hfi bb]cb`Aci bHYX
1.	150#	≤ 8"	> 8"
2.	300#	≤ 4"	> 4"
3.	600#	Nil	≥ 2"


Valve design shall minimize the possibility of debris ingress into the trunnion as far as practicable.

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F8`H97<B75@GD97=75HCB		
	C=@/ `; 5 G		
TITLE	65 @@J5 @J9	DOCUMENT NO. BR/TS/057	Page 9 of 20
			REVISION : 0
			EDITION : 1

- 4.6 Valve seats shall have metal to metal contact. O-rings or other seals, if used for drip tight sealing, shall be encased in a suitable groove in such a manner that it can not be removed from seat ring and there is no extrusion during opening or closing operation of valve at maximum differential pressure corresponding to valve class rating. The seat rings shall be so designed as to ensure sealing at low as well as high differential pressures.
- 4.7 Valves shall have double block and bleed feature to facilitate complete flushing, draining and venting of the valve body cavity.
- 4.8 For valves to be used in liquid service, the body cavity over-pressure shall be prevented by self relieving seat rings / assemblies. A pressure relief hole in the ball is not permitted. Self relieving seat rings shall relieve at a body cavity differential pressure not exceeding 50% of the valve class rating pressure.
- 4.9 Valves shall be designed to withstand a sustained internal vacuum of at least 1 (one) milli-bar in both open and closed positions.
- 4.10 FO valves of nominal size DN 200 mm (8") & above and RO valves of nominal size DN 250 mm (10") & above shall have provision for secondary sealant injection under full line pressure for seat and stem seals. All sealant injection connections shall be provided with a needle valve, a grease fitting and non-return valve. Valve design shall have a provision to replace the sealant injection fitting under full line pressure. Location and arrangement of sealant points shall be as per Figure-1.
- 4.11 Valves shall be provided with vent and drain connections. Location and arrangement of vents and drains shall be as per Figure-1. Body vent and drain shall be provided with valves (ball or plug type). Number and size shall be as per Figure-1.
- 4.12 Valve design shall ensure repair of stem seals / packing under full line pressure.
- 4.13 a) Valve ends shall be either flanged or butt welded or one end flanged and one end butt welded as indicated in Valve Data Sheet. Flanges of the flanged end cast/ forged body valves shall be integrally cast / forged with the body of valve. Face-to-face/ end-to-end dimensions shall conform to API 6D. Face-to-face and end-to-end dimensions for valve sizes not specified in API 6D shall be in accordance with ASME B 16.10. Face-to-face and end-to-end dimensions not shown in API 6D or in ASME B 16.10 shall be as per Manufacturer Standard and shall be subject to approval by Purchaser.
- b) Flanged ends shall have flanges as per ASME B16.5 for valve sizes up to DN 600 mm (24 inches) excluding DN 550 mm (22 inches) and as per MSS-SP-44 / ASME B 16.47 series A for valve sizes DN 550 mm (22 inches) & for DN 650 mm (26 inches) and above. Flange face shall be either raised face or ring joint type (RTJ) as indicated in Valve Data Sheet. Flange face finish shall be serrated or smooth as indicated in Valve Data Sheet. Smooth finish when specified shall be 125 to 200 microinches AARH. In case of RTJ flanges, the groove hardness shall be minimum 140 BHN.

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F8`H97<B75@GD97=75HCB		
	C=@/`; 5G`		
TITLE	65@@J5@9	DOCUMENT NO. BR/TS/057	Page 10 of 20
			REVISION : 0
			EDITION : 1

- c) Butt weld end preparation shall be as per ASME B16.25. The thickness of the pipe to which the valve has to be welded shall be as indicated in Valve Data Sheet. Valves shall be without transition pups, unless otherwise specified in Valve Data sheet. In case significant difference exists between thickness of welding ends of valve and connecting pipe, the welding ends of valve shall have bevel preparation as per ASME B31.4 or ASME B31.8, as applicable.
- 4.14 Design of weld end valves shall be such that during field welding operations, the soft seals or plastic components of the valve (where ever used) are not liable to be damaged. The Manufacturer shall furnish necessary field welding instructions and post-weld test procedure to demonstrate integrity and leak-tightness of valves after field welding operations.
- 4.15 Valves shall be provided with ball position indicator and stops of rugged construction at the fully open and fully closed positions.
- 4.16 FO valves of nominal size \geq DN 200 mm (8") and RO valves of nominal size \geq DN 250 mm (10") shall be equipped with support foot and lifting lugs. Tapped holes and eye bolts shall not be used for lifting lugs. Height of support foot shall be kept a minimum. The location and size of support foot / lifting lugs shall ensure unrestrictive operation of vent / drain valves.
- 4.17 Valve design shall be such as to avoid bimetallic corrosion between carbon steel and high alloy steel components. Suitable insulation shall be provided as required.
- 4.18 Valves shall be of fire resistant design as per API 607/BS EN ISO 10497/API 6FA, as indicated in Valve Data Sheet.
- 4.19 Valves shall be provided with anti-static devices to ensure electrical continuity between stem / ball and valve body.
- 4.20 Valves shall be suitable for either buried or above ground installation as indicated in Valve Data Sheet.
- 4.21 When stem extension requirement is indicated in Valve Data Sheet, the valves shall have the following provisions :
- Valves provided with stem extension shall have water proof outer casing. Length of stem extension shall be as indicated in Valve Data Sheet. The length indicated corresponds to the distance between centerline of the valve opening and the top of mounting flange for valve operating device (gear operator / power actuator as applicable).
 - Vent and drain connections and sealant injection lines shall be terminated adjacent to the valve operator by means of suitable piping anchored to the valve body. Pipe used shall be API 5L Gr. B / ASTM A 106 Gr. B, with Sch. 80. Fittings shall be ASTM A 105 / ASTM 234 Gr. WPB, Socket Welded, ANSI class 6000.

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F8`H97<B75@GD97=75HCB		
	C=@/';5G`		
TITLE	65@@J5@9	DOCUMENT NO. BR/TS/057	Page 11 of 20
			REVISION : 0
			EDITION : 1

c) Stem extension and stem housing design shall be such that the complete assembly will form a rigid unit giving a positive drive under all conditions with no possibility of free movement between valve body, stem extension or its operator.


d) Outer casing of stem extension shall have 3/8" or 1/2" NPT plugs at the top and bottom, for draining and filling with oil to prevent internal corrosion.

4.22 CdYfUj[b['8 Yj]Wg


- a) Valves shall have a power actuator or manual operator as indicated in Valve Data Sheet. In case of manual operator, valve sizes \leq DN 100 mm (4 inches) shall be wrench operated and valve sizes \geq DN 150 mm (6 inches) shall be gear operated. Each wrench – operated valve shall be supplied with wrench. Valve design shall be such that damage due to malfunctioning of the operator or its controls will only occur in the operator gear train or power cylinder and that damaged parts can be replaced without the valve cover being removed.
- b) The power actuator shall be in accordance with the Purchaser specification issued for the purpose and as indicated in Valve and Actuator Data Sheet. Operating time shall be as indicated in Valve Data Sheet. Valve operating time shall correspond to full close to full open/full open to full close under maximum differential pressure corresponding to the valve rating. For actuated valves, the actuator torque output shall be 1.25 times the break torque required to operate the ball valve under the maximum differential pressure corresponding to the valve class rating.
- c) For manual operator of all valves, the diameter of the hand wheel or the length of operating wrench shall conform to API 6D requirements and be such that under maximum differential pressure, the total force required to operate the valve does not exceed 350 N. Manufacturer shall also indicate the number of turns of hand wheel (in case of gear operators) required for operating the valve from full open to full close position.
- d) Direction of operation of hand wheel or wrench shall be in clock-wise direction while closing the valve. Hand wheels shall not have protruding spokes.
- e) Gear operators, when provided, shall have a self locking provision and shall be fully encased, in water proof/ splash proof/ dust proof/ weather proof enclosure and shall be filled with suitable grease.
- f) Operating devices shall be designed for easy operation of the valve under maximum differential pressure corresponding to the valve rating.

4.23 All welds shall be made by welders and welding procedures qualified in accordance with the provisions of ASME Section IX. The procedure qualification shall include impact test and hardness test and shall meet the requirements of clauses 3.4 and 3.6 of this specification, respectively.

4.24 All welds shall be stress relieved in accordance with ASME Section VIII.

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F8`H97<B75@GD97=75HCB		
	C=@/ `; 5 G		
TITLE	65 @@J5 @9	DOCUMENT NO. BR/TS/057	Page 12 of 20
			REVISION : 0
			EDITION : 1

- 4.25 Repair by welding is not permitted for fabricated and forged body valves. However, repair by welding as per ASME B16.34 is permitted for cast body valves. Such repairs shall be carried out at casting supplier's care only. Repair shall be carried out before any heat treatment of casting is done. Repair welding procedure qualification shall also include impact test and hardness test and shall meet the requirements of clauses 3.4 & 3.6 of this specification, respectively.
- 4.26 The tolerance on internal diameter and out of roundness at the ends for welded end valves shall be as per applicable connected pipe specification as indicated in Valve Data Sheet.
- 4.27 When indicated in Material Requisition, valves shall have locking device to lock the valve either in full open (LO) or full close (LC) positions. Locking devices shall be permanently attached to the valve operator and shall not interfere with operation of the valve.
- 4.28 Valve stem shall be capable of withstanding the maximum operating torque required to operate the valve against the maximum differential pressure corresponding to applicable class rating. The combined stress shall not exceed the maximum allowable stresses specified in ASME Section VIII, Division I. In case of power actuated valves, the valve stem shall be designed for maximum output torque of the selected power actuator (including gear box, if any) at valve stem.
- 5.0 **BGD97HCB`5B8`H9GHG**
- 5.1 The Manufacturer shall perform all inspection and tests as per the requirements of this specification and the relevant codes, prior to shipment, at his works. Such inspection and tests shall be, but not limited to, the following:
- 5.1.1 All valves shall be visually inspected. The internal and external surfaces of the valves shall be free from any strikes, gouges and other detrimental defects. The surfaces shall be thoroughly cleaned and free from dirt, rust and scales.
- 5.1.2 Dimensional check on all valves shall be carried out as per the Purchaser approved drawings.
- 5.1.3 Chemical composition and mechanical properties shall be checked as per relevant material standards and this specification, for each heat of steel used.
- 5.1.4 Non-destructive examination of individual valve material and components consisting of, but not limited to castings, forgings, plate and assembly welds shall be carried out by the Manufacturer.
- a) Body castings of all valves shall be radiographically examined on 100% of the surface of critical areas as per ASME B16.34. Procedure and acceptance criteria shall be as per ASME B16.34. The extent of radiography shall be as follows:

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F8 'H97 <B75 @GD97 = 75 HCB		
	C=@/ ' ; 5 G'		
TITLE	65 @@J5 @9	DOCUMENT NO. BR/TS/057	Page 13 of 20
			REVISION : 0
			EDITION : 1

5 BG=Df Yggi fYFU]b[JUj YG]nY	9I HbhcZFUX]c[fUd\ m
150 #	All sizes	Nil
300 #	\leq DN 400mm (16") \geq DN 450mm (18")	Nil 100%
\geq 600 #	All sizes	100%

All castings shall be wet magnetic particle inspected 100% of the internal surfaces. Method and acceptance shall comply with ASME B.16.34.

- b) All valves, with body fabricated from plates or made by forgings, shall be ultrasonically examined in accordance with the procedure and acceptance standard of Annexure E of ASME B16.34.

All forgings shall be wet magnetic particle inspected 100% of the internal surfaces. Method and acceptance shall comply with ASME B 16.34

- c) Bodies and bonnets made by welded assembly of segments of castings, forgings, plates or combinations thereof shall be examined, as applicable, by methods of clause 5.1.4 a) for cast components or clause 5.1.4 b) for forged components and plates.

5.1.5 Full inspection by radiography shall be carried out on all welds of pressure containing parts. Acceptance criteria shall be as per ASME B 31.4 or ASME B31.8, as applicable, and API 1104.


5.1.6 Welds, which in Purchaser's opinion cannot be inspected by radiographic methods, shall be checked by ultrasonic or magnetic particle methods and acceptance criteria shall be as per ASME Section VIII, Division 1, Appendix 12 and Appendix 6, respectively.

5.1.7 a) All finished wrought weld ends subject to welding in field shall be 100% ultrasonically tested for lamination type defects for a distance of 50mm from the end. Laminations shall not be acceptable.

- b) Weld ends of all cast valves subject to welding in field shall be 100% radiographically examined and acceptance criteria shall be as per ASME B16.34.

- c) After final machining, all bevel surfaces shall be inspected by dye penetrant or wet magnetic particle methods. All defects longer than 6.35 mm are rejected, as are defects between 6.35 mm and 1.59mm that are separated by a distance less than 50 times their greatest length. Rejectable defects must be removed. Weld repair of bevel surface is not permitted.

5.1.8 All valves shall be tested in compliance with the requirements of API 6D. During pressure testing, valves shall not have sealant lines and other cavities filled with sealant, grease or other foreign material. The drain, vent and sealant lines shall be

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F8'H97<B75@GD97=75HCB		
	C=@'; 5G'		
TITLE	65@@J5@9	DOCUMENT NO. BR/TS/057	Page 14 of 20
			REVISION : 0
			EDITION : 1

either included in the hydrostatic shell test or tested independently. Test pressure shall be held for at least 30 minutes. No leakage is permissible during hydrostatic testing. The body cavity self-relieving feature meeting the requirements of clause 4.8 of this specification shall also be checked.

5.1.9 A supplementary air seat test as per API 6D (Annex B, Clause B.3.3, Type II) shall be carried out for all valves. A bubble tight seal is required without the use of any sealant. No leakage is allowed. Test pressure shall be held for at least 15 minutes.

5.1.10 Manufacturer who intends bidding, must submit at bid stage, certificate and report for successful fire type-tests for valves in accordance with API-607/ BS EN ISO 10497 / API 6FA, as applicable in Valve Data Sheet.

: U'i fY' lc' Wta d'mk jH 'H jg' fYei jfYa Ybh gl U'' VY' U WU gY' cZ fY' Wjcb' cZ H Y
6 jXXYf g' cZ f"

5.1.11 Valves shall be subjected to Operational Torque Test as per API 6D (Annex B, Clause B.6) under hydraulic pressure equal to maximum differential pressure corresponding to the valve pressure class rating.

For manual operator of all valves, it shall be established that the force required to operate the valve does not exceed the requirements stated in clause 4.22(c) of this specification.


5.1.12 Power actuated valves shall be tested after assembly of the valve and actuator at the valve Manufacturer's works. At least five Open-Close-Open cycles without internal pressure and five Open-Close-Open cycles with maximum differential pressure shall be performed on the valve actuator assembly. The time for Full Open to Full close shall be recorded during testing. If required, the actuator shall be adjusted to ensure that the opening and closing times are within the limits stated in Actuator Data Sheet issued for the purpose.

Hand operator provided on the actuator shall also be checked after above testing, for satisfactory manual over-ride performance.

These tests shall be conducted on minimum one valve out of a lot of five (5) valves of the same size, rating and the actuator model / type. In case the tests do not meet the requirements, retesting / rejection of the lot shall be decided by Purchaser's Inspector.

5.1.13 Subsequent to successful testing as specified in clause 5.1.11 and 5.1.12 above, one (1) valve out of the total ordered quantity shall be randomly selected by the Purchaser's Representative for cyclic testing as mentioned below :

- The valve shall be subjected to at least 100 Open-Close-Open cycles with maximum differential pressure corresponding to the valve rating.
- Subsequent to the above, the valve shall be subjected to hydrostatic test and supplementary air seat test in accordance with clause 5.1.8 and 5.1.9.

BRIDGE AND ROOF CO.(I) LTD.	GH5B85F8 'H97 <B7 5 @GD97 = 7 5 HCB		
	C=@/ ' ; 5 G'		
TITLE	65 @@J5 @9	DOCUMENT NO. BR/TS/057	Page 15 of 20
			REVISION : 0
			EDITION : 1

In case this valve fails to pass these tests, the valve shall be rejected and two more valves shall be selected randomly and subjected to testing as indicated above. If both valves pass these tests, all valves manufactured for the order (except the valve that failed) shall be deemed acceptable. If either of the two valves fails to pass these tests, all valves shall be rejected or each valve shall be tested at the option of Manufacturer.

Previously carried out test of similar nature shall be considered acceptable if the same has been carried out by Manufacturer in last two years. Valves of two sizes below and two sizes above the size of valve previously tested, and rating similar or one rating lower of valve tested previously, shall be qualified.

5.1.14 Checks shall be carried out to demonstrate that the dissimilar metal used in the valves are successfully insulated as per the requirement of clause 4.17 of this specification.

5.1.15 When indicated in Valve Data Sheet, valves shall be subjected to anti-static testing as per supplementary test requirement of API 6D (Annex B, Clause B.5).

5.2 Purchaser reserves the right to perform stage-wise inspection and witness tests as indicated in clause 5.1 above at Manufacturer's works prior to shipment. Manufacturer shall give reasonable access and facilities required for inspection to the Purchaser's Inspector.

Purchaser reserves the right to require additional testing at any time to confirm or further investigate a suspected fault. The cost incurred shall be to Manufacturer's account.


In no case shall any action of Purchaser or his Inspector relieve the Manufacturer of his responsibility for material, design, quality or operation of valves.

Inspection and tests performed/ witnessed by the Purchaser's Inspector shall in no way relieve the Manufacturer's obligation to perform the required inspection and tests.

6.0 **9LH9BH'C: 'BGD97HCB/ 'H9GH'B:**

6.1 Purchaser's Inspector shall perform inspection and witness tests on all valves or as indicated in the Quality Assurance Plan (QAP) attached with this specification.

6.2 The hydrostatic testing and cyclic opening and closing of the valves with the operator shall be witnessed by Purchaser's Inspector.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	BALL VALVE	DOCUMENT NO. BR/TS/057	Page 16 of 20
			REVISION : 0
			EDITION : 1

7.0 **TEST CERTIFICATES**


7.1 Manufacturer shall submit the following certificates:

- a) Mill test certificates relevant to the chemical analysis and mechanical properties of the materials used for valve construction as per the relevant standards.
- b) Test certificates of hydrostatic and pneumatic tests complete with records of timing and pressure of each test.
- c) Test reports on radiograph and ultrasonic inspection.
- d) Test report on operation of valves conforming to clause 5.1.11, 5.1.12 and 5.1.13 of this specification.
- e) All other test reports and certificates as required by API 6D and this specification.

The certificates shall be valid only when signed by Purchaser's Inspector. Only those valves which have been certified by Purchaser's Inspector shall be despatched from Manufacturer's works.

8.0 **PAINTING, MARKING & SHIPMENT**

- 8.1 Valve surface shall be thoroughly cleaned, freed from rust and grease and applied with sufficient coats of corrosion resistant paint. Surface preparation shall be carried out by shot blasting to SP-6 in accordance with "Steel Structures Painting Council – Visual Standard SSPC-VIS-1". For valves to be installed underground, when indicated in Valve Data Sheet, the external surfaces of the buried portion of valves shall be painted with three coats of suitable coal tar epoxy resin with a minimum dry film thickness of 300 microns.
- 8.2 Manufacturer shall indicate the type of corrosion resistant paint used, in the drawings submitted for approval.
- 8.3 All valves shall be marked as per API 6D. The units of marking shall be metric except Nominal Diameter which shall be in inches. Marking shall be done by die-stamping on the bonnet or on the housing. However, for buried valves, the marking shall be done on the above ground portion of the stem housing only.
- 8.4 Valve ends shall be suitably protected to avoid any damage during transit. All threaded and machined surfaces subject to corrosion shall be well protected by a coat of grease or other suitable material. All valves shall be provided with suitable protectors, for flange faces, securely attached to the valves. Bevel ends shall be protected with metallic or high impact plastic bevel protectors.
- 8.5 All sealant lines and other cavities of the valve shall be filled with sealant before shipment.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	BALL VALVE	DOCUMENT NO. BR/TS/057	Page 17 of 20
			REVISION : 0
			EDITION : 1

8.6 Packaging and shipping instructions shall be as per API 6D.

8.7 On packages, following shall be marked legibly with suitable marking ink :

- a) Order Number
- b) Manufacturer's Name
- c) Valve Size and Rating
- d) Tag Number
- e) Serial Number

9.0 **SPARES & ACCESSORIES**

9.1 Manufacturer shall furnish list of recommended spares and accessories for valves required during start-up and commissioning and supply of such spares shall be included in the price quoted by Manufacturer.


9.2 Manufacturer shall furnish list of recommended spares and accessories required for two years of normal operation and maintenance of valves and price for such spares shall be quoted separately.

9.3 Manufacturer shall quote for spares & accessories as per Material Requisition.

10.0 **DOCUMENTATION**

10.1 At the time of bidding, Manufacturer shall submit the following documents:

- a) General arrangement / assembly drawings showing all features and relative positions and sizes of vents, drains, gear operator / actuator, painting, coating and other external parts together with overall dimensions as well as weights of valve & actuator.
- b) Sectional drawing showing major parts with reference numbers and material specification. In particular, a blow-up drawing of ball-seat assembly shall be furnished complying the requirement of clause 4.6 of this specification.
- c) Reference list of similar ball valves manufactured and supplied in last five years indicating all relevant details including project, year, client, location, size, rating, service, etc.
- d) Torque curves for the power actuated valves along with the break torque and maximum allowable stem torque. In addition, sizing criteria and torque calculations shall also be submitted for power actuated valves.
- e) Descriptive technical catalogues of the Manufacturer.
- f) Copy of valid API 6D certificate.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	BALL VALVE	DOCUMENT NO. BR/TS/057	Page 18 of 20
			REVISION : 0
			EDITION : 1


- g) Details of support foot, including dimensions and distance from valve centre line to bottom of support foot.
- h) Quality Assurance Plan enclosed with this tender duly signed, stamped and accepted.
- i) List of recommended spares required during start-up and commissioning.
- j) List of recommended spares required for 2 years of normal operation and maintenance.
- k) Other documents / drawings / data as per Material Requisition.

10.2 Within two weeks of placement of order, the Manufacturer shall submit six copies of, but not limited to, the following drawings, documents and specifications for Purchaser's final approval :

- a) Detailed sectional arrangement drawings showing all parts with reference numbers and material specifications as referred to in clause 10.1 above.
- b) Assembly drawings with overall dimensions and features. Drawing shall also indicate the number of turns of hand wheel (in case of gear operators) required for operating the valve from full open to full close position and the painting scheme. Complete dimensional details of support foot (where applicable) shall be indicated in these drawings as referred to in clause 10.1 above.
- c) Welding, heat treatment and testing procedures.
- d) Procedure for cyclic testing.
- e) Details of corrosion resistant paint to be applied on the valves.
- f) Design calculation for pressure containing parts.
- g) Other documents / drawings / data as per Material Requisition.

Manufacture of valves shall commence only after approval of the documents indicated in clause 10.2a) to 10.2c) above. Once approval has been given by Purchaser, any changes in design, material and method of manufacture shall be notified to Purchaser whose approval in writing of all changes shall be obtained before the valve is manufactured.

10.3 Within 2 weeks from the approval date, Manufacturer shall submit to Purchaser six copies of the approved drawings, documents and specifications as listed in clause 10.2 above.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	BALL VALVE	DOCUMENT NO. BR/TS/057	Page 19 of 20
			REVISION : 0
			EDITION : 1

10.4 Prior to shipment, Manufacturer shall submit six hard copies and six soft copies (on CD-ROMs) of the following:

- a) Test certificates as per clause 7.0 of this specification.
- b) Manual for installation, erection, maintenance and operation instructions, including a list of recommended spares for the valves.
- c) Other documents / drawings / data as per Material Requisition.

10.5 All documents shall be in English language.

10.6 **The above documents & data requirements shall also be supplemented by all requirements of clause 2.0 of the Material Requisition.**

11.0 **GUARANTEE**

11.1 Manufacturer shall guarantee that the materials and machining of valves and fittings comply with the requirements in this specification and in the Purchase Order.

11.2 Manufacturer is bound to replace or repair all valve parts which should result defective due to inadequate engineering or to the quality of materials and machining.

11.3 If valve defect or malfunctioning cannot be eliminated, Manufacturer shall replace the valve without delay,

11.4 Any defect occurring during the period of Guarantee shall be attended to by making all necessary modifications and repair of defective parts free of charge to the Purchaser as per the relevant clause of the bid document.

11.5 All expenses shall be to Manufacturer's account.

TITLE

BALL VALVE

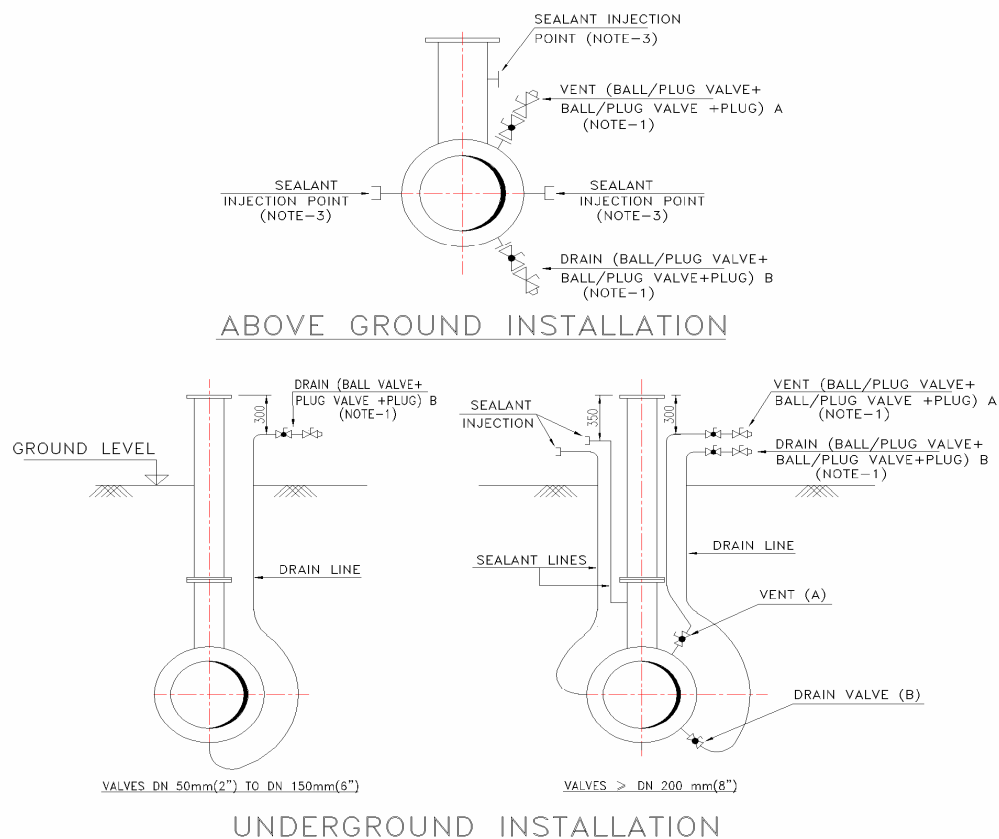
DOCUMENT NO.

BR/TS/057

Page 20 of 20

REVISION : 0

EDITION : 1



SIZES OF VENT & DRAIN CONNECTIONS		
NOM. VALVE SIZE	A, DN(mm)	B, DN(mm)
50 TO 150	—	15
200 TO 600	15	25
750 & ABOVE	15	50 (REFER NOTE-2)

LEGEND:

BALL VALVE
 PLUG VALVE
 PLUG

NOTES:

1. ALL VALVES (BALL OR PLUG) AND PLUGS FOR A AND B SHALL BE APPROVED BY THE PURCHASER.
2. VALVES OF SIZE 50mm SHALL BE MANUFACTURED AS PER API-6D.
3. SEALANT INJECTION POINTS SHALL BE PROVIDED FOR FULL OPENING VALVES OF NOMINAL VALVE SIZE 200mm (8") & ABOVE AND REDUCED OPENING VALVES OF NOMINAL VALVE SIZE, DN 250mm (10") AND ABOVE ONLY.
3. IN BURIED SECTION, ALL VENT & DRAIN CONNECTION SHALL BE OF WELDED CONSTRUCTION.

FIGURE—1


VENT, DRAIN & SEALANT INJECTION DETAILS

PROCESS & PIPING DESIGN SECTION
BRIDGE AND ROOF CO.(I) LTD.



TECHNICAL SPECIFICATION
FOR
PLUG VALVES
(NB \geq 2)


SPECIFICATION NO.: BR/TS/058

BRIDGE AND ROOF CO.(I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR PLUG VALVES	
TECHNICAL SPECIFICATION NO. : BR/TS/058		REV-0	Page 1 of 13

CONTENTS

<u>Sl.No.</u>	<u>Description</u>	<u>Page No.</u>
1.0	SCOPE	2
2.0	REFERENCE DOCUMENTS	2
3.0	MATERIALS & TEST PROCEDURES	3
4.0	DESIGN & CONSTRUCTION	4
5.0	INSPECTION & TESTS	7
6.0	EXTENT OF INSPECTION & TESTING	9
7.0	TEST CERTIFICATES	9
8.0	PAINTING, MARKING & SHIPMENT	10
9.0	SPARES & ACCESSORIES	10
10.0	DOCUMENTATION	11
11.0	GUARANTEE	12

PREPARED BY :	CHECKED BY :	APPROVED BY :

BRIDGE AND ROOF CO.(I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR PLUG VALVES	
TECHNICAL SPECIFICATION NO. : BR/TS/058		REV-0	Page 2 of 13

1.0 **SCOPE**


This specification covers the minimum requirements for design, manufacture and supply of carbon steel plug valves of size DN 50mm (2) and above and ANSI Class 150 thru 900 for use in onshore pipeline systems handling non sour hydrocarbons in liquid phase or gaseous phase including Liquefied Petroleum Gas (LPG).

2.0 **REFERENCE DOCUMENTS**

2.1 All valves shall be manufactured and supplied in accordance with the Twenty Second Edition, January, 2002, or the latest edition of American Petroleum Institute (API) Specification 6D, twenty first edition, 1994 including supplement 1 & 2 thereof with additions and modifications as indicated in the following sections of this specification.

2.2 Reference has also been made in this specification to the latest edition of the following Codes, Standards and Specifications :

ASME B 16.5	:	Pipe flanges and flanged fittings
ASME B 16.25	:	Buttwelding ends
ASME B 16.34	:	Valves Flanged, threaded and welding end
ASME B16.47	:	Large diameter steel flanges
ASME B 31.3	:	Chemical & process plant piping system
ASME B 31.4	:	Liquid transportation systems for hydrocarbons and other liquids
ASME B 31.8	:	Gas transmission and distribution piping systems
ASME Sec.VIII	:	Boiler and pressure vessel code
ASTM A 370	:	Standard test methods and definitions for mechanical testing of steel products
ASTM B 733	:	Autocatalytic nickel phosphorous coating on metals
API 6FA	:	Fire test for valves
API 1104	:	Welding of pipelines and related facilities
BS:6755 (Part-II)	:	Testing of valves Specification for fire type - testing requirements
MSS-SP-6	:	Standard finishes for contact faces of pipe flanges and connecting-end flanges of valves and fittings

BRIDGE AND ROOF CO.(I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR PLUG VALVES	
TECHNICAL SPECIFICATION NO. : BR/TS/058		REV-0	Page 3 of 13

MSS-SP-44 : Steel pipeline flanges

SSPC-VIS-1 : Steel structures painting council-visual standard

2.3 **In case of conflict** between the requirements of this specification, API 6D and the Codes, Standards and Specifications referred in clause 2.2 above, the requirements of this specification shall govern. Order of precedence shall be as follows :

- Data Sheets
- This Specification
- API 6D Specification
- Other Referred Codes & Standards
- Manufacturer's Standard

3.0 **MATERIALS & TEST PROCEDURES**

3.1 Material for major components of the valves shall be as indicated in Valve Data Sheet. Other components shall be as per Manufacturer's standard which will be subject to approval by Purchaser.

3.2 Carbon steel used for the manufacture of valves shall be fully killed.

3.3 Chemical composition (check analysis) of valve end connection which are subject to further welding by Purchaser shall meet the following requirements for each heat of steel used:


- | | | | | |
|----|------------|---|-------|--------|
| a) | Carbon | : | 0.22 | (max.) |
| b) | Manganese | : | 1.70 | (max.) |
| c) | Silicon | : | 0.55 | (max.) |
| d) | Phosphorus | : | 0.030 | (max.) |
| e) | Sulphur | : | 0.030 | (max.) |

Total percentage of Vanadium, Niobium and Titanium shall not exceed 0.20. Residual elements shall not exceed the following limits :

- | | | | |
|----|------------|---|-------|
| a) | Nitrogen | : | 0.019 |
| b) | Nickel | : | 0.30 |
| c) | Copper | : | 0.20 |
| d) | Aluminum | : | 0.070 |
| e) | Chromium | : | 0.15 |
| f) | Molybdenum | : | 0.05 |

Carbon equivalent (CE) as calculated by the following shall not exceed 0.45 .

$$CE = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}$$

BRIDGE AND ROOF CO.(I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR PLUG VALVES	
TECHNICAL SPECIFICATION NO. : BR/TS/058		REV-0	Page 4 of 13

- 3.4 For valves specified for Gas Service or high vapour pressure liquid service, Charpy V-Notch test on each heat of base material shall be conducted as per API 6D, for all pressure containing parts such as body, end flanges and welding ends as well as the bolting material for pressure containing parts. Unless specified otherwise in Valve Data Sheets, the Charpy impact test shall be conducted at 0 C. The Charpy impact test specimen shall be taken in the direction of principal grain flow and notched perpendicular to the original surface of plate or forging.

Unless specified otherwise in Valve Data Sheets, the minimum average absorbed energy per set of three specimens shall be 27 J with an individual minimum per specimen of 22 J.

- 3.5 For valves specified for Gas Service or high vapour pressure liquid service, the hardness of base material of body and principal parts of the valve such as plug, stem, etc., shall not exceed 22 RC.

- 3.6 Plug for valve size DN 200mm (8) and above or as specified in Valve Data Sheets shall have Electroless Nickel Plating (ENP) or equivalent. The hardness of plating shall be minimum 50 RC. Manufacturer shall ensure that the adhesive strength of plating is sufficient so as to prevent peeling of plating during operation of the valve.


- 3.7 All process-wetted parts, metallic and non-metallic, shall be suitable for the fluids and service specified by the Purchaser. The service gas composition when applicable shall be as given in Annexure-I.

4.0 **DESIGN & CONSTRUCTION**


- 4.1 The Manufacturer shall have a valid license to use API 6D monogram for manufacture of Plug Valves.

- 4.2 Valve pattern shall be short, regular or venturi as specified in the following table:

Class	Size Range, NB mm (inch)	Pattern
150	50-100 (2-4)	Short
	150-300 (6-12)	Regular
	350 (14) & above	Venturi
300	50-100 (2-4)	Short
	150-250 (6-10)	Regular
	300 (12) & above	Venturi
600	50-250 (2-10)	Regular
	300 (12) & above	Venturi
900	50-250 (2-10)	Regular
	300 (12) & above	Venturi

BRIDGE AND ROOF CO.(I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR PLUG VALVES	
TECHNICAL SPECIFICATION NO. : BR/TS/058		REV-0	Page 5 of 13

- 4.3 Valve shall have an inherent feature using line pressure to ensure that the line pressure cannot cause taper locking of the plug/ plug movement into taper i.e. valves shall be of pressure balanced design.
- 4.4 Cover shall be bolted to the body and screwed connections are not acceptable.
- 4.5 Soft seats to achieve a seal between plug and body are not permitted.
- 4.6 All valves shall have provisions for secondary sealant injection under full line pressure for seat and stem seals. Sealant injection points shall be provided with a ball type check valve or needle valve to replace the sealant injection fitting under full line pressure.
- 4.7 Valves shall have vent and drain connections as per API 6D.
- 4.8 When specified in the Valve Data Sheet, valves shall be designed to withstand a sustained internal vacuum of at least one milli-bar in both open and closed position.
- 4.9 Valve design shall ensure repair of gland packing under full line pressure.
- 4.10 a) Valve ends shall be either flanged or butt welded or one end flanged and one end butt welded as indicated in Valve Data Sheet. Flanges of the flanged end cast/ forged body valves shall be integrally cast/forged with the body of valve. Face-to-face/ end-to-end dimensions shall conform to API 6D.
- b) Flanged end shall have dimensions as per ASME B16.5 for valve sizes upto DN 600mm (24 inches) excluding DN 550mm (22 inches) and as per MSS-SP-44 for valve sizes DN 550mm (22 inches) & for DN 650mm (26 inches) and above. Flange face shall be either raised face or ring joint type as indicated in Valve Data Sheet. Flange face finish shall be serrated or smooth as indicated in Valve Data Sheet. Smooth finish when specified shall be 125 to 200 AARH. In case of RTJ flanges, the groove hardness shall be minimum 140 BHN.
- c) Butt weld end preparation shall be as per ASME B16.25. The thickness of the pipe to which the valve has to be welded shall be as indicated in Valve Data Sheet. Valves shall be without transition pups. In case significant difference exists between thickness of welding ends of valve and connecting pipe, the welding ends of valve shall have bevel preparation as per ASME B31.4 or ASME B31.8, as applicable.
- 4.11 Valves shall be provided with position indicator and stops at the fully open and fully closed positions.
- 4.12 Valves of size DN 200mm (8) and above shall be equipped with lifting lugs. Tapped holes and eye bolts shall not be used for lifting lugs.
- 4.13 Valves shall have locking devices to be locked either in full open or full close position when indicated in the Valve Data Sheets. Locking devices shall be permanently attached to the valve operator and shall not interfere with operation of the valve.

BRIDGE AND ROOF CO.(I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR PLUG VALVES	
TECHNICAL SPECIFICATION NO. : BR/TS/058		REV-0	Page 6 of 13

4.14 Valves shall be of fire safe design as per BS:6755 (Part-II)/ API 6FA, if indicated in Valve Data Sheet.


4.15 Valves shall be suitable for either buried or above ground installation as indicated in the Valve Data Sheet.

4.16 Valves with stem extension, when indicated in Valve Data Sheet shall have following provisions :

- a) Valves provided with stem extension shall have water proof outer casing. Length of stem extension shall be as indicated in the Valve Data Sheet. The length indicated corresponds to the distance between the centreline of the valve opening and the top of the mounting flange for valve operating device (gear operator/ power actuator as applicable).
- b) Vent and drain connections shall be terminated adjacent to the valve operator by means of suitable piping anchored to the valve body. Pipe used shall be API 5L Gr. B/ ASTM A106 Gr. B, with Sch. 160. Fittings shall be ASTM A105/ ASTM A 234 Gr. WPB, Socket Welded, ANSI class 6000.
- c) Sealant injection lines shall be extended and terminated adjacent to the valve operator in manner as indicated in (b) above.
- d) Stem extension and stem housing design shall be such that the complete assembly will form a rigid unit giving a positive drive under all conditions with no possibility of free movements between valve body stem extension or its operator.
- e) Outer casing of stem extension shall have 3/8" or NPT plugs at the top and bottom, for draining and filling with oil to prevent internal corrosion.

4.17 **Operating Devices**

- a) Valves shall have a power actuator or manual operator as indicated in the Valve Data Sheet. Manual operated valves of size _ DN 100mm (4") shall be wrench operated and valves of sizes _ DN 150mm (6") shall be gear operated. Each wrench operated valve shall be supplied with wrench. Valve design shall be such that damage due to malfunctioning of the operator or its controls will only occur in the operator gear train or power cylinder and damaged parts can be replaced without the bonnet being removed.
- b) The power actuator shall be in accordance with the specification issued for the purpose and as indicated in the valve and actuator data sheet. Operating time shall be as indicated in valve data sheet. Valve operating time shall correspond to full close to full open / full open to full close under maximum differential pressure corresponding to the valve rating. For actuated valves, the actuator torque shall be atleast 1.25 times the maximum torque required to operate the valve under maximum differential pressure corresponding to the valve class rating.
- c) Operating device shall be designed for easy operation of valve under maximum differential pressure corresponding to the valve rating.

BRIDGE AND ROOF CO.(I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR PLUG VALVES	
TECHNICAL SPECIFICATION NO. : BR/TS/058		REV-0	Page 7 of 13

- d) For manual operation of all valves, the diameter of the hand wheel or the length of operating lever shall be such that under the maximum differential pressure, the total force required to operate the valve does not exceed 350 N. Manufacturer shall also indicate the number of turns of hand wheel (in case of gear operator), required to operate the valve from full open to full close position.
- e) Direction of operation of hand wheel or wrench shall be in clock-wise direction while closing the valve. Hand wheels shall not have protruding spokes.
- f) Gear operators, if specified, shall have a self locking provision and shall be fully encased in waterproof/ dustproof/ weatherproof/ splashproof enclosure and shall be filled with suitable grease.

4.18 Repair by welding is not permitted for fabricated and forged body valves. However repair by welding as per ASME B16.34 is permitted for cast body valves. Repair shall be carried out before any heat treatment of casting is done. Repair welding procedure qualification shall also include impact test and hardness test when required as per Clause 3.4 and 3.6 of this specification and shall meet the requirements as specified therein.

4.19 The tolerance on internal diameter and out of roundness at the ends for welded ends valves shall be as per connected pipe specification as indicated in the Valve Data Sheet.

4.20 Valve stem shall be capable of withstanding the maximum operating torque required to operate the valve against the maximum differential pressure corresponding to applicable class rating. The combined stress shall not exceed the maximum allowable stresses specified in ASME section VIII, Division-1.

For Power Actuated Valves, the valve stem shall be designed for maximum output torque of the selected power actuator (including gear box, if any) at the valves stem.

5.0 **INSPECTION & TESTS**


5.1 The Manufacturer shall perform all inspection and tests as per the requirements of this specification and the relevant codes, prior to shipment at his works. Such inspection and tests shall be, but not limited to, the following :

5.1.1 All valves shall be visually inspected.

5.1.2 Dimensional check shall be carried out as per the Purchaser approved drawings.

5.1.3 Chemical composition and mechanical properties shall be checked as per relevant material standards and this specification, for each heat of steel used.

5.1.4 a) Non-destructive examination of individual valve material and component consisting of but not limited to castings, forgings, plates and assembly welds shall be carried out by the Manufacturer.

BRIDGE AND ROOF CO.(I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR PLUG VALVES	
TECHNICAL SPECIFICATION NO. : BR/TS/058		REV-0	Page 8 of 13

- b) Valves castings shall be radiographically examined at the cover and body portion, seat location, flanged body ends and circumference of ends to be field welded. Procedure and acceptance criteria shall be as per ASME B16.34. The extent of radiography shall be as follows :

ANSI Class 150-	All Sizes	-	Nil
ANSI Class 300-	≤ DN 400mm (16)	-	Nil
	≥ DN 450mm (18)	-	100
ANSI Class 600- and above	All Sizes	-	100

All castings shall be wet magnetic particle inspected 100 of the internal surfaces. Method and acceptance shall comply with ASME B16.34.


- c) Valve forgings shall be examined by ultrasonic method. Inspection procedure and acceptance criteria shall be as per Annexure E of ASME B16.34.

5.1.5 Areas which, in Purchaser's Inspector's opinion, cannot be inspected by radiographic methods shall be checked by ultrasonic or magnetic particle methods and acceptance criteria shall be as per ASME Sec-VIII, Division I, Appendix 12 and Appendix 6 respectively.

- 5.1.6
- Weld ends of all cast valves shall be 100 radiographically examined and acceptance criteria shall be as per ASME B16.34.
 - After final machining all bevel surfaces shall be inspected by dye penetrant, or wet magnetic particle methods. Any defects longer than 6.35mm shall be rejected and also defects between 6.35mm and 1.59mm that are separated by a distance less than 50 times their greatest length. Weld repair of bevel surface is not permitted. Rejectable defects must be removed.
 - All finished wrought weld ends subject to welding in the field shall be 100 ultrasonically tested for lamination type defects for a distance of 50mm from the end. Laminations shall not be acceptable.

5.1.7 All valves shall be tested in compliance with the requirements of API 6D. Hydrostatic shell testing shall ensure that the whole of the shell is subjected to the test pressure. If necessary, the empty shell shall be pressure tested prior to assembly of the plug. The drain, vent and sealant lines shall be either included in the hydrostatic shell test or tested independently. No leakage is permissible during hydrostatic testing.

5.1.8 A supplementary air seat test as per API 6D shall be carried out for all valves. No leakage is allowed. Test pressure shall be held for at least 15 minutes.

BRIDGE AND ROOF CO.(I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR PLUG VALVES	
TECHNICAL SPECIFICATION NO. : BR/TS/058		REV-0	Page 9 of 13

5.1.9 Manufacturer who intends bidding must submit at bid stage, certificate and report for successful fire safe tests for all types of valves in accordance with BS:6755 (Part-II)/ API 6FA, as applicable in Valve Data Sheet.

Failure to comply with the requirement shall be a cause of rejection of the offer.

5.1.10 Valve shall be subjected to Operational Torque Test as per supplementary test requirement of API 6D under hydraulic pressure equal to the maximum differential pressure corresponding to the valve rating. The maximum handwheel force shall not exceed 350 N.

5.1.11 Power actuated valves shall be tested after assembly at the valve Manufacturer s works. Actuator shall be capable to allow minimum five consecutive opening and closing cycles. To achieve this, the Manufacturer shall provide closing and opening operations. This test shall be conducted on one valve out of a lot of five valves of the same size, rating and actuator type. In case the test result dose not meet the requirements, retesting/ rejection of the lot shall be as decided by Purchaser s Inspector.

The actuator shall be adjusted to ensure that opening and closing time is within the limits stated in Actuator Data Sheet issued for the purpose.

The hand operator installed on the actuator shall also be checked after the cyclic testing, for satisfactory manual over-ride performance.

5.2 Purchaser reserves the right to perform stagewise inspection and witness tests as indicated in para 5.1 at Manufacturer s works prior to shipment. Manufacturer shall give reasonable access and facilities required for inspection to Purchaser s Inspector.

Purchaser reserves the right to request additional testing at any time to confirm or further investigate a suspected fault. If the suspected fault is confirmed, the cost incurred shall be to Manufacturer s account.


In no case shall any action of Purchaser or his representative relieve the Manufacturer of his responsibility for material, design, quality or operation of valves.

Inspection and tests performed/ witnessed by the Purchaser s Inspector shall in no way relieve the Manufacturer s obligation to perform the required inspection and tests.

6.0 **EXTENT OF INSPECTION & TESTING**

6.1 Purchaser s Inspector shall perform inspection and witness test on all valves as indicated in the Quality Assurance Plan (AP) attached with this specification.

6.2 The hydrostatic testing and cyclic opening and closing of the valves with the operator shall be witnessed by Purchaser s Inspector.

BRIDGE AND ROOF CO.(I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR PLUG VALVES	
TECHNICAL SPECIFICATION NO. : BR/TS/058		REV-0	Page 10 of 13

7.0 **TEST CERTIFICATES**


7.1 Manufacturer shall submit the following certificates :

- a) Mill test certificates relevant to the chemical analysis and mechanical properties of the materials used for valve construction as per the relevant standards.
- b) Test certificates on hydrostatic and pneumatic test complete with records of timing and pressure of each test.
- c) Test reports conforming to clause 5.1.9 of this specification, if applicable.
- d) Test reports on radiographic and ultrasonic inspection.
- e) Test reports on operation of valves conforming to clause 5.1.10 and 5.1.11 of this specification.
- f) All other test reports and certificates as required by API 6D and this specification.

The certificates shall be valid only when signed by Purchaser's Inspector. Only those valves which have been certified by Purchaser's Inspector shall be dispatched from Manufacturer's works.

8.0 **PAINTING, MARKING & SHIPMENT**

- 8.1 Valve surface shall be thoroughly cleaned, freed from rust and grease and applied with sufficient coats of corrosion resistant paint. Surface preparation shall be carried out by shot blasting to SP 6 in accordance with Steel Structures Painting Council - Visual Standard - SSPC-VIS-1 . For the valves to be installed underground, when indicated in Valve Data Sheet, external surfaces of the buried portion of valves shall be painted with three coats of suitable coal tar epoxy resin with a minimum dry film thickness of 300 microns.
- 8.2 Manufacturer shall indicate the type of corrosion resistant paint used, in the drawings submitted for approval.
- 8.3 All valves shall be marked as per API 6D. The units of marking shall be metric except Nominal Diameter which shall be in inches. Marking shall be done by die-stamping on the bonnet or on the housing. However for buried valves the marking shall be done on the above ground portion of the stem housing only.
- 8.4 Valve ends shall be suitably protected to avoid any damage during transit. All threaded and machined surfaces subject to corrosion shall be well protected by a coat of grease or other suitable material. All valves shall be provided with suitable protectors, for flange faces, securely attached to the valves. Bevel ends shall be protected with metallic bevel protectors.

BRIDGE AND ROOF CO.(I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR PLUG VALVES	
TECHNICAL SPECIFICATION NO. : BR/TS/058		REV-0	Page 11 of 13

8.5 All sealant lines and other cavities of the valves shall be filled with sealant before shipment.

8.6 Packaging and shipping instructions shall be as per API 6D.

8.7 Packages shall be marked legibly, with suitable marking ink, the following.

- a) Order Number
- b) Manufacturer's Name
- c) Valve Size and Rating
- d) Tag Number
- e) Serial Number

9.0 **SPARES & ACCESSORIES**


9.1 Manufacturer shall recommend and quote separately the spares for valves required for commissioning and two years of normal operation. List of such spares without price shall be indicated alongwith technical bid and separately with price.

9.2 Manufacturer shall recommend and quote unit price separately for the accessories (like wrench, sealant injector, etc.), sealant and special tools required for maintenance of valves.

10.0 **DOCUMENTATION**

10.1 At the time of bidding, the bidder shall submit the following documents :

- a) General arrangement/ assembly drawings showing all features and relative positions & sizes of vents, drains, gear box & other external parts together with overall dimensions.
- b) Sectional drawing showing major parts with reference numbers and material specification.
- c) Reference list of similar plug valves manufactured and supplied in last five years, indicating all relevant details including project, year, client, location, size rating, service, etc.
- d) Torque curves for the power actuated valves alongwith break torque and maximum allowable stem torque. In addition, sizing criteria and torque calculations shall also be submitted for power actuated valves.
- e) Descriptive technical catalogues of the Manufacturer.
- f) Copy of valid API 6D certificate, wherever applicable.

BRIDGE AND ROOF CO.(I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR PLUG VALVES	
TECHNICAL SPECIFICATION NO. : BR/TS/058		REV-0	Page 12 of 13

- g) Details of support foot, including dimensions and distance from valve centre line to bottom of support foot.
- h) Quality Assurance Plan enclosed with this tender duly signed, stamped and accepted.

IMPORTANT

The drawings to be submitted alongwith the bid shall be in total compliance with the requirement of technical specification and data sheets of the valves with no exception & deviation.

10.2 Within two weeks of placement of order, the manufacturer shall submit six copies of, but not limited to, the following drawings, documents and specifications for approval :

- a) Design drawings and relevant calculations for pressure containing parts and other principle parts.
- b) Detailed sectional arrangement drawing showing all parts with reference numbers and materials specification.
- c) Assembly drawings with overall dimensions & clearances required and showing all features. Drawing shall also indicate the numbers of turns of handwheel (in case of gear operator) required for operating the valve from full open to full close position and the painting scheme.
- d) Welding, heat treatment, testing and quality control procedures.
- e) Details of corrosion resistant paint to be applied on the valves.
- f) Design calculation for pressure containing parts.


Manufacture of valves shall commence only after approval of the above documents. Once approval has been given by Purchaser, any change in design, material and method of manufacture shall be notified to the Purchaser, whose approval in writing for all changes shall be obtained before the valves are manufactured.

10.3 Within 30 days from the approval date, Manufacturer shall submit one reproducible and six copies of the approved drawings, documents and specification as listed in clause 10.2 of this specification.

10.4 Prior to shipment, Manufacturer shall submit one reproducible and six copies of following :-

- a) Test certificates as listed in clause 7.0 of this specification.
- b) Manual for installation, erection instructions, maintenance and operation instructions, including a list of recommended spares for the valves.

10.5 All documents shall be in English Language.

BRIDGE AND ROOF CO.(I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR PLUG VALVES	
TECHNICAL SPECIFICATION NO. : BR/TS/058		REV-0	Page 13 of 13

11.0 **GUARANTEE**


- 11.1 Manufacturer shall guarantee that the materials and machining of valves and fittings comply with the requirements in this specification and in the Purchase Order.
- 11.2 Manufacturer is bound to replace or repair all valve parts which should result defective due to inadequate engineering or to the quality of materials and machining.
- 11.3 If valve defect or malfunctioning cannot be eliminated, Manufacturer shall replace the valve without delay.
- 11.4 Any defect occurring during the period of Guarantee shall be attended to by making all necessary modifications and repair of defective parts free of charge to the Purchaser as per the relevant clause of the bid document.
- 11.5 All expenses shall be to Manufacturer's account.

PROCESS & PIPING DESIGN SECTION
BRIDGE & ROOF CO. (I) LTD.



TECHNICAL SPECIFICATION
FOR
CHECK VALVES

SPECIFICATION NO. : BANDR/TS/05/62/004, Rev-0

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR CHECK VALVES	
TECHNICAL SPECIFICATION NO. : BANDR/TS/05/62/004		REV-0	Page 1 of 8


CONTENTS

Sl.No.	Description	Page No.
1.0	SCOPE	2
2.0	REFERENCE DOCUMENTS	2
3.0	MATERIALS	2
4.0	DESIGN AND CONSTRUCTION	3
5.0	INSPECTION AND TESTS	4
6.0	TEST CERTIFICATES	5
7.0	PAINTING, MARKING AND SHIPMENT	6
8.0	SPARES AND ACCESSORIES	6
9.0	DOCUMENTATION	6
10.0	GUARANTEE	7

PREPARED BY

CHECKED BY

APPROVED BY

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR CHECK VALVES	 ब्री एण्ड रूफ BANDR Building Nation Since 1926
TECHNICAL SPECIFICATION NO. : BANDR/TS/05/62/004		REV-0	Page 2 of 8

1.0 **SCOPE**

This specification covers the minimum requirements for design, manufacture and supply of carbon steel check valves of size DN 50mm (2") and above and ANSI class 150, 300 and 600 , for use in onshore pipeline systems handling non-sour hydrocarbons in liquid phase or gaseous phase including Liquefied Petroleum Gas (LPG).

2.0 **REFERENCE DOCUMENTS**

2.1 All valves shall be manufactured and supplied in accordance with the latest edition of American Petroleum Institute (API) Specification 6D or 594 or British Standard BS:1868, with additions and modifications as indicated in the following sections of this specification.

For Contractual purpose, the edition in force at the time of floating of the enquiry shall be termed as "latest edition".

3.0 **MATERIALS**

3.1 Material for major components of the valves shall be as indicated in Valve Data Sheet. Other components shall be as per Manufacturer's standards which will be subject to approval by Purchaser.


3.2 Carbon steel used for the manufacture of valves shall be fully killed.

3.3 The Carbon Equivalent (CE) of valve end connections which are subject to further field welding by Purchaser, shall not exceed 0.45% (as calculated by the following formula) on check analysis for each heat of steel used :

$$CE = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}$$

3.4 Charpy V-Notch test on each heat of base material shall be conducted as per API 6D, clause 7.5, for all pressure containing parts such as body, end flanges and welding ends as well as bolting material for pressure containing parts. Unless specified otherwise, the Charpy impact test shall be conducted at 0°C. The Charpy impact test specimen shall be taken in the direction of principal grain flow and notched perpendicular to the original surface of plate or forging.

The minimum average absorbed energy per set of three specimens shall be 27 J with an individual minimum per specimen of 22 J. No specimen shall exhibit less than 80 percent shear area.

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR CHECK VALVES	 ब्री एण्ड आर BAND R Building Nations Since 1920
TECHNICAL SPECIFICATION NO. : BANDR/TS/05/62/004		REV-0	Page 3 of 8

3.5 All process – wetted parts, metallic and non-metallic, shall be suitable for the fluids and service specified by the Purchaser.

4.0 **DESIGN AND CONSTRUCTION**

4.1 Following types of check valves, meeting the requirements of applicable standards (refer clause 2.1 of this specification) are acceptable :

- a) Swing check valve
- b) Dual plate check valve
- c) Axial flow (Nozzle) check valve

Valve design shall be suitable for the service conditions indicated in Valve Data Sheet. Corrosion allowance indicated in Valve Data Sheet shall be considered in valve design.

4.2 In case of swing check valves, the disc hinge shall be mounted on the valve body and shall not be attached to the valve body cover. Valve body cover joint shall be of bolted design. Screwed covers shall not be used.


4.3 Valves shall be provided with non-renewable integral type seats as indicated in Valve Data Sheet. Non-renewable seats shall be of a design which does not required renewal over the design life of the valve.

4.4 Valves shall be provided with drain connection as per the Manufacturer's standard. Drain tapping shall be provided in a position suitable to completely drain the valve with valve in horizontal position.

4.5 Valve ends shall be either flanged or butt welded or one end flanged and one end butt welded as indicated in Valve Data Sheet. Flanged end shall have dimensions as per ASME B16.5 for sizes upto DN 400mm (16"). Flanges of the flanged end cast body valves shall be integrally cast with the body of the valve.

4.6 Butt weld end preparation shall be as per ANSI B16.25. The thickness of the pipe to which the valve has to be welded shall be as indicated in Valve Data Sheet. Valves shall be without transition pups. In case difference exists between thickness of valve neck end and connecting pipe, the bevel end of valve shall be prepared as per ANSI B31.8 or ANSI B31.4, as applicable.

4.7 Valves of size DN 200mm (8") and above shall be equipped with lifting lugs. Tapped holes and eye bolts shall not be used for lifting lugs.

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR CHECK VALVES	 ब्री एण्ड रूफ BAND R <small>Building Nations Since 1920</small>
TECHNICAL SPECIFICATION NO. : BANDR/TS/05/62/004		REV-0	Page 4 of 8

4.8 An arrow indicating the direction of flow shall be embossed or cast on the body of all valves.

4.9 All welds shall be made by welders and welding procedures qualified in accordance with the provisions of ASME Section IX. The welding and repair welding procedure qualification shall include impact test and shall meet the requirements of clause 3.4 of this specification.

4.10 Repair by welding is permitted for cast body valves subject to written approval by Purchaser and shall be carried out as per ANSI B16.34. Repair shall be carried out before any heat treatment of casting is done.

5.0 **INSPECTION AND TESTS**

5.1 The Manufacturer shall perform all inspection and tests as per the requirements of this specification and the relevant codes, prior to shipment at his works. Such inspection and tests shall be, but not limited to, the following :

5.1.1 All valves shall be visually inspected.

5.1.2 Dimensional check on all valves shall be carried out as per the Purchaser approved drawings.


5.1.3 Chemical compositions and mechanical properties shall be checked as per relevant material standards and this specification, for each heat of steel used.

5.1.4 a) Where applicable, the body castings of valves shall be radiographically examined on 100% of the surface of critical areas as per ANSI B16.34. Procedure and acceptance criteria shall be as per ANSI B16.34.

b) Where applicable, valve body made by forging and plate components shall be ultrasonically examined in accordance with procedure and acceptance standard of Annexure E of ANSI B16.34.

c) The extent of radiography/ ultrasonic examination shall be as follows :

ANSI class 150	-	All sizes	-	Nil
ANSI class 300	-	≤ DN 400mm (16")	-	Nil
		≥ DN 450mm (18")	-	100%
ANSI class 600	-	All sizes	-	100%

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR CHECK VALVES	
TECHNICAL SPECIFICATION NO. : BANDR/TS/05/62/004		REV-0	Page 5 of 8

5.1.5 All valves shall be tested in compliance with the requirements of applicable standard (refer clause 2.0).

5.2 Purchaser reserves the right to perform stage-wise inspection and witness tests as indicated in clause 5.1 above at Manufacturer's works prior to shipment. Manufacturer shall give reasonable access and facilities required for inspection to the Purchaser's Inspector.

Purchaser reserves the right to require additional testing at any time to confirm or further investigate a suspected fault. The cost incurred shall be to Manufacturer's account.

In no case shall any action of Purchaser or its Inspector relieve the Manufacturer of his responsibility for material, design, quality or operation of valves.


Inspection and tests performed/ witnessed by the Purchaser's Inspector shall in no way relieve the Manufacturer's obligation to perform the required inspection and tests.

6.0 **TEST CERTIFICATES**

Manufacturer shall submit the following certificates :

- a) Mill test certificates relevant to the chemical analysis and mechanical properties of the materials used for the valve construction as per the relevant standards.
- b) Hydrostatic test certificates complete with records of timing and pressure of each test.
- c) Test reports of radiograph and ultrasonic inspection, as applicable.
- d) All other test reports and certificates as required by applicable standard and this specification.

The certificates shall be valid only when signed by Purchaser's Inspector. Only those valves which have been certified by Purchaser's Inspector shall be despatched from Manufacturer's works.

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR CHECK VALVES	
TECHNICAL SPECIFICATION NO. : BANDR/TS/05/62/004		REV-0	Page 6 of 8

7.0 **PAINTING, MARKING AND SHIPMENT**


- 7.1 Valve surface shall be thoroughly cleaned, freed from rust and grease and applied with sufficient coats of corrosion resistant paint. Surface preparation shall be carried out by shot blasting to SP-6 in accordance with "Steel Structures Painting Council – Visual Standard SSPC-VIS-1".
- 7.2 All valves shall be marked as per applicable standard. The units of marking shall be metric except nominal diameter which shall be in inches.
- 7.3 Valve ends shall be suitably protected to avoid any damage during transit. All threaded and machined surfaces subject to corrosion shall be well protected by a coat of grease or other suitable material. All valves shall be provided with suitable protectors for flange faces, securely attached to the valves.
- 7.4 Packaging and shipping instructions shall be as per applicable standard.
- 7.5 On packages, the following shall be marked legibly with suitable marking ink:
- Order Number
 - Manufacturer's Name
 - Valve Size and Rating
 - Tag Number

8.0 **SPARES AND ACCESSORIES**


- 8.1 Manufacturer shall recommend and quote separately the spares for valves required for commissioning and two years of normal operation.

9.0 **DOCUMENTATION**

- 9.1 At the time of bidding, Manufacturer shall submit the following documents :
- General arrangement drawings showing all features together with overall dimensions and actual valve bore size.
 - Sectional drawing showing major parts with reference numbers and material specification.

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR CHECK VALVES	 ब्री एण्ड रूफ B AND R Building Valves Since 1920
TECHNICAL SPECIFICATION NO. : BANDR/TS/05/62/004		REV-0	Page 7 of 8

	<ul style="list-style-type: none"> c) Details of corrosion resistant paint proposed to be applied. d) Reference list of similar supplies of check valves, including project, year, client, location, size, rating, services, etc. shall be furnished by the Manufacturer for the last three years. (The valves shall be proven for service indicated in Valve Data Sheet).
9.2	<p>Within three weeks of placement of order, the Manufacturer shall submit four copies of, but not limited to, the following drawings, documents and specifications for Purchaser's approval.</p> <ul style="list-style-type: none"> a) Detailed sectional drawings showing all parts with reference numbers and material specification. b) Assembly drawings indicating overall dimensions, features and painting scheme. <p>Once the approval has been given by Purchaser, any changes in design, material and method of manufacture shall be notified to Purchaser whose approval in writing of all changes shall be obtained before the valve is manufactured.</p>
9.3	<p>Within 30 days from the approval date, Manufacturer shall submit to Purchaser one reproducible and six copies of all approved drawings, documents and specifications as listed in clause 9.2 above.</p>
9.4	<p>Prior to shipment, Manufacturer shall submit to Purchaser one reproducible and six copies of the following :</p> <ul style="list-style-type: none"> a) Test certificates as listed in clause 6.0 of this specification. b) Manual for installation, erection, maintenance and operation instructions, including a list of recommended spares for the valves.
9.5	<p>All documents shall be in English language.</p>
10.0	<p><u>GUARANTEE</u></p>
10.1	<p>Manufacturer shall guarantee that the materials and machining of valves and fittings comply with the requirements in this specification and in the Purchase Order.</p>

BRIDGE AND ROOF CO. (I) LTD.	PROCESS & PIPING DESIGN SECTION	TECHNICAL SPECIFICATION FOR CHECK VALVES	 ब्री एण्ड आर BANDR <small>Building Nation Since 1920</small>
TECHNICAL SPECIFICATION NO. : BANDR/TS/05/62/004		REV-0	Page 8 of 8

- 10.2 Manufacturer is bound to replace or repair all valve parts which should result defective due to inadequate engineering or to the quality of materials and machining.
- 10.3 If valve defect or malfunctioning cannot be eliminated, Manufacturer shall replace the valve without delay,
- 10.4 Any defect occurring during the period of Guarantee shall be attended to by making all necessary modifications and repair of defective parts free of charge to the Purchaser as per the relevant clause of the bid document.
- 10.5 All expenses shall be to Manufacturer's account.

TECHNICAL NOTES FOR GATE & GLOBE VALVES

(A) **TECHNICAL NOTES FOR GATE & GLOBE VALVES**

1.0 **General**

1.1 Valves shall be designed, manufactured, tested, inspected, marked and supplied as per the specifications, applicable design standards & codes and manufacturing standards (latest editions) as specified.

1.2 Material test certificates (Physical property, Chemical composition & Heat treatment report) of the pressure containing parts shall be furnished for the valves supplied. Material test certificates of other parts shall also be furnished for verification during inspection.

1.3 For heavy valves, provision for lifting shall be made by way of lugs, eyebolts, or similar standard devices.

1.4 Unless otherwise stated, all flanged valves shall have end flanges integral with valve body. Weld on flanges are not acceptable. Flange finish shall be serrated finish 250 AARH (250 AARH to 500 AARH) or 125 AARH (125 AARH to 250 AARH) or 63 MRH (32 AARH to 63 AARH) as per valve specification sheet.

1.5 For all weld end valves, with bevel end as per ANSI B 16.25, the bevel contour shall be as follows:

Material	Wall Thickness	Weld Contour
Carbon Steel (Except Low Temp. Carbon Steel)	Upto 22 mm > 22 mm	Figure 2 Type A Figure 3 Type A
Alloy Steel Stainless Steel & Low Temp Carbon Steel	Upto 10 mm > 10 mm & upto 25 mm > 25mm	Figure 4 Figure 5 Type A Figure 6 Type A

1.6 If an overlay weld-deposit is used for the body seat ring, seating surface, the seat ring base material shall be at least equal to the corrosion resistance of the materials of the shell.

1.7 For valve body/ bonnet, forging is acceptable where castings are specified but not vice versa.

1.8 Material of construction of yoke shall be as a minimum equivalent to body/ bonnet material.

1.9 Stem shall be forged or machined from a forged bar. Castings are not permitted except integral stem.

1.10 Stellite/ hard facing by deposition shall have minimum 1.6mm thickness. Renewable seat rings shall be seal welded.

1.11 Face to face dimension of flanged valves shall conform to ANSI B 16.10 to the extent covered. For valves not covered in the ANSI specification, Contractor shall furnish certified dimensional drawings.

- 1.12 Flange dimensions of steel, alloy steel and stainless steel flanged valves shall conform to ANSI B 16.5 for sizes up to 24" and API 605 for size 26" and above.
- 1.13 Flange dimensions for cast iron flanged valves shall conform to ANSI B 16.1 for size up to 24" class 125 and API 605 with flat face for sizes greater than 24".
- 1.14 Unless otherwise mentioned, various valves should conform to following standards / codes.
- | | | |
|--|---|-------------------|
| SW gate valves (1 1/2" and below) | : | API 602 |
| SW Globe/Check valves (1 1/2" and below) | : | BS 5352 |
| Flanged gate valves | : | API 600 |
| Flanged Globe valves | : | BS 1873 |
| Flanged check valves | : | BS 1868 |
| Diaphragm valves | : | BS 5156 |
| Butterfly valves | : | BS5155/AWVVA C504 |
- 1.15 Wherever stellite is specified, it means facing of seat and disc are welded by Cr-Co-W alloy. Stellite facing shall maintain minimum hardness of 375 BHN at high temperature.
- 1.16 All weld end valves shall have bevel ends as per ANSI B 16.25.
- 1.17 If an overlay weld deposit is used for the body seat ring or seating surface, the seat ring base material shall be at least equal to corrosion resistance of the material of the shell.
- 1.18 By Pass
- Unless otherwise noted, by-pass requirement for gate valves shall be under -

150 Class	:	on sizes 26" and above
300 Class	:	on sizes 16" and above
600 Class	:	on sizes 6" and above
900 Class	:	on sizes 4" and above
1500 Class	:	on sizes 4' and above
2500 Class	:	on sizes 3" and above
 - By-pass valve shall be a globe valve.
 - Contractor shall supply the by-pass valve duly tested and fitted to the main valve. By-pass attachment to the main valve body shall not be screwed. All fillet welds for by-pass installation shall be 100% examined by DP / MP test.
- 1.19 Spiral wound bonnet gasket is to be provided with inner / outer ring except when encapsulated gaskets type body bonnet joints are employed. Outer ring may be avoided in case of non-circular spiral wound gasket used in 150#

valve provided the outermost layer of spiral touches the bolts ascertaining the centering.

1.20 Pressure Test

- Valves covered under API codes shall be tested as per API 598 unless otherwise specified in the applicable valve code.
- Valves covered under BS code shall be tested as per BS 6755 unless otherwise specified in the applicable valve codes.

1.21 For all austenitic stainless valves, inter-granular corrosion test shall have to be conducted as per following: -

- ASTM A 262 Practice 'E' with acceptance criteria of "60 mils / year (max.)".
- OR
- ASTM A 262 practice 'E' with acceptance criteria of "No cracks as observed from 20X magnification U & Microscopic structure to be observed from 250X magnification".

1.22 When specifically asked for high temperature application of some grades of austenitic stainless steel (like SS 309, 310, 316, 316H etc.) ASTM A 262 practice 'C' with acceptance criteria "15 MILS/YEAR" shall have to be conducted. When testing is conducted as per practice 'E' photograph of microscopic structure shall be submitted for record.

1.23 For the IGC test as described in 1.16.1 & 1.16.2 two sets of samples shall be drawn from each solution treatment lot, one set corresponding to highest carbon content and other set corresponding to the highest rating/ thickness.

2.0 **OPERATION**

2.1 Valves shall be supplied with gear operations based on the following requirements:

Valve Types	Class	Size Requiring Gear Operation
Gate & Diaphragm Valves	150	14" and larger
	300	14" and larger
	600	12" and larger
	900	6" and larger
	1500	3" and larger
	2500	3" and larger
Globe Valves	900	6" and larger
	1500	3" and larger
	2500	3" and larger
Butterfly Valves	150	10" and larger
	300	6" and larger

- 2.2 Gear operator shall be as under with position indicators for open / close positions, with limit stops.

For Gate / Globe / Diaphragm Valves	Totally enclosed bevel gear in grease case with grease nipples/ plug
For Butterfly Valves	Totally enclosed helical worm gear or combination of helical worm and spur gear in grease case with grease nipples/ plugs.

- 2.3 Gear operators shall be so designed to operate effectively with the differential pressure across the closed valve equal to the cold non-shock pressure rating.
- 2.4 Butterfly valves even with wrench or lever operators shall have "open" and "closed" position indicators with limit stops.
- 2.5 Hand wheel diameter shall not exceed 750 mm and effort to operate shall not exceed 35 kg at hand wheel periphery. In case these limits cannot be satisfied for any valve, a gear operation shall be provided.

3.0 **INSPECTION AND TESTING**

- 3.1 All valves and valves operators shall be subject to stage wise and final inspection by third party inspection agency (at Contractor's cost). However, Company reserves the right to depute its authorized / representative in addition to third party inspection agency. Minimum 15 days notice shall be given to Company for all shop inspection and testing.
- 3.2 All the mandatory shop tests and inspection required by the respective data sheet and applicable standards & codes etc. shall be carried out.
- 3.3 The extent of inspection by shall be as under. However the exact extent with hold points shall be decided during review of the inspection plan to be submitted to Company as part of the post-order documentation.
- 3.4 Valves under NACE should follow the requirements of MR-01-75

FORGED VALVES

- Visual and dimensional inspection
- Review of material test certificates
- Any mandatory or supplementary test
- Hydrostatic test of all valves
- Strip check on 1% of total ordered quantity of valves at random to verify compliance with specification requirements.

CAST STEEL VALVES

- Visual and dimensional inspection
- Review of material test certificates

- Review of radiographs / radiographic reports and reports of any other NDT tests, wherever applicable as per data sheets
- Any mandatory or supplementary tests
- Hydrostatic test 100% for body
- Strip check on 1% of total ordered quantity of valves at random to verify compliance with specification requirements.

3.5 For motor /actuator operated valves, functional / operational checks as per the requirements of the specifications shall be made on each valve.

4.0 **RADIOGRAPHY OF CAST VALVES**

4.1 When specifically not mentioned in individual data sheets, valves castings shall undergo radiographic examination as specified hereunder:

MATERIAL	RATING	SIZE RANGE	RADIOGRAPHY
All	150#	24" and below	Nil
	150#	26" and above	100%
	300#	16" and below	Nil
	300#	18" and above	100%
	600# and above	All sizes	100%

4.2 Radiography procedure areas of casting to be radiographed shall be as per ANSI B 16.34 and acceptance criteria shall be as per ANSI B 16.34 Annexure -B. However for areas of casting to be radiographed for types of valve not covered in ANSI B 16.34, Contractor shall enclose details of areas to be radiographed in line with ANSI B 16.34.

5.0 **IBR VALVES**

5.1 All valves described as "IBR Valves" shall be in accordance with the latest IBR (Indian Boiler Regulations) as well as the other requirements specified in the specification.

5.2 For BW / SW end carbon steel valves under "IBR", the chemical composition shall conform to the following:

Carbon (Max.) : 0.25%
Others (S, B, Mn) : As per IBR

Above composition is not applicable for non-IBR valves.

5.3 For all "IBR Valves", test certificate in form III-C shall be furnished duly signed by IBR inspection authority or an IBR approved representative.

5.4 All valves shall be painted red.

6.0 **MARKING**

6.1 Valves markings, symbols, abbreviations, etc. shall be in accordance with

MSS-SP-25 or the standard referred to in the specifications as applicable
Manufacturer's name, valve size and rating, material designation, nominal
size, direction of flow (if any) etc. shall be integral on the body.

- 6.2 Each valve shall have a corrosion resistant tag giving size and valve tag/code no. securely attached on the valve body.
- 6.3 Paint or ink used for marking shall not contain any harmful metal or metal salts such as zinc, lead or copper which may result in corrosive attack on heating.
- 6.4 Carbon steel valves shall be painted with two coats of red oxide zinc chromate primer.
- 6.5 All alloy steel high temp valves shall be painted with heat resistant silicone paint suitable for intended temperature.

7.0 **DESPATCH**

- 7.1 Valves shall be dry, clean and free from moisture, dirt and loose foreign material of any kind.
- 7.2 Valves shall be protected from rust, corrosion and any mechanical damage during transportation, shipment, and storage.
- 7.3 Rust preventative applied on machined surfaces to be welded shall be easily removable with a petroleum solvent or shall not be harmful to welding.
- 7.4 Each end of valves shall be protected as follows:


Flange Face	:	Wood, plastic or metal cover
Beveled End	:	Wood, plastic or metal cover
SW / Screwed End	:	Plastics cap
- 7.5 End protectors to be used on flange faces shall be attached by at least three bolts or wires through bolt holes and shall not be smaller than the outside diameter of the flange. Plastic caps for SW / Screwed and valves shall be press fit type.
- 7.6 End protectors to be used on beveled ends shall be securely attached.

**SPECIFICATION
FOR
INSULATING JOINTS**

SPECIFICATION NO.: BR/TS/059




**(OIL & GAS)
BRIDGE AND ROOF CO. (I) LTD**

BRIDGE AND ROOF CO. (I) LTD	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	INSULATING JOINTS	DOCUMENT NO.: BR/TS/059	Page 1 of 1
			REVISION : 0
			EDITION : 1


CONTENTS

<u>Sl.No.</u>	<u>Description</u>
1.0	SCOPE
2.0	REFERENCE DOCUMENTS
3.0	MATERIALS
4.0	DESIGN & CONSTRUCTION REQUIREMENTS
5.0	INSPECTION AND TESTS
6.0	TEST CERTIFICATES
7.0	PAINTING, MARKING AND SHIPMENT
8.0	GUARANTEE
9.0	DOCUMENTATION

BRIDGE AND ROOF CO. (I) LTD	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	INSULATING JOINTS	DOCUMENT NO.: BR/TS/059	Page 1 of 1
			REVISION : 0
			EDITION : 1

AMENDMENT STATUS

Sl. No.	Clause / Paragraph / Annexure / Exhibit / Drawing Amended	Page No.	Revision	Date	By (Name)	Verified (Name)

BRIDGE AND ROOF CO. (I) LTD	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	INSULATING JOINTS	DOCUMENT NO.: BR/TS/059	Page 1 of 7
			REVISION : 0
			EDITION : 1

1.0 **SCOPE**

This specification cover the basic requirements for design manufacture, testing and supply of carbon steel insulating joints to be installed in onshore pipeline systems handling hydrocarbons in liquid or gaseous phase including Liquefied Petroleum Gas (LPG).


2.0 **REFERENCE DOCUMENTS**

2.1 Reference has been made in this specification to the latest edition of, the following Codes, Standards and Specifications.

a)	ASME B 31.8	Gas Transmission & Distribution piping System
b)	ASME B 31.4	Liquid transportation systems for hydrocarbons, LPG, Anhydrous Ammonia and Alcohols
c)	ASME B 16.5	Steel Pipe Flanges & Flanged Fittings
d)	ASTM A 370	Mechanical testing of Steel Product
e)	ANSI B 16.25	Butt Welding Ends
f)	ASME Section	Boiler & pressure Vessel Code viii & ix
g)	API 1104	Standard for welding pipelines and Related facilities.
h)	SSPC-VIS-1	Steel Structures painting Council Visual Standard.
i)	MSS-SP-53	Quality standard for steel castings and forgings for valves flanges and fittings and other piping components - magnetic particle examination method.
j)	MSS-SP-75	Specification for high test wrought welding fittings.
k)	NACE RP 0286	The electrical isolation of cathodically protected pipelines.

2.2 In case of conflict between the requirements of this specification and any code, Standard and Specification referred in Clause 2.1 above. Order of precedence shall be as follows:

- Data Sheets
- This Specification
- Dther Referred Codes & Standards
- Manufacturer's Standard.

BRIDGE AND ROOF CO. (I) LTD	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	INSULATING JOINTS	DOCUMENT NO.: BR/TS/059	Page 2 of 7
			REVISION : 0
			EDITION : 1

3.0 **MATERIALS**

- 3.1 Material for the pressure containing parts of the insulating joints shall be as indicated in the data sheets. Material for pups shall be equivalent or superior to the material of connecting pipeline which is indicated in the data sheets. Other part shall be as per manufacturer's standard suitable for the service condition indicated in Insulating Joint Data Sheets and shall be subject to approval by purchaser.

All process-wetted parts, metallic & non-metallic shall be suitable for the commissioning fluids & service specified by the purchaser. Manufacturer shall confirm that all wetted parts are suitable for treated water/seawater environment, which may be used during field testing.

- 3.2 Insulating joints which are subject to field welding by purchaser, shall have carbon equivalent (CE) not exceeding 0.45 based on check analysis for each heat of steel calculated according to the following formula :

$$CE = C + Mn/6 + (Cr+Mo+V)/5 + (Ni +Cu)/15$$

- 3.3 When specified in the II Data Sheet, charpy V-notch test shall be conducted on each heat of base material, weld metal and heat affected zone of all pressure containing parts such as body, welding ends in accordance with the impact test provisions of ASTM A 370 at a temperature of 0° C. The charpy impact test specimens shall be taken in the direction of principal grain flow and notched perpendicular to the original surface of the plate of forging. Average impact energy value of three full sized specimens shall be 27 joules. Minimum impact energy value of any one specimen shall not be less than 80% of the average impact energy specified. No specimen shall exhibit less than 80% shear area.


When Low Temperature Carbon Steel (LCTS) materials are specified in Datasheet or offered by Manufacturer, the Charpy V-notch test requirements of applicable material standard shall be complied with.

- 3.4 Carbon steel used for the manufacture shall be fully killed
- 3.5 When specified in data sheet, hardness test shall be carried out as per ASTM A370 for each heat of steel used. The maximum hardness of base metal, weld metal and heat affected zone of all pressure parts shall be 248 HV₁₀, unless specified otherwise.
- 3.6 Insulation material shall be minimum 20 mm thick and shall comply section 5, NACE RP 0286.

4.0 **DESIGN & CONSTRUCTION REQUIREMENTS**

4.1 **Mechanical**

- 4.1.1 Insulating joints shall be of integral type fabricated by welding and with pups on either

BRIDGE AND ROOF CO. (I) LTD	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	INSULATING JOINTS	DOCUMENT NO.: BR/TS/059	Page 3 of 7
			REVISION : 0
			EDITION : 1

side as shown in data sheet. A corrosion allowance as indicated in data sheet shall be considered in design. Bolted and threaded joints are not acceptable. Insulating Joints of design, not having closing welds, are not acceptable.

4.1.2 All materials used for the manufacture of the insulating joint shall be in accordance with clause 3.0 of this Specification.

4.1.3 Insulating joints shall be designed using the design principles of ASME Section-VIII Div. 1. The design shall be checked for the following two cases:

Case-I : Design Pressure (as per Data Sheet) + Axial Force (F)

The Axial force shall be calculated as under :

$$F = 0.1 \times S \times A$$

Where

S = SMYS of connected pipe (refer Data Sheet)
A = Metal cross-sectional area of connected pipe.

The allowable stress in this case shall be less than or equal to 0.5 x SMYS of insulating joint material.

Case-II : Hydrostatic Test Pressure

The allowable stress in this case shall be less than or equal to 95% of SMYS of insulating joint material.

All design parameters shall be as per Insulating Joint Data Sheet. Detailed calculations shall be submitted for Purchaser's approval.


4.1.4 Insulating joint design and materials shall be capable of being vacuum tested to 1 millibar.

4.1.5 The joint between pipe pup pieces and main forging shall be full penetration butt weld type. Weld design shall be such as resulting in a weld joint factor of 1.0.


4.1.6 Butt weld ends shall have ends as per ASME B16.25. However, end preparation for butt welding ends having unequal thickness with respect to connecting pipe, shall be as per ASME B31.4/ B31.8 as applicable.

4.1.7 The reinforcement of inside weld seam, in case pups fabricated from LSAW pipes, shall be removed for a distance of at least 50mm from each end.


4.1.8 Insulating joints shall allow free passage of scraper/ instrumented pigs. The internal bore shall be same as that of connecting pipe including its tolerances.

BRIDGE AND ROOF CO. (I) LTD	STANDARD TECHNICAL SPECIFICATION		 बी एण्ड आर B AND R <i>Building Nation Since 1926</i>
	OIL & GAS		
TITLE	INSULATING JDINTS	DOCUMENT NO.: BR/TS/059	Page 4 of 7
			REVISION : 0
			EDITION : 1

- 4.1.9 The insulating joint shall be formed by sandwiching and locking in positions the insulating material in a bell and spigot type of joint. The joint shall be assembled in such a way that its various components are firmly locked in position and the completed joint is capable of withstanding stresses due to designed operating conditions and field hydrostatic testing.
- 4.1.10 Insulating joints shall be suitable for aboveground or underground installations as indicated in the data sheets.
- 4.1.11 All welds shall be made by welders and welding procedures qualified in accordance with the provisions ASME section IX. The procedure qualification shall include impact test and hardness test and shall meet the requirements of clause 3.3, 3.5 of this specification.
- 4.1.12 Repair welding on parent metal is not allowed. Repair of welds shall be carried out only after specific approval by purchaser's representative for each repair. The repair welding shall be carried out by welders and welding procedures duly qualified as per ASME section IX and records for each repair shall be maintained. Repair welding procedure qualification shall also include impact test & hardness test when required as per Cl. No. 3.3 & 3.5 of this specification & shall meet the requirements as specified therein.
- 4.1.13 The Tolerance on Internal diameter at the welding end shall be as per applicable connected pipe specification as indicated in the datasheet.
- 4.1.14 Out of roundness measured at the root face of the welding ends shall not be more than 0.5% of the specified inside diameter.
- 4.2 **Electrical**
- 4.2.1 The average dielectric strength of the insulating joint shall be minimum 15 kilo Volts.
- 4.2.2 Two cleats as shown in data sheet shall be provided on the pups on either side of the insulating joint for connecting 10 mm² and 50 mm² cables for measurement/ shorting purposes. Cleats shall be attached to the insulating joint by welding.
- 5.0 **INSPECTION AND TESTS**
- 5.1 The manufacturer shall perform all inspection and tests as per the requirements of this specification and the relevant codes, prior to shipment at his works. Such inspection and tests shall be, but not limited to the following:
- 5.1.1 All insulating joints shall be visually inspected. The internal & external surfaces shall be free from any strikes, gauges & other detrimental & defects. The surfaces shall be thoroughly cleared & free from dirt, rust & scales.

BRIDGE AND ROOF CO. (I) LTD	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	INSULATING JOINTS	DOCUMENT NO.: BR/TS/059	Page 5 of 7
			REVISION : 0
			EDITION : 1

- 5.1.2 Dimensional checks shall be carried out as per the purchaser approved drawings.
- 5.1.3 Chemical composition and mechanical properties including hardness shall be checked as per relevant material standards and this specification, for each heat of steel used.
- 5.1.4 Non-destructive inspection of insulating joints shall be carried out as given below:
- 100% radiography shall be carried out on all butt & repair welds of pressure containing parts. Acceptance limits shall be as per API 1104. Welds, which in purchaser's Representative opinion cannot be inspected by radiographic methods, shall be checked by ultrasonic or magnetic particle methods. Acceptance criteria shall be as per ASME Section VIII Appendix-12 and Appendix-6 respectively.
 - All finished weld ends shall be 100% ultrasonically tested for lamination type defects for a distance of 50mm from the ends. Any lamination larger than 6.35 mm shall not be acceptable.
 - All forgings shall be wet magnetic particle inspected on 100% of forged surfaces. Method and acceptance shall comply MSS-SP-53.
 - All fillet weld of thickness < 6mm shall be examined 100% by magnetic particle inspection and ≥ 6mm shall be examined 100% by UT. Acceptance criteria for MPI & UT shall be as per ASME Sec.VIII Appendix-6 & Appendix-12 respectively.
- 5.1.5 Insulating joint shall be hydrostatically tested to a pressure as indicated in data sheet. The test duration shall be of 15 minutes.
- 5.1.6 After the hydrostatic test insulating joints shall be tested with air at 5 kg/cm² for 10 minutes. The tightness shall be checked by immersion or with a frothing agent. No leakage will be accepted.
- 5.1.7 **Dielectric Test**
- Insulation resistance of each insulating joint shall be atleast 25 mega-ohms when checked with 500-1000 V DC.
 - Insulating joint before and after the hydrostatic test, shall be tested for dielectric integrity for one minute at 5000 V A.C., 50 cycles and the leakage current before and after hydrostatic test shall be equal. Testing time voltage and leakage shall be recorded and certified. No repair shall be permitted to the insulating joints failed in the above-mentioned tests.
- 5.2 Purchaser reserves the right to perform stage wise inspection and witness test as indicated in Para 5.1 at Manufacturer's works prior to shipment. Manufacturer shall give reasonable notice of time and shall provide without charge reasonable access and facilities required for inspection to the purchaser's Representative.

BRIDGE AND ROOF CO. (I) LTD	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	INSULATING JOINTS	DOCUMENT NO.: BR/TS/059	Page 6 of 7
			REVISION : 0
			EDITION : 1

Inspection and tests performed/witnessed by the Purchaser's Representative shall in no way relieve the Manufacturer's obligation to perform the required inspection and test.

6.0 TEST CERTIFICATES

6.1 Manufacturer shall submit following certificates to Purchaser's Representative.

- a) Test certificates relevant to the chemical analysis and mechanical properties including hardness of the materials used for construction of insulating joint as per this specification and relevant standards.
- b) Test reports on non-destructive testing.
- c) Test certificates for hydrostatic and air tests.
- d) Test certificate for electrical test.
- e) Test report on vacuum test.

7.0 PAINTING, MARKING AND SHIPMENT.

7.1 Insulating joint surface shall be thoroughly cleaned, freed from rust and grease and applied with sufficient coats of corrosion resistant paint. Surface preparation shall be carried out by shot blasting to SP-6 in accordance with "steel structures painting council - Visual standard SSPC-VIS-1.". External surfaces of burled insulating joints shall be painted with three coats of suitable coal tar epoxy resin with a minimum dry film thickness of 300 microns.


Manufacturer shall indicate the type of corrosion resistant paint used, in the drawings submitted for approval.

7.2 Insulating joints shall be marked with indelible paint with the following data:-

- a. Manufacturer's name
- b. Suitable for ____ inch nominal diameter pipeline
- c. End thickness in mm
- d. Material
- e. Design Pressure/ Hydrostatic Test Pressure
- f. ANSI Class Rating
- g. Tag No.
- h. Year of Manufacture

7.3 Insulating joints shall be suitably protected to avoid any damage during transit. Metallic or high-impact plastic bevel protectors shall be provided to weld ends.

7.4 Only those insulating joints which have been inspected and certified by Purchaser shall be shipped.

BRIDGE AND ROOF CO. (I) LTD	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	INSULATING JOINTS	DOCUMENT NO.: BR/TS/059	Page 7 of 7
			REVISION : 0
			EDITION : 1

8.0 **GUARANTEE**

- 8.1 The manufacturer shall guarantee that the materials used comply with the requirements of this specification.
- 8.2 Manufacturer shall replace or repair insulating joints found defective due to inadequate engineering or quality of material.
- 8.3 Manufacturer shall replace the insulating joint without delay if the defect or malfunctioning can not be eliminated.
- 8.4 Any defects occurring within 12 months from the date of installation or within 30 months from the date of despatch, whichever is earlier, shall be repaired making all necessary modifications and repair of defective parts free of charge to the purchaser.

9.0 **DOCUMENTATION**


- 9.1 All documents shall be in English Language.
- 9.2 At the time of bidding, Bidder shall submit the following documents:-
- General arrangement drawing along with cross sectional view, overall dimensions and details of insulating materials recommended.
 - Reference lists of previous supplies of insulating joint of similar specification.
 - Clause wise list of deviation from this specification, if any.
- 9.3 Within three weeks of placement of order, the Manufacturer shall submit four copies of but not limited to the following drawings, documents and specifications for approval.
- Fabrication drawings and relevant calculations for pressure containing parts.
 - Welding procedure and method of manufacture for all phases of manufacture.
 - Quality Control Manual & Quality Control Plan.
- Once the approval has been given by purchaser any changes in design, material and method of manufacture shall be notified to the Purchaser whose approval in writing of all changes shall be obtained before the insulating joint are manufactured.
- 9.4 Within four weeks from the approval date Manufacturer shall submit one reproducible and six copies of the approved drawings, documents and specifications as listed in 9.3 of this specification.
- 9.5 Prior to shipment, the manufacturer shall submit one reproducible and six copies of the test certificates as listed in Clause 5.0 of this specification.

PROCESS & PIPING DESIGN SECTION
BRIDGE AND ROOF CO.(I) LTD.



TECHNICAL SPECIFICATION
FOR
LONG RADIUS BENDS


SPECIFICATION NO. : BR/TS/060

BRIDGE AND ROOF CO.(I) LTD.		PROCESS & PIPING DESIGN SECTION	STANDARD SPECIFICATION	
TITLE	LONG RADIUS BENDS	SPECIFICATION NO.		PAGE 1 OF 8
		BR/TS/060		REV 0

CONTENTS

- 1.0 SCOPE
- 2.0 REFERENCE DOCUMENTS
- 3.0 MATERIAL
- 4.0 MANUFACTURE
- 5.0 INSPECTION AND TESTS
- 6.0 MARKING, PACKING AND SHIPMENT
- 7.0 WARRANT
- 8.0 DOCUMENTATION

Revision No.	Date	Revised by	Checked by	Approved by
PREPARED BY :		CHECKED BY :		APPROVED BY :

BRIDGE AND ROOF CO.(I) LTD.		PROCESS & PIPING DESIGN SECTION	STANDARD SPECIFICATION	
TITLE	LONG RADIUS BENDS	SPECIFICATION NO.		PAGE 2 OF 8
		BR/TS/060		REV 0

1.0

SCOPE

This specification covers long radius steel pipe bends to be manufactured in accordance with the requirements of MSS-SP (Manufacturers Standardisation Society Standard Practice) 75, latest edition, to be used in pipeline system handling Natural Gas. The selection of options permitted by MSS-SP-75 shall be as described below. All applicable requirements contained in the MSS-SP-75 shall be fully valid unless cancelled, replaced or amended by more requirements as stated in this specification. In case of conflict between the requirements of this specification and MSS-SP-75, the requirements of this specification shall govern.

2.0

REFERENCE DOCUMENTS

Reference has also been made in this specification to the latest edition of the following codes, standards and specifications.

a)

ANSI B31.8

:

Gas Transmission and Distribution Piping System.

b)

ASME Sec. VIII Div. 1

:

Boiler and Pressure Vessel Code

c)

ASME Sec IX

:

Boiler & Pressure Vessel Code Welding and Brazing Qualifications

d)

API Spec. 5L

:

Line Pipe

e)

ASTM Part-I

:

Steel Piping, Tubing, Fittings


In case of conflict between the above reference documents and this specification, the requirements of the specification shall prevail.


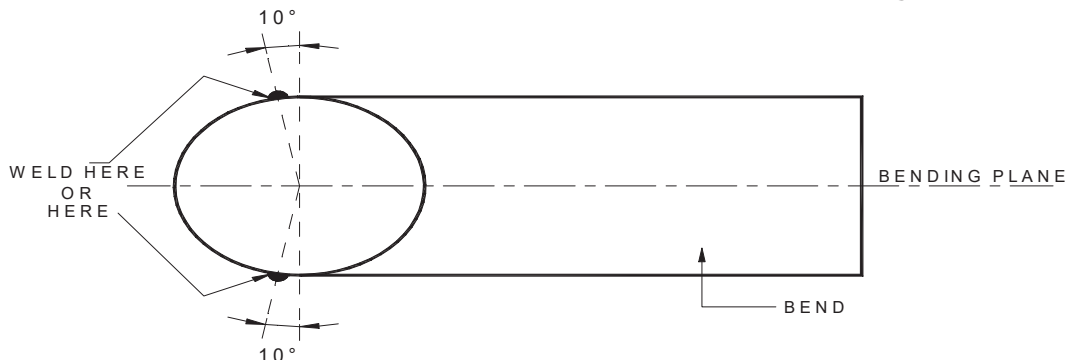
3.0


MATERIALS


3.1

Bends shall be fabricated from bare steel line pipe (to be issued as free issue item by Purchaser). The details of free issue line pipe material is given separately in LR Bend Data Sheet & Purchase Requisition.

BRIDGE AND ROOF CO.(I) LTD.		PROCESS & PIPING DESIGN SECTION	STANDARD SPECIFICATION	
TITLE	LONG RADIUS BENDS	SPECIFICATION NO.		PAGE 3 OF 8
		BR/TS/060		REV 0
3.2	All mechanical properties of the bends after finishing shall be same as pipe specification as referred in section 3.1. The following tests shall be conducted on finished bends and test procedures shall be as per pipe specification as referred in para 3.1.			
3.2.1	One transverse tensile test will be conducted to establish the yield strength, ultimate tensile strength and elongation of :			
	a) Base material at inside radius of the bend.			
	b) Base material at outside radius of the bend.			
3.2.2	One all weld tensile test will be conducted (wherever applicable) to establish yield strength, ultimate tensile strength and elongation of weld material on bend.			
3.2.3	Three transverse Charpy-V-notch impact tests shall be conducted on full sized specimen of the same heat in accordance with ASTM A370 at 0 C for each of the following :			
	a) Base material at outside radius of the bend.			
	b) Weld material of bend			
3.2.4	<u>Guided Bend Tests</u>			
	One face and one root guided bend weld test shall be performed on samples cut from one bend per heat of steel. The dimensions A' in guided bend test shall not exceed 4.0 times the nominal wall thickness and dimension B' shall be equal to A - 2t - 3.2mm.			
4.0	<u>MANUFACTURE</u>			
4.1	Bends shall be manufactured by hot bending of pipe applying induction heating only.			
	The adopted procedure shall be completed by suitable heat treatment to achieve the required mechanical and chemical properties of the finished bends and is accepted only after written approval of the Purchaser. The procedure shall ensure uniform bending without any defects other than those allowed in this specification and pipe specification as referred in para 3.1.			

BRIDGE AND ROOF CO.(I) LTD.		PROCESS & PIPING DESIGN SECTION	STANDARD SPECIFICATION	
TITLE	LONG RADIUS BENDS	SPECIFICATION NO.		PAGE 4 OF 8
		BR/TS/060		REV 0
4.2	When bending, the weld wherever applicable shall be located at approx. 10° from the neutral zone, measured at outside of the bend as indicated in figure below.			
				
4.3	Bevels at the ends shall be as specified in MSS-SP-75 unless otherwise specified differently in the material/ purchase requisition.			
4.4	Bends shall not have any circumferential joint.			
4.5	No repair by welding is allowed on any part of the bends.			
4.6	The cooling of the bend immediately after bending shall be an interval cooling, alternatively with water and air at a minimum pressure of 2 atmospheres.			
4.7	The procedure shall be such which shall not require any additional heat treatment after bending. If such a heat treatment is required, it is permitted only after the written approval of purchaser and shall be carried out at Manufacturer's expense.			
4.8	Bulges, dents and flat areas shall not appear within 100mm from end of the bend.			
	For the remaining part of the bend these deviations from the original contour of the pipe are permitted but the same shall be repaired, provided these deviations shall not exceed 6.5 of nominal wall thickness in height/ depth and the same shall not extend (in any direction) over a distance of more than 25 of nominal diameter.			
4.9	The excess weld material wherever applicable at the inside of the bend shall be removed over a distance of 100mm at both ends.			
4.10	Tolerances The dimensions of bends shall be controlled to make sure that they are manufactured according to the tolerances indicated below over and above the requirements of MSS-SP-75			

BRIDGE AND ROOF CO.(I) LTD.		PROCESS & PIPING DESIGN SECTION	STANDARD SPECIFICATION	
TITLE	LONG RADIUS BENDS	SPECIFICATION NO.		PAGE 5 OF 8
		BR/TS/060		REV 0
4.10.1	Minimum Inside Diameter : -2.5 of inside nominal diameter except 200mm from ends			
	Bend Angle : 1			
	Bend Radius : 1 of bending nominal Diameter			
4.10.2	The manufacturer shall check the wall thickness of the pipe before and after bending along the outside radius either at distances approximately equal to pipe diameter or 300mm whichever is less. The measured wall thickness shall be atleast equal to :			
	tmin 0.95 (tnom. - Δ t)			
	tnom nominal wall thickness as specified in the material/ purchase requisition.			
	Δ t 0.35mm for a wall thickness smaller than 10mm.			
	Δ t 0.50mm for a wall thickness 10mm or more.			
4.10.3	Ovality may be defined as :			
	$\frac{OD\ max.\ -\ OD\ min}{OD\ nom.}$			
	The above value shall be 1 within 100mm from each end and 6 for remaining part of the bend. The measurement shall be made over the circumference of the bend either at distance approximately equal to pipe diameter or 300mm whichever is less.			
4.10.4	Wrinkles			
	Measurements of the outside diameter shall be taken in the plane of the bend at locations where wrinkles are present (OD max.) and at locations where wrinkles are not present (OD min,). The acceptance limit shall be as defined below.			
	$\frac{OD\ max.\ -\ OD\ min}{OD\ nom.} \leq 1$			

BRIDGE AND ROOF CO.(I) LTD.		PROCESS & PIPING DESIGN SECTION	STANDARD SPECIFICATION	
TITLE	LONG RADIUS BENDS	SPECIFICATION NO.	PAGE 6 OF 8	
		BR/TS/060	REV 0	

5.0

INSPECTION AND TESTS

5.1

The manufacturer shall perform all inspection and tests as per the requirements of this specification and MSS-SP-75 prior to shipment at his works. Such inspection and tests shall be, but not limited to, the following :

a)

Verify that the unfinished product arriving at manufacturer’s shop is in full compliance with the pipe specification as referred in para 3.1.

b)

Visual Inspection.

c)

Dimensional and tolerances check as per MSS-SP-75 and requirements of section 4.0 of this specification.

d)

Check heat treatment, if carried out, as required and maintain its records.

e)

Temperature against time recorder charts for each induction heating.

f)

Material properties shall be checked to meet the requirements of section 3.0 of this specification.

g)

The non-destructive inspection on the finished bend shall be carried out as given below :

•

All longitudinal seam welds shall be fully radiographed and acceptance limits shall be as per pipe specification as referred in para 3.1.


•

The full circumference of both ends of each bend after bevelling shall be ultrasonically tested for laminations over a length of 25mm and acceptance limits shall be as per pipe specification as referred in para 3.1.

5.2

Purchaser’s Representative reserves the right to perform stagewise inspection and witness tests on all bends as indicated in para 5.1 at Manufacturer’s works, prior to shipment.

Manufacturer shall give reasonable notice of time and shall provide without charge reasonable access and facilities required for inspection, to the Purchaser’s Representative. Inspection and test performed or witnessed by Purchaser’s Representative shall in no way relieve the Manufacturer’s obligation to perform the required inspection and tests. Under no circumstances any action of the Purchaser’s Representative shall relieve the Manufacturer of his responsibility for the material, design, quality and operation of the equipment.

BRIDGE AND ROOF CO.(I) LTD.		PROCESS & PIPING DESIGN SECTION	STANDARD SPECIFICATION	
TITLE	LONG RADIUS BENDS	SPECIFICATION NO.		PAGE 7 OF 8
		BR/TS/060		REV 0

5.3

Test Certificates

The Manufacturer shall produce the Certificates (in original) for all, but not limited to, the following :

a)

Certificates of chemical analysis and mechanical tests carried out on pipe and bends separately.

b)

Certificates of required non-destructive test inspection.

c)

Certificates of heat treatments, if any.

d)

Certificates of all other tests as required in this specification.

In case any of the above said certificates are not available during the final inspection, the supply shall be considered incomplete.

6.0

MARKING, PACKING AND SHIPMENT

6.1

All bends shall be marked as per MSS-SP-75.

6.2

All loose and foreign material i.e. rust, grease, etc. shall be removed from inside and outside of the bends.

6.3

All bends except bevelled ends shall be coated internally and externally with a thin film of zinc chromate red oxide paint for protection against corrosion during transit and storage. The coating shall be easily removable in the field. Manufacturer shall furnish the details for the same.

6.4

Both ends of all bends shall be suitably protected to avoid any damage during transit by means of metallic bevel protectors.

6.5

Package shall be marked legibly with suitable marking to indicate the following:

a)

Order Number

b)


Package Number

c)

Manufacturer’s Name

d)

Size (Inches) and wall thickness (mm)

BRIDGE AND ROOF CO.(I) LTD.		PROCESS & PIPING DESIGN SECTION	STANDARD SPECIFICATION	
TITLE	LONG RADIUS BENDS	SPECIFICATION NO.		PAGE 8 OF 8
		BR/TS/060		REV 0

7.0

WARRANTY

Purchaser will be reimbursed by Manufacturer for any bend furnished on this order that fails under field hydrostatic test if such failure is caused by a defect in the bend which is outside the acceptance limits of this specification. The reimbursement cost shall include bend cost, labour cost and equipment rental for searching, excavation, cutting out and installation of replaced bend in position. The field hydrostatic test pressure will not exceed that value which will cause a calculated hoop stress equivalent to 100 of specified minimum yield strength of the attached pipe.

8.0

DOCUMENTATION

8.1

All documents shall be in English language.

8.2

At the time of bidding, bidder shall submit the following documents :

a)

Reference list of previous supplies of bends of similar specifications.

b)

Clause-wise list of deviation from this specification, if any.

c)

Brief description of manufacturing and quality control facilities of the Manufacturer’s works.

8.3

Within one week of placement of order the Manufacturer shall submit four copies, of the manufacturing process and quality assurance plan for pipe and bends.

Once the approval has been given by Purchaser any change in material and method of manufacture and quality control shall be notified to Purchaser whose approval in writing of all such changes shall be obtained before the bends are manufactured.

8.4

Within four weeks from the approval date Manufacturer shall submit one reproducible and six copies of the documents as stated in para 8.3 of this specification.

8.5


Prior to shipment, the Manufacturer shall submit one reproducible and six copies of test certificates as listed in para 5.3 of this specification.

**TECHNICAL / STANDARD
SPECIFICATION
FOR
CIVIL & STRUCTURAL WORKS**

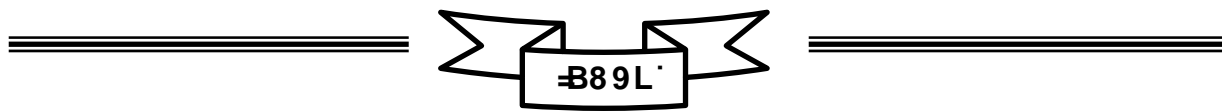
SPECIFICATION FOR CIVIL ENGINEERING WORKS



BRIDGE AND ROOF CO.(I) LTD.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 1 of 1
			REVISION : 0
			EDITION : 1

GD97 = 75 HCB: CF 7 J = @9B; B99F-B; K CF?G




D5; 9G

D5 FH!' =	A5 H9F-5 @G	≡hc'≡L' / '≡%hc'≡**
D5 FH!' =	K CF?A5 BG<-D	≡hc'≡L' / '≡%hc'≡% \$
D5 FH!' =	BCFAG'C: 79A9BH7 CBGI ADHCB	≡/ '≡%hc'≡%
D5 FH!' =	8-A9BG-CB5 @HC @F5 B79	'≡!%hc'≡!%\$
D5 FH!' J	A9H<C8`C: `A95 GI F9A9BH	J!≡/ `J!%hc`J!%
D5 FH!' J =	G5: 9HMF9EI -F9A9BHG: CF 7CBGHFI 7HCB`K CF?	J≡%hc`J≡%
5BB9LI F9	@GH'C: -G/ 7C89G'F9: 9FF98	5!%hc`5!&)

SPECIFICATION FOR CIVIL WORKS

PART – I MATERIALS

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 1 of 9
			REVISION : 0
			EDITION : 1

C O N T E N T S

1.0 GENERAL


- 1.1 Scope
- 1.2 Standard
- 1.3 Approval and Tests
- 1.4 Codes
- 1.5 Rejection of Materials

2.0 MATERIALS FOR CONCRETE

- 2.1 Aggregates
- 2.2 Coarse Aggregates
- 2.3 Fine Aggregates
- 2.4 Lime
- 2.5 Surkhi
- 2.6 Cement
- 2.7 Water
- 2.8 Admixtures for Concrete
- 2.9 Interval of Routine Test

3.0 STEEL

- 3.1 For Reinforcement
- 3.2 For Binding Works
- 3.3 For Light Structural Work and Insert

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 2 of 9
			REVISION : 0
			EDITION : 1

3.4 Steel Tubes

3.5 Foundation Bolts

3.6 Steel tubes for Non-structural use

3.7 Threaded Fasteners

3.8 Testing

3.9 Cast Steel

3.10 Conduits

4.0 ASBESTOS CEMENT PRODUCTS

4.1 General

4.2 Building Boards

4.3 Flat Sheets

4.4 Pipes and Fittings

4.5 Corrugated and Semi-corrugated sheets

4.6 Asbestos Cement Roof fittings

5.0 BRICK AND STONES

5.1 Bricks


5.2 Handling

5.3 Inspection

5.4 Brick Bats

5.5 Laterite Stone Blocks

5.6 Stones (Granite, trap, sandstone and quartzite etc.)

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 3 of 9
			REVISION : 0
			EDITION : 1

5.7 Hollow and Solid Concrete Blocks

5.8 Cement, Lime and Water

5.9 Sand for Masonry Mortar

6.0 SAND FOR PLASTERING

7.0 MATERIALS FOR FLOORING & PAVING

7.1 Cement & Binders

7.2 Aggregates

7.3 Tiles

7.4 Pigments

7.5 Red oxide of Iron

7.6 Hardening Agents

7.7 Dividing Strips

7.8 Marble chips

7.9 Marble powder

8.0 TIMBER


8.1 General

8.2 Teak Wood / Sal / Beja Sal / Deodar / Kail and other varieties.

8.3 Storage & Inspection

8.4 Moisture Content

8.5 Allowance for Bulk Timber

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 4 of 9
			REVISION : 0
			EDITION : 1

8.6 Flush Door Shutters, Shelves

8.7 Wood Particle Board

8.8 Veneered Particle Board

8.9 Plywood for general purpose

8.10 Veneered decorative plywood

9.0 FITTINGS FOR DOORS, WINDOWS ETC.

9.1 General

9.2 Hinges

9.3 Sliding Door Bolts

9.4 Door Rim Latch

9.5 Tower bolts

9.6 Door Handles

9.7 Mortice locks and Rebated Mortice locks

9.8 Floor door stopper

9.9 Hooks and eyes.

9.10 Casement window handles

9.11 Casement peg stays


9.12 Quadrant stays

9.13 Fan light pivots

9.14 Fan light catch

9.15 Steel Frames for doors

9.16 Putty

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 5 of 9
			REVISION : 0
			EDITION : 1

10.0 METAL DOORS, WINDOWS, VENTILATORS AND ROLLING SHUTTERS


- 10.1 General
- 10.2 Steel doors, Windows, Ventilators
- 10.3 Aluminium Doors, Windows, Ventilators
- 10.4 Steel Rolling Shutter, Rolling Grills
- 10.5 M.S. Bolts etc.,
- 10.6 Hardware
- 10.7 Mastic

11.0 GLASS

- 11.1 General
- 11.2 Plain Transparent Glass
- 11.3 Ground or Frosted Glass
- 11.4 Thickness
- 11.5 Inspection

12.0 PAINT

- 12.1 General
- 12.2 Sampling & Testing
- 12.3 Storage
- 12.4 Paints for Priming
- 12.5 Paints for Finishing

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 6 of 9
			REVISION : 0
			EDITION : 1

12.6 White Wash

12.7 Colour Wash

12.8 Water proof cement Paint

12.9 Distemper

12.10 Varnish

12.11 Polish

12.12 Plastic acrylic emulsion paint

12.13 Creosote oil or Coal tar creosote

12.14 Coal Tar black paint

12.15 Floor polish paste

13.0 WATERPROOFING MATERIALS

13.1 Integral Cement water proofing compounds

13.2 Bitumen

13.3 Bitumen Primer

13.4 Bitumen Felt

13.5 Bitumen Mastic


13.6 Bituminous Compounds

13.7 Surface Application Materials

13.8 Polymer based paints

13.9 Fibre glass R.P. Tissue

13.10 P.V.C. Membrane/sheet

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 7 of 9
			REVISION : 0
			EDITION : 1

14.0 WATER BAR

14.1 General

14.2 Jointing

15.0 LEAD

15.1 General

16.0 BUILDING PAPER/GYPSUM MATERIALS

16.1 Building paper

17.0 FILLING MATERIAL

17.1 General

17.2 Mastic Bitumen

17.3 Flexible Boards

18.0 DRAINAGE AND SANITATION (INTERNAL)

18.1 General

18.2 P.V.C Waste Pipe

18.3 Stoneware Pipes

18.4 HCl Pipes and fittings


18.5 Cast Iron Pipes and AC pipes (Rain Water pipes)

18.6 Sanitary appliances (E.W.C. & I.W.C.)

18.7 Wash Hand Basin

18.8 Flat Back Lipped Urinal

18.9 Mirror Frames

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 8 of 9
			REVISION : 0
			EDITION : 1

18.10 Toilet Shelf

18.11 Towel rail

18.12 Soap Container

18.13 CP Flush Valves for E.W.C.

18.14 CP Flush Valves for urinals

18.15 Gully Trap

18.16 C.I. Manhole Cover and frame

18.17 Flushing cistern

18.18 Plastic seat & cover for water closets

19.0 WATER SUPPLY & PLUMBING (INTERNAL)

19.1 General

19.2 G.I. Pipes and Fittings

19.3 RCC, Asbestos, prestressed pipes and fittings

19.4 C.I. Pipes and fittings

19.5 Steel Pipes

19.6 Bib Tap and Stop Tap


19.7 Valves

19.8 Shower Rose

19.9 Storage Tank

19.10 Misc. items

20.0 EXTERNAL SEWERAGE & DRAINAGE

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 9 of 9
			REVISION : 0
			EDITION : 1

20.1 C.I. Pipes

20.2 Washers

20.3 Gaskets

20.4 Caulking Lead

20.5 Salt glazed stoneware Pipes

20.6 Steel pipes

20.7 Cast Iron Manhole Covers and frames

21.0 ROAD AND FENCING

21.1 General

21.2 Soling Stones

21.3 Coarse aggregate for Water Bound Macadam

21.4 Screenings

21.5 Stone Chips for Bituminous Surfacing

21.6 Sand

21.7 Binder

21.8 Kerbs


21.9 Barbed wire

21.10 Chain link fabric

21.11 Concertina Coil fencing

22.0 APPROVED BRAND AND/OR MANUFACTURER'S NAME FOR SOME OF THE IMPORTANT MATERIALS

23.0 MATERIALS NOT SPECIFIED

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 1 of 66
			REVISION : 0
			EDITION : 1

1.0 GENERAL

1.1 Scope

This part deals with the requirements of materials for use in construction work with regard to quality, testing, approval and storage, before they are used on work. This part is supplementary to Part-II: Workmanship and Other requirements of the Technical Specifications for civil works.

1.2 Standard


A high standard of quality is required for all materials used in construction work. They shall be the best of the kind obtainable indigenously in each case and shall be procured from manufacturers of repute in order to ensure uniformity of quality and assurance of timely supply.

1.3 Approval and Tests

1.3.1 All materials to be used in construction shall be subject to approval of the Engineer. The Contractor shall apply sufficiently in advance with samples of the materials including the supporting test results from the approved laboratory and other documentary evidence from the manufacturer wherever applicable and indicating the types of materials and their respective sources. The delivery of materials at site shall commence only after the approval of the quality, grading and sources of the materials by the Engineer.

1.3.2 The quality of all materials once approved shall be maintained throughout the period of construction and periodical tests shall be carried out to ensure that it is maintained. Such routine tests shall be listed under the different materials and/or as may be ordered by the Engineer from time to time.

1.3.3 Where a particular "Brand" or "Make" of material is specified in the Schedule of Items or Technical Specifications, such "Brand" or "Make" of material alone shall be used on the work. Should it become necessary for any reason (such as non-availability/ceased to be produced), to use any material other than the specified "Brand" or "Make", the Contractor shall submit sample of the same to the Engineer for approval together with test certificates and other documents necessary for examining and giving approval thereof.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 2 of 66
			REVISION : 0
			EDITION : 1

Should such change or substitution of materials, subsequently approved, results in use of material of price lower than that of the material specified in the Schedule of Items or Technical Specifications, the rates of work affected by the substitution shall be proportionately reduced. Similarly, in case the substitution results in use of material of price higher than that specified in the Schedule of Items or Technical Specifications, the rates of work affected by the substitution shall be proportionately increased.

1.4 Codes

- 1.4.1 The years of publication against various standards, referred in this specification, correspond to the latest standards as on date of preparation of this specification. During use of this specification in future, the latest publication as on date shall be referred to. Where standards are not yet published by the BIS or IRC, adoptable British Standards or other International Standards shall apply.
- 1.4.2 In case of any conflict in meaning between these specifications and those of BIS or IRC, or British /International Standard; the provisions of these specifications shall prevail.


1.5 Rejection of Materials

- 1.5.1 Any material brought to site which, in the opinion of the Engineer is damaged, contaminated, deteriorated or does not comply with the requirement of this specification shall be rejected.
- 1.5.2 If the routine tests or random site tests show that any of the materials, brought to site, do not comply in any way with the requirements of this specification or of I.S. Codes as applicable, then that material shall be rejected.
- 1.5.3 The Contractor at his own cost shall remove from site any and all such rejected material within the time specified by the Engineer.

2.0 MATERIALS FOR CONCRETE

2.1 Aggregates

- 2.1.1 Aggregates shall comply with the requirements of IS: 383-1970 "Coarse and Fine Aggregates for Concrete". They shall be hard, strong, dense, durable, clean and free from veins and adherent

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 3 of 66
			REVISION : 0
			EDITION : 1

coating, vegetable matter and other deleterious substances; and shall be obtained from approved sources. Aggregates shall not contain any harmful material such as pyrites, coal, lignite, shale or similar laminated material, clay, alkali, soft fragments, sea shells and organic impurities in such quantity as to affect the strength or durability of concrete. Aggregates which are chemically reactive with alkalies of cement shall not be used. Aggregates which are not sufficiently clean shall be washed in clean fresh water to the satisfaction of the Engineer.

2.1.2 Testing

All aggregates shall be subject to inspection and testing. The Contractor shall submit samples for testing as may be required by the Engineer. Sampling and testing shall be carried out in accordance with IS: 2386-1963 "Methods of Test for Aggregates for concrete".

2.1.3 Grading


The Contractor shall ensure that the full range of aggregate used for making concrete is graded in such a way as to ensure a dense workable mix. The delivery of aggregates will commence only when the Engineer has approved the samples and the quality and grade shall be maintained consistent and equal to the approved sample. Before construction commences, the Contractor shall carry out a series of tests on the aggregates and on the concrete made therefrom to determine the most suitable grading of the available aggregates. Once the most suitable grading has been found, the grading shall be adopted for the construction of the works and periodic tests shall be carried out to ensure that it is maintained.

2.1.3.1 Size and grading of fine aggregates

The grading shall conform to IS: 383-1970 and shall be within the limits of Grading Zone-III. The maximum size of particle shall be 4.75mm and shall be graded down. Sand containing more than 10% of fine grains passing through 150 micron sieve or having the fineness modulus less than 2 shall not be used for concrete work.

2.1.3.2 Size and grading of coarse aggregates

The nominal maximum size of the aggregates for each mark of concrete or for each type of work shall depend upon the description of the particular item in the Schedule of Items and/or according to

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 4 of 66
			REVISION : 0
			EDITION : 1

relevant clauses of IS: 456-1978. The aggregates shall be well graded and the grading shall conform to relevant requirements of IS: 383-1970 depending upon the maximum nominal size as specified or as required.

2.1.3.3 Fine aggregate for mortar and grout

The grading of fine aggregate for mortar and grout shall be within the limits of grading zone III and IV as defined in IS: 383-1970.

2.1.4 Storage & stacking

Care shall be taken in the storage to avoid intrusion of any foreign materials into the aggregates and where two types of aggregates are stored close to each other, they shall be separated by a wall or plate. In case of stockpiling, care shall be taken to avoid forming pyramids resulting in segregation of different sized materials. The height of the stacks shall be generally limited to 150 cm.

2.2 Coarse Aggregates

2.2.1 Types


The type of coarse aggregate viz., stone chips, gravel or broken brick shall be as described in the Schedule of Items. Unless otherwise specified in the Schedule of Items, stone chips shall be used as coarse aggregate.

2.2.2 Stone chips

It shall be crushed or broken from hard stone obtained from approved quarries of igneous or metamorphic origin. The stone chips shall be hard, strong, dense, durable and angular in shape. It shall be free from soft, friable, thin, flat, elongated or laminated and flaky pieces and free from dirt, clay lumps, and other deleterious materials like coal, lignites, silt, soft fragments, and other foreign materials which may affect adversely the strength & durability of concrete. The total amount of deleterious /foreign materials shall not exceed 5% by weight according to relevant clause of IS: 383-1970. If found necessary the stone chips shall be screened and washed before use.

2.2.3 Gravel

It can be either river bed shingle or pit gravel. It shall be sound, hard, clean, irregular in shape and suitably graded in size with or without

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 5 of 66
			REVISION : 0
			EDITION : 1

some broken fragments. It shall be free from flat particles, powdered clay, silt, loam and other impurities. Before using, the gravel shall be screened and washed to the satisfaction of the Engineer. However, the foreign/deleterious materials shall not exceed 5% by weight.

2.2.4 Broken bricks / Brick aggregates

These shall be obtained by breaking well burnt or over burnt dense brick bats. They shall be homogeneous in texture, well graded in size, roughly cubical in shape, clean and free from dirt, clay, silt or any other deleterious matter. Before use, these shall be screened.

2.3 Fine Aggregates

2.3.1 Unless specified otherwise it shall either be natural river sand or pit sand.

2.3.2 Sand shall be clean, sharp, strong, angular and composed of hard siliceous material. It shall not contain harmful organic impurities in such form or quantities as to affect adversely the strength and durability of concrete. Sand for reinforced concrete shall not contain any acidic or other impurities which is likely to attack steel reinforcement. The percentage of all deleterious materials including silt, clay etc., shall not exceed 5% by weight. If directed, sand shall be screened or washed before use to the satisfaction of Engineer.


2.3.3 Crusher dust

Crusher stone dust (that is retained on 300 micron sieve) may be used as replacement for certain quantum of sand aiming to improve the fineness modulus of fine aggregate. The quantum of replacement for sand shall be arrived at by suitable trial mixes. The Engineer will decide the final usage of crusher dust depending on the circumstances.

2.4 Lime

Lime for mortars and concrete shall conform to IS: 712-1984 The total of CaO and MgO content in quick lime shall not be less than 85% (MgO shall not exceed 5%). Quicklime, after slaking, shall leave a residue of not more than 5% by weight on IS sieve 85.

2.5 Surkhi

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 6 of 66
			REVISION : 0
			EDITION : 1

Surkhi used in lime concrete for flooring, terracing etc., shall conform to IS: 3182-1986. Surkhi shall be made from well burnt bricks or brickbats. Surkhi shall pass through I.S. sieve 3.35mm with at least 50 % of it passing through I.S. sieve 1.70mm and be perfectly clean and free from foreign matter. Surkhi shall not be made from bricks which have come in contact with any mortar.

2.6 Cement


Ordinary Portland cement / Portland slag cement complying with the requirements of IS:269-1989 and I.S. 455-1989 respectively shall be used for making plain and reinforced concrete, cement grout and mortar.

Other types of cement may be used depending upon the requirements of certain jobs with the approval of the Engineer. These shall conform to the following standards :

Portland Pozzolana Cement	IS: 1489-1991
Rapid Hardening Portland Cement	IS: 8041-1990
43 Grade Ordinary Portland Cement	IS: 8112-1989
53 Grade Ordinary Portland Cement	IS: 12269-1987
Hydrophobic Portland Cement ..	IS: 8043-1991
High alumina cement for structural work	IS: 6452-1989
White portland cement	IS: 8043-1989
Sulphate Resisting Portland Cement	IS: 12330-1988

2.6.1 Testing of samples

The Contractor shall supply a copy of the manufacturer's test certificate for each consignment of cement supplied by him and consignments shall be used on work in the order of delivery. The Contractor shall supply samples of cement to the Engineer as frequently as he may require for testing. The sampling of cement for testing shall be according to IS: 3535-1986. All tests shall be in accordance with the

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 7 of 66
			REVISION : 0
			EDITION : 1

relevant clauses of IS: 4031 (Part-I to Part-15) 1988 to 1991 & IS: 4032-1985.

2.6.2 Contractor's responsibility

From the time a consignment of cement is delivered at site and tested and approved by the Engineer until such time as the cement is used on the works, the Contractor shall be responsible for keeping the same in sound and acceptable condition and at his expense and risk. Any cement which deteriorates while in the Contractor's charge and is rejected as unsuitable by the Engineer, shall be removed from the site to outside the limits of work at the cost of contractor within two days of ordering such removal by the Engineer.

2.6.3 Stock of cement

In order to ensure due progress, the Contractor shall at all times maintain on the site at least such stock of cement as the Engineer may from time to time consider necessary. No cement shall be used upon the works until it has been accepted as satisfactory by the Engineer.


2.6.4 Storage of cement

The cement shall be stored in such manner as to permit easy access for proper inspection and in a suitable weather-tight, well ventilated building to protect it from dampness caused by ingress of moisture from any source. Different types of cement shall be stored separately. Cement bags shall be stacked at least 15 to 20 cm clear of the floor leaving a space of 60 cm around the exterior walls. The cement shall not be stacked more than 10 bags high. Each consignment of cement shall be stacked separately to permit easy access for inspection.

2.7 Water

Water used for mixing concrete and mortar and for curing shall be clean and free from injurious amounts of oil, acid, alkali, salts, sugar, organic materials or other substances that may be deleterious to concrete or steel. The pH value of water shall generally be not less than '6'. Water has to meet the requirements mentioned in clause 4.3 of IS: 456-1978. Water shall be obtained from an approved source.

Where it is obtained from a source other than a supply main, it shall be tested to establish its suitability. Water for construction purpose shall

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 8 of 66
			REVISION : 0
			EDITION : 1

be stored in proper storage tanks to prevent any organic impurities getting mixed up with it.

2.8 Admixture for Concrete

2.8.1 Approval

Admixtures to concrete shall not be used without the written consent of the Engineer. When permitted, the Contractor shall furnish full details from the manufacturer and shall carry out such test as the Engineer may require before any admixture is used in the work.

2.8.2 Types


2.8.2.1 Integral water proofer

Admixtures used as integral water proofer shall be free of chlorides and sulphates and shall conform to IS: 2645-1975. The application and doses shall be as per manufacturer's specification.

2.9 Interval of Routine Test

2.9.1 The routine tests of materials, delivered at site, shall be at the following intervals :

- Aggregates - Fortnightly or for every 200 m³ for each aggregate whichever is earlier and in other respects generally as per IS : 2386 (Part 1 to 8)-1963.
- Cement - Fortnightly or for each consignment, within 4 days of delivery and in other respects generally as per IS : 4031-1988.
- Water - Once in two months for each source of supply and in other respects generally as per IS : 456-1978.
- Reinforcement - For each consignment within 4 days of delivery in accordance with I.S. 1786-1985, I.S. 1599-1985 and I.S. 1608-1972.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 9 of 66
			REVISION : 0
			EDITION : 1

3.0 STEEL


3.1 For Reinforcement

Reinforcing bars for concrete shall be round steel bars of the following types as may be shown on the drawing :

- i) Plain mild steel bars conforming to Grade-I of IS : 432-1982 "Mild Steel & Medium Tensile Steel for Concrete Reinforcement".
- ii) "High strength deformed steel bars conforming to IS : 1786-1985 for Concrete Reinforcement".
- iii) Reinforcement fabrics conforming to IS:1566-1982 "Hard Drawn Steel Wire Fabric for Concrete Reinforcement"

All reinforcement bars shall be of uniform cross sectional area and be free from loose mill scales, dust, loose rust, coats of paint, oil or other coatings which may destroy or reduce bond. Unit weight of reinforcement bars conforming to I.S. 1786-1985 is as given below.

Nominal Size (Dia) (mm)	Mass Per Metre Run (Kg)
6	0.222
8	0.395
10	0.617
12	0.888
16	1.580
18	2.000
20	2.470
22	2.980
25	3.850

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 10 of 66
			REVISION : 0
			EDITION : 1

28

4.830

32

6.310

3.2 Binding wire

Binding wire for reinforcement shall be annealed steel wire 20 BWG conforming to IS : 280 -1978 "Specification for Mild Steel Wire".

3.3 Light structural work and inserts

Steel for light structural work and for preparation of inserts and embedments shall conform to IS: 2062-1992 "Steel for general structural purposes - Specification."

3.4 Steel Tubes

Steel tubes for use in light structural work and inserts shall be of light or medium class (as may be specified in drawings or the schedule of items) and of grade YST 25 conforming to IS : 1161 - 1979 "Specification for Steel Tubes for Structural Purposes".

3.5 Foundation Bolts


3.5.1 Bolts to be embedded in concrete shall, unless otherwise detailed in drawings, conform to IS : 5624-1970 "Specification for Foundation Bolts". Material for bolts, shall, unless otherwise mentioned in drawings or the schedule of items, be of steel conforming to IS : 2062-1992.

3.5.2 Nuts and locknuts shall conform to IS : 1363 (Part 1 to 3) -1992 "Specification for Black Hexagon Bolts, Nuts and Lock Nuts (Diameter 6-39 mm) and Black Hexagon Screws "Specification for Hexagon Bolts and Nuts (M-42 to M-150)".

3.5.3 Plain washers shall conform to IS : 2016 -1967 "Specification for Plain Washers and spring washers shall conform to IS : 3063 -1972 "Spring Washers for Bolts, Nuts & Screws".

3.6 Steel Tubes for Non-structural use

3.6.1 Steel tubes for non-structural use shall conform to IS : 1239 (Part-I) - 1990 "Specification for Mild Steel Tubes, Tubular and Other Wrought Steel fittings, Part-I : Mild Steel Tubes".

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 11 of 66
			REVISION : 0
			EDITION : 1

3.6.2 Fittings for steel tubes used for non-structural purposes shall conform to IS : 1239 (Part-II) -1992 "Specification for Mild Steel Tubular and Other Wrought Steel Pipe Fittings".

3.7 Threaded Fasteners

Bolts and nuts for fastening shall conform to IS:1367 (Part 1)-1980 "Technical Supply Conditions for Threaded Fasteners".

3.8 Testing

Test certificates from manufacturer shall be submitted for each consignment. Any additional test which the Engineer may require shall be done according to IS : 1786-1985, 1566-1982, 280-1978, 2062-1992, 1161-1979, 2614-1969, 3063-1972, 1239 (Part 1 and 2)-1990 and 1992 and 1367-1980.

3.9 Cast Steel

3.9.1 Quality

Cast steel shall conform to IS : 1030-1989 "Carbon Steel Casting for General Engineering Purpose". Unless otherwise specified, it shall conform to Grade2.


3.10 Conduits

3.10.1 Steel for electrical wiring

Rigid steel conduits for electrical use shall conform to IS : 9537 (Part 2) - 1981 for rigid pipes and to IS : 3480-1966 for flexible conduits. Fittings for conduits shall conform to IS : 2667-1988.

All conduit pipes shall be finished with galvanised or stove-enamelled surface. All accessories shall be of threaded type and pipes shall be jointed by means of screwed couplers only. Bend in conduits shall be made to the dimension shown in drawing, but a minimum of 12 times the diameter. Where shown in drawing they shall be treated with anticorrosive preservative as specified.

3.10.2 Non-metallic conduit for electrical wiring

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 12 of 66
			REVISION : 0
			EDITION : 1

Non-metallic conduits for electrical use shall conform to IS : 9537 (Part 3) -1983 for rigid pipes and to IS : 6946 -1973 for flexible pipes. Fittings shall conform to IS : 3419-1989.

Bends shall be achieved by bending the pipes by inserting suitable solid or inspection type normal bends, elbows or similar fittings.

4.0 ASBESTOS CEMENT PRODUCTS

4.1 General

Asbestos cement products shall be free from visible defects, uniform in colour, of required density, length, thickness and diameter within the allowable tolerance. They shall be obtained from an approved source of manufacture and stored safely. Methods of test shall be according to IS:5913-1989 "Method of Test for Asbestos Cement Products."

4.2 Building Boards


These shall be of Class A, B and C with board thickness being 6.5mm , 5mm and 4mm respectively. The length shall be 2400, 1800 and 1200mm and width in all cases 1200 mm. Building boards shall conform to IS : 2098 - 1964 "Asbestos Cement Building Boards". They shall, when tested in two perpendicular directions, take a load of not less than 15 kgf for Class-A and 10 Kgf for Class-B and Class-C boards. The boards shall show water absorption of not more than 40% of their dry weight.

4.3 Flat Sheets

Flat sheets shall conform to IS : 2096-1992 "Asbestos Cement Flat Sheets". They shall have a bending stress of not less than 225 kgf/cm² & a density of 1.6 kg/dm³ for compressed sheets & a bending stress of not less than 160 kgf/cm² and a density of 1.2 Kg/ dm³ for uncompressed sheets. Nominal thickness shall be 5,6,8,10 and 15 mm , length 2400, 1800 and 1200mm and width 1200mm. Water absorption shall not exceed 28% of dry wt.

4.4 Pipes and fittings

Pressure pipes shall conform to IS : 1592-1989 "Asbestos Cement Pressure Pipes" and to IS : 9627 -1980 "Asbestos Cement Pressure Pipes (Light Duty)". Pipes for sewerage and drainage shall conform to IS

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 13 of 66
			REVISION : 0
			EDITION : 1

: 6908 -1991 "Asbestos Cement Pipes and Fittings for Sewerage and Drainage ". Building pipes gutters and fittings shall conform to IS : 1626 - (Part 1 to 3)-1980 to 1991 "Asbestos Cement Building pipes and pipe fittings".

Pressure pipes shall satisfy Hydraulic test and transverse crushing test as per IS : 5913-1989.

4.5 Corrugated and Semi-Corrugated Sheets

These shall conform to IS : 459 -1992 "Unreinforced Corrugated and Semi-Corrugated Asbestos Cement Sheets". Unless otherwise stated the sheets shall be corrugated and not less than 6mm thick. The sheets shall have a load bearing capacity of not less than 5 N/mm width of specimen and shall not absorb more water than 28% of its dry weight. Overall width of corrugated sheets is 1050mm and of semi-corrugated sheet is 1100mm.


4.6 Asbestos Cement Roof fittings

These shall conform to IS : 1626 (Part 3)-1981. Shapes and dimensions shall be as given in the above mentioned code. All finished products shall be free from visual defects that impair appearance or serviceability. Surface of fittings shall be of uniform texture and shall have neatly trimmed edges. Mean water absorption shall not be more than 28% of dry mass of the material.

5.0 BRICK AND STONES

5.1 Bricks

Bricks for masonry in foundations, walls and other locations shall be common burnt clay building bricks having minimum crushing strength of 5 N/sq.mm., or such other strength as may be described in the Schedule of Items, when tested in accordance with IS : 1077-1992 "Common Burnt Clay Building Bricks". They shall be sound, hard and thoroughly well burnt, with uniform size having rectangular faces with parallel sides and sharp straight right angled edges and be of uniform colour with fine compact uniform texture. Bricks shall be of uniform deep red cherry or copper colour. They shall be free from flaws, cracks and nodules of free lime. Water absorption after 24 hours immersion in cold water shall be not more than 20% by weight. They shall not absorb more than 10% by weight of water after immersion for six hours. They shall emit a clear

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 14 of 66
			REVISION : 0
			EDITION : 1

metallic ringing sound when struck by a mallet and shall not break when dropped on their face, from a height of 60 cm. Fractured surface shall show homogeneous, fine grained uniform texture, free from cracks, air holes, laminations, grits, lumps of lime, efflorescence or any other defect which may impair their strength, durability, appearance and usefulness for the purpose intended. Underburnt or vitrified bricks shall not be used. Samples of bricks brought to the site shall be tested periodically for compression and other tests according to IS : 3495 (Parts-1 to 4) -1992 "Method of Test for Burnt Clay Building Bricks". Where the size of bricks is not specifically mentioned, it shall be taken to mean conventional sizes as is commonly available in the area. In case modular bricks are to be used, it shall be accordingly specified in Schedule of Items. The bricks shall be classified on the basis of average compressive strength as given in table 1 of IS : 1077-1992.

5.2 Handling

Bricks shall be unloaded by hand and carefully stacked and all broken bricks shall be removed from the site.

5.3 Samples and Inspection


Representative samples shall be submitted by the contractor and approved samples retained by the Engineer for comparison and future reference. Bricks shall be obtained from approved manufacturer. All bricks shall be subject to inspection on the site and shall be to the approval of the Engineer who may reject such consignment as are considered by him to be inferior to the quality specified. The Contractor shall provide all labour and plant required for the inspection and conduct such test as shall be required by the Engineer without additional charges.

5.4 Brick Bats

Brick bats shall be obtained from well burnt bricks of approved quality.

5.5 Laterite Stone Blocks

These shall conform to IS : 3620 -1979 "Laterite Stone Blocks for Masonry". The laterite stone blocks shall have a minimum compressive strength of 30 kg/cm² and to be tested as per IS : 1121-1974. The blocks shall be minimum 15 cm thick but not exceeding 30 cm. They shall be dressed to the desired sizes and shapes with an axe. Laterite

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 15 of 66
			REVISION : 0
			EDITION : 1

stones shall be well seasoned by exposure to air before dressing and using on work.

5.6 Stone (granite, trap, sandstone, quartzite etc.)

5.6.1 Stone used shall be strong, durable, dense, compact, close grained, homogeneous, fire resistant and shall be obtained from sources approved by Engineer. Stones shall additionally be hard, sound, free from cracks, decay and other flaws or weathering and shall be easily workable. Stones with round surfaces shall not be made use of.

5.6.2 Stones shall have a crushing strength of not less than 200 kg/cm². Stones with lesser crushing strength may be used in works with prior approval of the Engineer. Stones shall be non-porous and when tested in accordance with IS : 1124 -1974 "Method of Test for Determination of Water Absorption Etc.," shall show water absorption of less than 5% of its dry weight when soaked in water for 24 hours. Tests for durability and weathering shall be done in accordance with IS : 1126-1974 and IS : 1125-1974 respectively. The working of stones to required sizes and their dressing shall be as per IS : 1127-1970 "Recommendations for dimensions and workmanship of natural building stones for masonry work" and IS : 1129 -1972 "Dressing of Natural Building Stones". Stones especially limestone and sand stones shall be well seasoned by exposure to air before use in construction works.


5.6.3 Size

Normally stones shall be of size that could be lifted and placed by hand, between 20 to 30 kg per piece. The length of stones shall not exceed 3 times the height and the breadth on base shall not be greater than 3/4 of the thickness of wall or less than 15cm. The height of stone may be upto 30cm.

5.6.4 Dressing

5.6.4.1 Random rubble

Stones shall be hammer dressed on the face, the sides, and the beds to enable it to come into close proximity with the neighbouring stone. The bushings in the face shall not project more than 4cm on all exposed faces and 2cm on a face to be plastered, nor shall it have depressions more than 1cm from the average wall surface.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 16 of 66
			REVISION : 0
			EDITION : 1

5.6.4.2 Coursed rubble - First sort

Face stones shall be hammer dressed on all beds, and joints, so as to give them approximately rectangular block shape. These shall be squared on all joints and beds. The bed joint shall be rough chisel dressed for atleast 5cm back from the face, and side joints for atleast 4cm such that no portion of the dressed surface is more than 6mm from a straight edge placed on it. The bushing on the face shall not project more than 4cm as an exposed face and one cm on a face to be plastered. The hammer dressed stone shall also have a rough tooling for a minimum width of 2.5cm along the four edges of the face of the stone, when stone work is exposed.

5.6.4.3 Coursed rubble - Second sort


Dressing shall be as specified in 5.6.4.2 except that no portion of dressed surface shall exceed 10mm from a straight edge placed on it as against 6mm for first sort.

5.6.4.4 Stone for veneering

Stone lining upto 8cm shall be treated as veneering work. The stone shall be cut into slabs or required thickness along the planes parallel to the natural bed. Every stone shall be cut to the required size and shape so as to be free from any waviness and to give truly vertical and horizontal joints. Adjoining faces shall be fine chisel dressed to a depth of a 6mm, so that when checked with a 60cm straight edge, no point varies from it by more than 1mm. All edges shall be chisel dressed to be true, square and free from chippings. Top and bottom faces shall be dressed to within 3mm tolerance and vertical faces to within 6mm tolerance, when checked with a 60mm straight edge. Dressing at the back shall not be done.

5.7 Hollow and Solid Concrete Blocks

5.7.1 Cement concrete blocks used in the construction of concrete masonry load bearing as well as non-load bearing walls shall conform to the requirements of IS : 2185 (Part 1)-1979. Physical properties such as density, compressive strength, water absorption etc., shall be determined in accordance with the procedure laid down in IS : 2185 (Part 1) - 1979 and shall conform to the requirement laid therein. When inspected visually all blocks shall be sound, free from cracks, broken edges,

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 17 of 66
			REVISION : 0
			EDITION : 1

honeycombing and other defects which would interfere with the proper placing of blocks or impair strength or permanence of construction.

5.7.2 Dimensions and tolerance

The blocks shall be made in sizes and shapes to suit the particular job and shall include stretcher, corner, double corner or pier, jamb, header, bullnose and floor units.

5.7.2.1 The nominal dimensions of concrete block shall be as follows :

Length : 400, 500 or 600mm
Height : 200 or 100mm
Width : 50, 75, 100, 150, 200, 250 or 300mm

In addition, blocks shall be manufactured in half and other suitable lengths and shapes to suit Architectural requirements.

5.7.2.2 The maximum dimensional tolerances shall be plus or minus 5mm in length and plus or minus 3mm in height and width.

5.7.3 Hollow blocks (open and closed cavity)


5.7.3.1 The blocks having solid material about 50% to 75% of total volume of the block calculated from the overall dimensions shall be termed as hollow blocks. Grade-A blocks used as load bearing units shall have a minimum block density of 1500 kg/m³ and shall have minimum average compressive strength of 3.5, 4.5, 5.5 or 7.0 N/mm² at 28 days as specified.

5.7.3.2 Grade-B Blocks used as load bearing units shall have block density less than 1500 kg/m³, but not less than 1000 kg/m³ and shall have compressive strength of 2.0, 3.0, or 5.0 N/mm² or as specified.

5.7.3.3 Grade-C blocks used as non load bearing units shall have block density less than 1500 kg/m³, but not less than 1000 kg/m³ and compressive strength of 1.5 N/mm² at 28 days.

5.7.4 Solid blocks

The blocks having solid material more than 75% of the total volume of the block shall be termed as solid block. Solid blocks (Grade-D) used

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 18 of 66
			REVISION : 0
			EDITION : 1

as load bearing units shall have a block density of not less than 1800 kg/m³ and compressive strength of 4.0 or 5.0 N/mm² as specified.

5.7.5 Mix proportion

The concrete mix used for blocks shall not be richer than one part by volume of cement to six parts by volume of combined aggregates before mixing.

5.7.6 Surface texture and finish

Surface texture, that is, very fine closed texture or coarse open texture and finish, whether coloured or not shall be according to the drawing, description in the Schedule of Items or instructions of the Engineer.

5.7.7 Marking and certificate

The blocks shall be marked permanently indicating the Grade of the unit, identification of the manufacturer and the year of manufacture. Manufacturers test certificate shall be supplied with the delivery of each lot.


5.8 Cement, Lime and Water

Cement, lime and water shall conform to the specification under the Section Concrete of this part.

5.9 Sand for Masonry Mortar

Sand for masonry mortars shall be natural sand, crushed stone sand or crushed gravel and shall comply with IS : 2116 - 1980 "Sand for Masonry Mortars". The sand shall be hard, durable, clean and free from adherent coatings and shall not contain amount of clay, silt and fine dust more than 5% by wt. Sand shall not contain any harmful impurities such as iron pyrites, alkalies, salts, coal, mica and organic matters. The particle size grading of sand for use in mortars shall be within the limits as specified in Table I of above code.

6.0 SAND FOR PLASTERING

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 19 of 66
			REVISION : 0
			EDITION : 1

Sand for use in mortars for internal wall, ceiling and external plastering and rendering shall conform to IS:1542 -1992. It shall not contain any harmful impurities such as iron pyrites, alkalis, salts, coal, mica and organic matters. Percentage of salt and dust shall not be more than 5% by weight. Grading of sand shall be within the limits specified in clause no. 5.1 of above code. Fineness modulus of naturally occurring sand shall not be less than 1.5.

7.0 MATERIALS FOR FLOORING & PAVING

7.1 Cement and Binders

7.1.1 Cement

Cement, fine aggregates, reinforcement and water used shall comply with the requirements of concrete as per clauses 2.1, 2.3, 2.6 and 2.7 of this part.

7.1.2 Water

Water for construction shall be clean, soft, free from loam, salt and organic materials. Hard water shall not be used.

7.2 Aggregates


7.2.1 Coarse Aggregate

7.2.1.1 Coarse aggregate shall conform to the requirement as per clauses 2.1 and 2.2 of this part.

7.2.1.2 For granolithic floor the screeded bed shall comprise of aggregates size 15mm and down graded and topping shall comprise of clean fine stone chippings, size 4mm and down. For concrete floor with hardener treatment the topping shall comprise of stone chippings, size 6mm and down and for in-situ terrazzo flooring, chippings shall be within sizes 12mm to 6mm graded. The marble chips for topping of terrazzo floor shall be of 3-6mm size and shall conform to Grade-I of IS : 2114-1984 "CP for laying in-situ terrazzo floor finish".

7.2.2 Common burnt clay bricks

Common burnt clay bricks shall conform to IS : 1077-1992 and comply with requirements under the section "Brick and Stones" of this part.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 20 of 66
			REVISION : 0
			EDITION : 1

7.2.3 Rubble

Rubble of approved quality shall be used and shall be clean and free from dirt. The loose and weathered sections shall be removed before use. Rubble used as hard core shall have a least lateral dimension (thickness) between 100mm and 225mm, depending on the thickness of hardcore.

7.3 Tiles

7.3.1 Terrazzo Tiles

Terrazzo tiles shall be machine made under a minimum pressure of 140 kg/cm². It shall have a minimum total thickness of 20mm including a minimum of 6mm thick topping. It shall be of size, texture, colour, shade and pattern as specified in schedule of item and as approved by the Engineer.

7.3.2 White Glazed Tile


White glazed tiles shall be of approved manufacture and quality and shall conform to IS:777 - 1988 "Glazed Earthenware Tiles. They shall be true in shape, free from hair cracks, crazing spot, chipped edges and corners and surface shall be perfectly flat without warps and of uniform colour. The top surface shall be glazed either gloss or matt as specified. The tiles, normally shall be 149mm x 149mm or 99mm x 99mm size and shall not be less than 5mm thick or as specified. The tolerance on average facial dimension value shall be plus or minus 0.8 and on thickness plus or minus 0.5mm. The specials such as coves, internal and external angles, beads, cornices and their corner pieces shall be of specified sizes and of thickness not less than the thickness of tiles.

7.3.3 Coloured tiles

Only glaze shall be coloured as specified. The size and specification of tiles shall be same as for the white glazed tiles.

7.3.4 Marble tiles

It shall conform to IS : 1130 -1960 "Marble (Blocks, Slabs and Tiles)". Marble for paving and facing work shall be of selected quality, hard,

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 21 of 66
			REVISION : 0
			EDITION : 1

sound, dense and homogeneous in texture (with crystalline texture) and free from cracks, decay, weathering and flaws and shall be of kind and quality, size and thickness as specified in schedule of items. The samples of tiles shall be got approved by the Engineer before use. The tiles shall be cut to the requisite dimensions.

7.4 Pigments

Pigments incorporated in mortar or used for grouting shall be subject to approval of Engineer and as per table I of IS : 2114-1984.

7.5 Red Oxide of Iron

Red oxide of iron where used for "Red Artificial Stone Flooring" shall be of quality approved by the Engineer, and shall be of uniform tint.

7.6 Hardening Agents

Hardening agents such as ironite used for "Cement Concrete Flooring with Hardener Treatment", shall be of quality approved by the Engineer for every work.

7.7 Dividing Strips


Dividing strips shall be of aluminium, glass, brass, copper, plastic or similar materials as specified in the schedule of item and of quality approved by the Engineer. Strips shall be 1.5 mm thick unless otherwise specified penetrating to the full depth of the flooring. Aluminium strips when used shall have a protective coating of bitumen.

7.8 Marble Chips

It shall be in sizes varying from 1mm to 25mm and in different colours as per requirement. Marble chips shall be hard, sound, dense and homogeneous in texture with crystalline and coarse grains. It shall be uniform in colour and free from cracks, stains, decay and weathering and shall be obtained from approved source.

7.9 Marble Powder

It shall be clean, free from dust and other foreign materials and of approved quality, obtained from approved source. It shall pass through sieve 300 conforming to IS: 460- (Part-1)-1985.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 22 of 66
			REVISION : 0
			EDITION : 1

8.0 TIMBER

8.1 General

All timber used for carpentry and joinery works shall be new. It shall be well seasoned by a suitable process conforming to IS : 1141-1973 before being planed to the required sizes. It shall be sound, straight, free from sap, radial cracks, decay, fungal growth, boxed heart, pitch pockets, borer holes, splits, loose knots, flaws or any other defects and shall show a clean surface when cut. Timber shall conform to the requirements of IS : 1003 (Part 1&2)-1983 to 1991. The finished components shall be given suitable preservative treatment wherever necessary.

8.2 Teak wood/Sal / Bija Sal / Deodar / Kail and other varieties of timber

8.2.1 Teak wood


The timber shall be of good quality and well seasoned. It shall be of fairly uniform colour and shall be free from defects such as cracks, dead knots, shakes etc. No individual hard and sound knot shall be more than 15 sq. cm. in size and aggregate area of all such knots shall not exceed 2 % of the area of the piece. Wood shall be generally free from sap wood but traces of the same shall be allowed. The timber shall be fairly grained having not less than 2 growth per cm width in cross section.

8.2.2 Sal / Bija Sal wood

Timber shall be of good quality and well seasoned. It shall have fairly uniform colour, reasonable straight grains and shall be free from all defects as mentioned in previous clauses. No individual hard and sound knot shall be more than 6 sq. cm. in size and aggregate area of all such knots shall not exceed 2 % of the area of the piece. There shall not be less than 5 growth rings per 2 cm of the width.

8.2.3 Deodar wood

The timber shall be of good quality and well seasoned. It shall have fairly uniform colour, reasonable straight grains and shall be free from all defects as mentioned in previous clauses. No individual hard and sound knot shall be more than 15 sq.cm. in size and aggregate area of

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 23 of 66
			REVISION : 0
			EDITION : 1

all such knots shall not exceed 2 % of the area of the piece. There shall be at least 3 growth rings per cm width in cross section.

8.2.4 Kail wood

The timber shall be generally as specified in clause 8.2.3 for Deodar wood. However, there shall not be less than 2 growth rings per cm width in cross section.

8.2.5 Other varieties of timber

The timber as named in the item of work shall be used. It shall be well seasoned and generally free from defects such as dead knots, cracks, shakes, sap wood etc. However, traces of sap wood shall be allowed and sound and hard knots up to 2 % of the area of the piece shall be allowed.

8.3 Storage and Inspection

Timber shall be carefully stored and subject to inspection on site, piece by piece. The Engineer may reject such pieces as are considered by him not of the quality or meeting the requirements specified herein.

8.4 Moisture Content


Timber shall be accepted as well seasoned if its moisture content does not exceed the permissible limit as per IS : 287-1973.

8.5 Tolerances for Timber

For timber allowance as specified in the IS : 1003 (Part 1&2) 1983 to 1991 shall be applicable.

8.6 Flush Door Shutters, Shelves

Flush door shutters, shall be wooden, solid core or cellular and hollow core type, as may be shown in drawing or described in the Schedule of Items or directed by Engineer. They shall be obtained from an approved source of manufacture, covered on face with commercial ply, wood veneer or other finish as may be necessary. Solid core shutters

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 24 of 66
			REVISION : 0
			EDITION : 1

shall conform to IS : 2202 (Part 1&2)-1983 to 1991 and cellular or hollow core shutters to IS : 2191 (Part 1&2)-1983. The resin used shall be phenol formaldehyde. A full size sample door shall be offered for inspection and approval.

8.7 Wood Particles Boards

Particle boards for general purposes shall be of medium density conforming to IS:3087-1985. These are of four types, Flat pressed single layer board (FPSI), Flat pressed three layer board (FPTH), Extrusion pressed solid board (XPSO) and Extrusion pressed tubular core (XPTU). Adhesive shall be BWR, WWR or un-extended CWR type. High density wood particle board shall conform to IS:3478-1966 and are in flat sheets or moulded forms. These shall be of type 1 (BWR type of resin) or Type 2 (WWR or CWR type of resin). Both types of boards shall be of Grade A (resin content 20 to 50 percent) and Grade : (resin content 8-12 percent).

8.8 Veneered Particle Board


These shall conform to IS : 3097-1980 and shall be of two grades. Exterior (grade-I with BWP or BWR type adhesive) & interior (grade-II with WWR or CWR type adhesive). Each grade of boards shall be of 4 types, solid core general purpose, solid core decorative, Tubular core general purpose and Tubular core decorative and accordingly designated.

8.9 Plywood for General Purpose

Plywood for general purpose shall conform to IS:303-1989. Depending on type of adhesive used for bonding veneers, it is of 4 grades, BWP (boiling water proof), B.W.R (boiling water resistant), WWR (warm water resistant) and CWR (Cold Water resistant). Any species of timber may be used for plywood manufacture. However list of species, for the manufacture of plywood is given in Annexure 'B' of the IS : 303-1989 for guidance.

Plywood is classified in 10 different types as per appearance of the surface. These are type AA,AB,AC,AD,BB, BC,BD,CC,CD and DD as detailed in IS : 303-1984. It is available from 3 ply to 11 ply with thickness from 3mm to 25mm.

8.10 Veneered Decorative Plywood

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 25 of 66
			REVISION : 0
			EDITION : 1

This quality of plywood shall conform to IS : 1328-1982. These plywood shall be of two types Type 1 and Type 2 as per details given in IS : 1328-1982. Species of timber for decorative face commonly used are given in Table 1 of IS : 1328-1982 but the purchaser shall specify the particular veneer to be used. Timber for cores and backs shall be either class I or II as specified in IS : 303-1989. Adhesive used shall be BWR or WWR synthetic resin.

9.0 FITTINGS FOR DOORS, WINDOWS, ETC.

9.1 General


Fittings shall be of iron, brass, aluminium or as specified. These shall be well made, reasonably smooth and free from sharp edges, corners, flaws and other defects. Screw holes shall be countersunk to suit the head of specified wood screws. All hinge pins shall be of steel and their riveted heads shall be well formed.

Iron fittings shall be finished bright or black enameled or copper oxidised or painted as specified. Brass fittings shall be finished bright, oxidised or chromium plated and aluminium fittings shall be finished bright or anodised as specified. Fittings shall be got approved by the Engineer before fixing. Screws used for fittings shall be of the same metal and finish as the fittings. However, anodised cadmium/chromium plated M.S. screws of approved quality shall be used for fixing aluminium fittings.

9.2 Hinges

9.2.1 Butt hinges

These shall be mild steel butt hinge (medium), brass butt hinges, extruded aluminium alloy butt hinges or as specified. Type (light/medium/heavy weight) and size shall be as specified in the drawing or schedule of items. Brass / Aluminium and M.S butt hinges shall conform to Indian Standard Specification for butt hinges IS : 205-1992 and IS : 1341-1992 respectively. Hinges shall be finished bright or satin polished or anodised.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 26 of 66
			REVISION : 0
			EDITION : 1

9.3 Sliding Door Bolts

Mild steel sliding door bolts shall conform to IS : 281-1991 and are of 2 types, plate type and clip or bolt type. Plate type bolts shall have plates and straps stove enameled black with hasp and bolt finished bright or copper oxidized or nickel / chromium plated. Clip or bolt type are copper oxidized or plated. All screw holes in the M.S bolts shall be countersunk. Diameter of bolt for plate type is 12mm and for clip type is 16mm.

Non ferrous metal sliding doors are of brass or aluminium alloy and shall conform to IS:2681-1979. Brass sliding bolts are of 150 to 450mm size with bolt dia being 16mm for 150 to 300mm and 18mm for 375 and 450 size. Aluminium alloy sliding bolts are of size 200 to 450mm with 16mm bolt dia. Brass quality is finished satin, polished or plated and aluminium alloy bolts are anodised.

For both ferrous and non-ferrous metal bolts the size of the sliding bolt is determined by the length of the bolt.

9.4 Door Rim Latch


This shall be of mild steel, brass, aluminium alloy or as specified and of sizes 75, 100, 125 and 150mm denoted by overall length of the body measured from outside face of the fore end to the rear end. These are of type 1 and type 2 and shall conform to IS : 1019-1974.

9.5 Tower Bolts

Tower bolts may be of one of the following types and shall conform to IS : 204 (Part 1 and 2)-1991 and 1992.

i) Barrel tower bolts

These shall be of bright finished/stove enamelled/ black painted mild steel tower bolts, brass barrel tower bolts with cast brass barrel and rolled or drawn brass bolt/brass barrel tower bolts with barrel of extruded sections of brass and rolled or drawn brass bolt/brass barrel tower bolts with brass sheet barrel and rolled or drawn brass bolt. Aluminium barrel tower bolts with barrel and bolt of extruded section of aluminium alloy-bolts and barrel anodised.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 27 of 66
			REVISION : 0
			EDITION : 1

ii) Semi-barrel tower bolts

These shall be mild steel semi barrel tower bolts full cover/open type with mild steel sheet pressed barrel and cast iron/mild steel bolt. Bolt bright finished other parts stove enameled black.

iii) Rivetted or spot welded tower bolts

These shall be mild steel tower bolts rivetted type with black flat and mild steel/cast iron bolt and open staple.

iv) Skeleton tower bolts

These shall be of bright finished / stove enameled / black painted mild steel or brass bright finished skeleton tower bolts with cast brass/extruded sections plate and staples and rolled or drawn brass bolt or Aluminium skeleton tower bolts with plates staples and bolt or extruded sections of Aluminium alloy plate and staple anodised.


9.6 Door Handles

Door handles shall conform to IS : 208-1987 and shall be of 4 types. Type 1 is cast Iron / Brass / Aluminium or zinc alloy die casting and available in 75,100,125 150mm sizes. Type 2 is mild steel pressed oval in 75, 100,115 and 135mm sizes. Type 3 is mild steel present half oval in 75,90 and 100mm sizes. Type 4 is fabricated (brass / aluminium alloy) in 75,100 and 125mm sizes. The size of the handle shall be determined by inside (grip) size overall size and internal depth of the handles shall be as detailed in IS : 208-1987.

Finish for type 1 shall be satin/nickel plating, copper oxidising and bronze finish for cast-brass and zinc die cast handles and stove enamelled black or copper oxidized for cast iron handles. Aluminium handles shall be anodized. Type 2 and 3 handles shall be stove enamelled black. For type 4 it shall be satin finish, nickel plating, copper oxidized and bronze finish for brass handles and anodizing for aluminium handles.

9.7 Mortice Lock and Rebated Mortice lock

Mortice lock with latch and pair of lever handles shall have body of steel, Aluminium alloy or brass and shall be right or left handed as

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 28 of 66
			REVISION : 0
			EDITION : 1

shown in the drawing or as directed by the Engineer. It shall be of the best Indian make of approved quality and shall conform to IS: 2209 / 6607-1976/1972. The shape and pattern shall be approved by the Engineer. The size of the lock shall be determined by its length. The lock for single leaf door shall have plain face and that for double leaf door a rebated face. Lever handles with springs shall be mounted on plates and shall weigh not less than 0.5 kg per pair. These shall be of brass, finished, bright chromium plated or oxidised. The locks shall be of 65, 75 and 100 mm sizes.

9.8 Floor Door Stopper

These are for the use of the door shutters of 30, 35, 40 & 45mm thickness. It is made of aluminium alloy/ brass with springs of phosphor bronze or hard drawn steel wire and tongue of aluminium/brass/nylon/ plastic. The floor door stoppers shall conform to IS : 1823-1980 and shall be best Indian make of approved quality. Width of cover plate is 40mm but its overall length is 140mm for 30 and 35mm thick shutters & 150mm for 40 and 45mm shutters. The body shall be cast in one piece and fixed to cover plate by brass or M.S screws. On the extreme end there shall be rubber cushion to absorb shocks. The extension of the door stopper shall be in flush with floor and be finished bright/satin/chromium plated or anodised.

9.9 Hooks and Eyes


These shall be of mild steel or hard drawn brass and shall generally conform to IS : 207-1964.

9.10 Casement Window Handles

These shall be made of cast brass, steel protected against rusting, aluminium, pressed brass or as specified. Casement handles for single leaf window shutter shall be left or right handed and shall weigh as specified.

9.11 Casement Peg Stays

These shall be made of cast brass, steel protected against rusting, aluminium, cast alloy or as specified. The stay shall be made from a channel section and shall be 300mm long with steel peg and locking bracket. The peg stay shall have three holes to open the window in three different angles. The shape and pattern of stays shall be

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 29 of 66
			REVISION : 0
			EDITION : 1

approved by the Engineer. The peg stay shall be minimum 2mm thickness in case of brass and aluminium and 1.25 mm in case of steel.

9.12 Quadrant Stays

These shall be made of cast brass, aluminium alloy, CP iron or as specified. The shape and pattern shall be approved by the Engineer. It shall weigh as specified.

9.13 Fan Light Pivots

These shall be made of mild steel, cast brass or aluminium alloy or as specified and shall generally conform to IS : 1837-1966.

The pattern and the shape of the catch shall be as approved by the Engineer and size and finish shall be as specified.

9.14 Fan light catch

These shall be made of mild steel, cast brass, aluminium alloy or as specified and shall generally conform to IS : 364-1993. Steel springs of the catch shall be 0.90 mm dia, 6 coils, 12 mm internal diameter and 20 mm long. The pattern and the shape of the catch shall be as approved by the Engineer.

9.15 Steel Frames

These shall conform to IS:4351-1976. The frames shall be manufactured from commercial mild steel sheets of 1.25mm thickness and are suitable for door shutters 30 to 40mm thick. The door frames are designated as per profile A, B and C.


Profile A Size 105x60mm : rebated for one set of shutters

Profile B Size 125x60mm : rebated for one set of shutters

Profile C Size 165x60mm : rebated for two sets of shutters.

Miscellaneous Items :

9.16 Putty

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 30 of 66
			REVISION : 0
			EDITION : 1

The material shall be homogeneous paste and shall be free from dust and other visible impurities. Putty shall conform to IS : 419-1967 for wood work.

10.0 METAL DOORS, WINDOWS, VENTILATORS AND ROLLING SHUTTERS

10.1 General

Materials used in the fabrication of doors, windows, and ventilators shall be the best procurable and conforming to relevant Indian Standards.

10.2 Steel Doors, Windows and Ventilators

Steel sections used for fabrication of doors, windows and ventilators shall be standard rolled steel sections specified in IS : 1038, IS : 1977, IS : 1361 or IS : 7452 year 1983, 1975, 1978 and 1990 respectively as appropriate or as specified in drawing and Schedule of Items. Rivets shall conform to IS : 1148-1982.

10.3 Aluminium Door, Windows and Ventilators


Aluminium sections for fabricating doors, windows, ventilators, partitions etc., shall be extruded sections conforming to IS : 1948-1961 & IS : 1949-1961 or as manufactured by Indian Aluminium Company Limited or approved equivalent The alloy used shall conform to Designation HE 9 - WP of IS : 733-1983.

10.4 Steel Rolling Shutters, Rolling Grills

These shall conform to IS : 6248-1979.

10.5 M.S. Bolts etc.

M.S. bolts, nuts, screws, washers, peg stays and other mild steel fittings shall be treated for corrosion. Putty for glazing shall conform to IS : 419-1967. Glass panes and glazing shall conform to the specification detailed under this series.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 31 of 66
			REVISION : 0
			EDITION : 1

10.6 Hardware and fixtures shall be as specified in the drawings or Schedule of Items. All hardware and fixtures shall be able to withstand repeated use. Door closers shall be suitable for doors weighing 61 80 kg, unless otherwise stated. Each closer shall be guaranteed against manufacturing defect for one year and any defect found within this period shall be rectified or the closer replaced free of charge. Concealed door closers shall be either floor mounted or transom mounted, suitable for installation with metal doors. It shall conform to the performance requirements and endurance test stated in IS : 3564 1986 Appendix-A.

10.7 The mastic for caulking shall be of best quality from a manufacturer approved by the Engineer. In general, the mastic for fixing of metal frames shall conform to IS : 1081-1960 and/or as approved by the Engineer.

11.0 GLASS


11.1 General

Plain, ground, frosted or rough cast wired glass shall be used as shown on the drawing or as specified in the Schedule of Items. It shall be procured from a reputed source of manufacture and be of the best quality. All glass panes shall be free from flaws, specks, bubbles etc. Glass panes shall be of thickness 3mm or more as required. Weight of 3mm thick glass pane shall not be less than 7.5 Kg//sqm. The tolerance of glass panes, except wired glasses, in length and width shall be plus or minus 2 mm for 3 to 6.3 mm glass sheets. Tolerance in thickness of glass sheets shall be +/- 0.2mm for 3mm and 4mm thick glasses and +/- 0.3mm for 4.8, 5.5 and 6.3mm thick glasses.

11.2 Plain Transparent Glass

Plain transparent glass for glazing and framing shall conform to IS: 2835-1987. It shall be free from flaws, specks, bubbles or distortions.

11.3 Ground and Frosted Glass

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 32 of 66
			REVISION : 0
			EDITION : 1

Glare reducing or heat absorbing glass shall be "Calorex" or approved equivalent and special care shall be taken to grind smooth and round off the edges before fixing.

11.4 Thickness

Glass shall have the following thickness, unless otherwise stated in the Schedule of Items or drawings

Upto 60 cms x 60 cms	...	3 mm
do- of larger size	...	4 mm and 4.8mm
Sheet glass for doors	...	5.5 mm
Rough cast wired	...	6.4 +/- 0.4 mm

11.5 Inspection

All glasses shall be subject to inspection on the site. Glass found to suffer from defects shall be rejected. Samples submitted for inspection shall be selected so as to be representative of the consignment.

12.0 PAINTS


12.1 General

All paints, varnishes, distemper or other surface coating materials shall be of approved quality conforming to the appropriate Indian Standard, wherever such standard is available, and be obtained from a manufacturer of repute. If there is more than one quality for one particular product, only first quality shall be used unless otherwise stated in the Schedule of Items.

12.2 Sampling and Testing

The Engineer may, at his discretion, require samples of paint to be tested. In such cases testing will be according to IS : 101 (Part 1 to 8) - 1964 to 1993.

12.3 Storage

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 33 of 66
			REVISION : 0
			EDITION : 1

Paints, primers, distempers and varnishes shall be delivered in sealed containers. They shall be stored in cool dry condition to the satisfaction of the Engineer.

12.4 Paints for Priming

Ready mixed paints for priming coats of steel and iron work shall either comply with IS : 2074-1992 "Ready Mixed Paint", "Red Oxide Zinc Chrome Priming" or Red Oxide metal primer as specified. For wood work it shall be pink/white wood primer as specified by the manufacturer of the synthetic enamel paints, conforming to IS : 3536-1966.

12.5 Paints for finishing

Ready mixed oil synthetic enamel paint of approved manufacturers like Berger, Jenson & Nicholson, Shalimar, I.C.I., Asian, Garware and Goodlass Nerolac paints only shall be used unless otherwise specified. Paint shall be of first grade quality of the above manufacturers ie., Luxol Brolac, Superlac, Dulox gloss, Apocolite, Garcoat and Nerolac respectively.

If for any other reason, thinning is necessary, the brand of the thinner recommended by the manufacturer, shall only be used with the specific permission of the Engineer.

Aluminium paint for general purpose shall be in Dual Containers. It shall be of manufacturers as for synthetic enamel paints above.


12.6 White wash

White wash shall be prepared from freshly burnt fat, white in colour lime slaked on spot, conforming to IS : 712-1984 mixed and stirred with sufficient water to make a thin cream. Best and approved quality gum and ultra marine blue only shall be used in lime wash.

12.7 Colour wash

Colour wash shall be prepared by adding mineral colours, not affected by lime, to white wash.

12.8 Water proofing Cement Paint

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 34 of 66
			REVISION : 0
			EDITION : 1

Cement paints shall comply with IS: 5410-1992 and shall be of approved brand and manufacture like Snowcem India Ltd., Berger, Jenson & Nicholson & Shalimar paints. The shade shall be approved by the Engineer before its application.

12.9 Distemper

Dry/synthetic washable distemper of approved brand and manufacture like Berger, Jenson & Nicholson, Asian, Shalimar, Garware & Goodlass Nerolac shall be used. The shade shall be approved by the Engineer before application of the distemper. and shall comply with IS : 427-1965 and IS : 428-1969.

12.10 Varnish

Varnish for the finishing coat shall be copal finish or synthetic class varnish of approved brand. Varnish for the under coat shall be flattening varnish of the same make as the top coats and shall be to the satisfaction of the Engineer.


12.11 Polish

French spirit polish shall be of an approved make conforming to IS: 348-1968. In case it is to be prepared on site, the polish shall be made by dissolving 0.7 kg of best, shellac in 4.5 litres of methylated spirit without heating. To obtain required shade pigment may be added and mixed. Shellac shall conform to IS : 5467-1986.

12.11.1 Wax polish for Wood work

The polish shall consist mainly of waxes and Organic solvents with or without water and shall be of smooth consistency, homogeneous, Semi-Solid mass and free from gritty materials. It shall not flow at ordinary temperature. It may be tinted with an oil soluble colour. The polish shall not crumble or dry too rapidly and shall produce non-tacky polished surface. The polish shall be amenable to smooth spreading on the furniture surface and the gloss shall appear on gentle rubbing with a soft polishing cloth.

The wax polish shall conform to IS : 8542-1977.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 35 of 66
			REVISION : 0
			EDITION : 1

- 12.11.2 Where wax polishing is to be prepared at site, it shall be prepared by heating two parts of "Bee Wax" two parts of boiled linseed oil over a slow fire. When dissolved but still warm, one part of turpentine is to be added. The boiled linseed oil, bees wax and turpentine used shall be of approved quality and complying with IS : 77-1976, IS : 1504-1974 and IS : 533-1973 respectively.

12.12 **Plastic (Acrylic) emulsion paint**

Plastic emulsion paint of approved manufacturers like Jenson & Nicholson, Goodlass Nerolac, Shalimar, Berger, Asian and Garware paints only shall be used unless otherwise specified and shall comply with IS : 5411 (Part 1)-1974 & (Part 2)-1972 as applicable. Cement primer used for priming work both for oil bound distemper and plastic emulsion paint shall be of the same manufacture as that of distemper or plastic emulsion paint used. For dry distemper priming, whitening of approved quality shall be used.


12.13 **Creosote oil or Coaltar Creosote**

It is primarily used for preservation of wood. It shall be a homogeneous liquid and shall liquify completely on being warmed to 38 degree C with stirring and shall remain liquid on cooling down to 32 degree C and on standing at that temperature for 2 hours.

The material shall conform to IS : 218-1983. All persons handling the creosote oil should be fully aware of the hazards involved in handling . Skin should be protected from coming in direct contact and eyes should be protected by using safety goggles while handling the material.

12.14 **Coaltar Black Paint**

Coaltar paint film protects surfaces by serving as a barrier against the action of moisture and other corrosive agents. Coaltar black paint is generally used as a protective and anti corrosive paint of iron and steel as well as protection of other building surfaces. For this it has to be applied under proper condition and on suitably prepared surface. Coaltar should be applied by brush only and is not recommended for locations which are not likely to be well ventilated. Coaltar paint shall conform to IS : 290 1961.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 36 of 66
			REVISION : 0
			EDITION : 1

The material is of two types : Type A Quickly drying and Type B Slow drying. It shall be a homogenous black solution type paint consisting of a base prepared by blinding suitable grades of Coltar pitch, washed free from ammoniacal liquor, tar acid bases etc. Consistency, permeability, thickness and surface preparation etc. shall be as per para 5 and A-2 of the above code.

12.15 Floor Polish - Paste

The polish shall consist mainly of waxes and organic solvents with or without water.

The paste floor polish shall be of smooth consistency, homogenous, semi-solid-mass and free from gritty material. It shall not flow at ordinary temperature. It shall be so constituted and prepared that on application by means of a clean cloth, it shall spread easily and evenly and shall give with minimum buffing a firm and glossy surface free from greasiness or tackiness. The polish film after spreading with a cloth shall not take more than 10 minutes to dry. The polished floor shall neither be slippery nor show any resistance to easy walking.

Floor polish paste shall conform to IS : 8591-1977.


13.0 WATER PROOFING MATERIALS

13.1 Integral Cement Waterproofing Compounds

Integral cement waterproofing compounds, i.e. admixture for waterproofing purposes shall fully comply with the requirements of IS : 2645-1975. Properties like permeability, setting time, compressive strength shall be in accordance with the requirements of this code when tested as per procedure laid therein. Calcium chloride content of the product used shall be made known to Engineer before use.

13.2 Bitumen

The bitumen bonding material for waterproofing shall conform to the requirements laid down in IS : 702-1988 or IS : 93-1992 or IS : 217-1988 or IS : 454-1961 depending upon whether industrial bitumen, paving bitumen or cutback bitumen is used. For selecting the particular type and grade of bitumen to be used the relevant item in Schedule of Items shall be referred to.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 37 of 66
			REVISION : 0
			EDITION : 1

13.3 Bitumen Primer

Bitumen primer used for application to concrete and masonry surfaces and bitumen for the purpose of waterproofing shall conform to requirements given in IS : 3384-1986 and pass tests in accordance with the procedure laid down in appropriate IS mentioned in Table-I of IS : 3384-1986. Bitumen primer should be free from water and shall preferably ;be made from the same grade of bitumen as used in bonding.

13.4 Bitumen Felt

Bitumen felts used for water proofing purposes shall be as specified in IS: 1322-1982. Physical properties shall conform to the requirements and tests shall be carried out as per procedure laid down in IS :1322-1982. Base, (whether fibre or Hessian), type and grade of felt shall be as mentioned in the relevant items under Schedule of Items. Unless otherwise stated, hessian base felt Type-3, Grade-2 shall be used.

13.5 Bitumen Mastic

Bitumen mastic used for water proofing of roofs shall have the physical properties as mentioned in IS : 3037-1986 when tested with the procedure laid down in appropriate IS mentioned in IS : 3037-1986.


13.6 Bituminous Compounds

Bituminous compounds when used for waterproofing of porous masonry, concrete floors, walls and roofs shall conform to the requirements of IS : 1580-1991. Physical properties shall be governed by the requirements of this code when tested in accordance with the procedure laid therein.

13.7 Surface Application Materials

Waterproofing material for application on mortar or concrete surface shall conform to IS: 9862 1981. The primer shall be suitable for spray or brush application. It shall have properties enabling it to penetrate through pores or cracks and fill them up, making the surface impervious.

13.8 Polymer based paints

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 38 of 66
			REVISION : 0
			EDITION : 1


The materials used shall be high polymer based chloride and sulphide free cement and waterproofing additions and epoxy based waterproofing paints as per manufacturer's specification and approved by Engineer.

13.9 Fibre glass R. P. Tissue

The fibre glass R.P. tissue is a thin flexible uniform mat, composed of glass fibre in an open porous structure bonded with a suitable inert material compatible with coal tar, asphaltic enamel and oil plastic based wall paint. The fibrous glass mat is reinforced with continuous filament glass yard at 3/8" (10mm) pitch in the longitudinal direction.

PHYSICAL PROPERTIES

- | | | |
|------|-------------------|--|
| i) | Weight | The average weight of fibre glass R.P. tissue shall not be less than 50 gms/sq.sm. |
| ii) | Thickness | The fibre glass R.P. tissue shall have a thickness not less than 0.4mm. |
| iii) | Tear Strength | The tear strength shall be not less than 900 grams in the transverse direction. |
| iv) | Breaking Strength | This shall have a minimum breaking strength of 13 lb/in (2.32kg/cm) in the longitudinal direction. |
| v) | Porosity | This shall have a porosity when related to pressure difference across the sample of not less than 0.022" (0.56mm) and not more than 0.76" (1.92mm) of water guage at an air velocity of 200fpm.(100cm/sec.). |
| vi) | Pliability | There shall be no cracking of the tissue mat when bent over a 1/8" (3.2mm) radius after immersing for 10-15min. through a 90 degree arc. |
| vii) | Temperature | The fibre glass tissue shall be Resistance under a load of hot bitumen at 530 degree F (276 degree C) for one minute. |

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 39 of 66
			REVISION : 0
			EDITION : 1

13.9.1 Primer

Primer shall conform to requirements laid down in IS : 3384-1986. It is to be prepared by blending turpentine and blown grade bitumen in the ratio of 60:40 by weight.

13.9.2 Blown Materials

Blown grade bitumen shall be conforming to IS : 702-1988 and residual grade bitumen conforming to IS:73 respectively. This shall be prepared by heating to correct working temperature.

13.9.3 Surface finish

Pea sized gravel/grit 6mm and down.

13.10 P.V.C. Membrane/Sheets

Polyvinyl chloride sheets for the purpose of water proofing and other underground use are specially developed sheets made from the compounded resin of grade MP/DP/CR-02 and shall be resistant to the passage of gross water and water vapour. It shall be corrosion resistant and resistant to a wide range of acidic and alkali reagents, saltpetre action, salt water and ultra violet rays etc. PVC sheets manufactured by approved and reputed firms like Maxlok Polymer Ltd. shall only be used


The sheets shall consist of Knobs or Lugs jutting out of the sheets in a grid fashion so as to provide a perfect grip in the mortar and concrete. Sheet thickness, spacing of the knobs and their projection from the sheet shall be as specified in the item. The sheets shall be of maximum practicable length and width unless otherwise specified.

The adhesive used for jointing shall be of approved quality and of grade C-02.

The sample of the material shall be got approved before use.

13.10.1 Properties

- i) Chemical Composition : Resin Plasticiser Inhibitor
Stabiliser UV Barrier.
- ii) Thickness : Not less than 0.25 mm

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 40 of 66
			REVISION : 0
			EDITION : 1

- iii) Rupture/Tensile Strength : Not less than 225Kg/cm²
- iv) Adhesive bond Strength : : Not less than 7.1 Kg/cm [width]
- v) Elongation at Break : 130%

14.0 WATER BAR

14.1 General

Water bar for use in construction/expansion joints in concrete and reinforced concrete structures shall be of copper sheet, galvanised steel sheet, rubber or PVC as shown in drawing or described in the Schedule of Items. It shall be subject to approval of Engineer.

14.2 Jointing

The water bar shall have dimensions as shown in drawing. Where water bars are required to be lengthened or otherwise jointed the joining shall be done in such a way as to achieve a perfectly watertight joint.

15.0 LEAD

15.1 General

Lead for joints in cast iron spigot and socket pipes shall be melted from pure soft pig lead conforming to Type-I of IS : 782-1978. "Caulking Lead". Where lead wool is allowed for caulking, it shall be equal to or better than Type-II of IS : 782-1978. Lead flashing shall conform to IS : 405 Part I&II-1992.

16.0 BUILDING PAPER

16.1 Building paper shall be bitumen impregnated paper conforming to IS: 5134 1977, or such other as may be approved by the Engineer.

17.0 FILLING MATERIAL

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		The logo consists of a green circular emblem with a stylized 'B' and 'R' inside. Below the emblem, the text 'बी एण्ड आर' is written in Devanagari script, followed by 'B AND R' in bold English letters. At the bottom, the tagline 'Building Nation Since 1920' is written in a smaller font.
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 41 of 66
			REVISION : 0
			EDITION : 1

17.1 General

Filling material shall conform to what is shown in drawing, described in the Schedule of Items or otherwise directed by the Engineer. Earth or sand for filling under floors shall correspond to those described elsewhere in these specifications.

17.2 Mastic Bitumen

Mastic Bitumen shall conform to IS : 3037-1986 or IS : 5871-1987 as appropriate.

17.3 Flexible Boards

Flexible boards for use in expansion joints shall correspond to the description given in drawing or the Schedule of Items or the instruction of Engineer.


18.0 DRAINAGE & SANITATION (INTERNAL)

18.1 General

All materials, pipes, specials, fittings, fixtures etc., to be used in the works shall be of best quality and class specified in relevant IS Code. Where specified these shall be of specific manufacture and quality and shall be procured from manufacturer or their accredited stockists and be marked with manufacturers' names and trade mark. Contractor shall submit to the Engineer samples of all materials, pipes, specials, fittings fixtures for approval before use in the works. Such approved samples shall be retained by the Engineer till completion of works. Pipes and Specials may be any or combination of following types:-

- i) PVC Pipes
- ii) Stone Ware Pipes
- iii) Sand Cast Iron Pipes for soil waste & Ventilation
- iv) CI Pipes for rain water
- v) AC Pipes for rain water
- vi) R.C.C Pipes

18.1.1 High density PVC pipes and fittings

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 42 of 66
			REVISION : 0
			EDITION : 1

This shall conform to IS : 4984-1987 and IS : 8008 (Part 1 to 7)-1976 unless otherwise specified.

18.2 **PVC Waste Pipe**

This shall conform to IS : 4985-1988 unless otherwise specified.

18.3 **Stoneware Pipes & Fittings**


All stoneware pipes, bends, gully traps and sewer traps shall be of the best salt glazed variety inside and outside, hard burnt dark grey colour, perfectly sound, free from fire cracks and imperfection of glaze, truly circular in cross section, perfectly straight, of standard nominal length and depth of socket and barrel. These shall be of approved manufacture and shall comply with the requirement of IS: 651-1992. These pipes shall be of grade AA unless otherwise specified.

18.4 **Sand Cast Iron Pipes & Fittings conforming to IS : 1729-1979**

All soil waste and vent pipes and fittings used in the work shall be cast iron and shall conform to IS: 1729-1979. The pipes shall have spigot and socket ends, with bead on spigot end and shall be with or without ears. The pipes shall be free from cracks and other flaws. The interior of the pipe and fittings shall be clean, smooth painted inside and outside with DR Angas smiths solution or other approved anti-corrosive paint.

The standard weights and thickness of pipe shall comply with the requirements of IS: 1729-1979. The tolerance on wall thickness and weight shall be minus 15 percent and minus 10 percent respectively. Pipes weighing more than the nominal weight given below may be accepted provided they comply in every other respect.

Nominal size	Weight per piece in Kg. excluding ears		
	Overall length		
	1500 mm	1800 mm	2000 mm
50	9.56	11.41	12.65
75	13.83	16.52	18.37
100	18.14	21.67	24.15
150	26.70	31.92	35.66

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 43 of 66
			REVISION : 0
			EDITION : 1

Specials and Fittings shall include bends, offsets, branches of various types, junctions etc., as required for the work which shall be provided according to drawings and directions of the Engineer. B.M. trap shall have water seal as per I.S. provisions.

The specials and fittings shall be provided with access doors where so specified or directed by the Engineer. The access door fittings shall be of proper design so as not to form cavities in which the filth may accumulate. Doors shall be provided with 3 mm thick rubber insertion packing, and when closed and bolted they shall be water tight. The access doors shall have MS studs and bolts or screws or bolts and nuts.

18.5 Cast Iron Pipes & A.C. pipes : Rainwater pipe

18.5.1 Pipes shall be of approved manufacture, true, smooth and cylindrical, their inner and outer surfaces being as nearly as practicable concentric and shall conform to IS : 1230-1979. These shall be sound and uniform casting, free from laps, pin holes or other imperfections and shall be neatly finished inside and outside. The ends of pipes shall be reasonably square to their axis.


18.5.2 Dimensions

CI rain water pipes shall be of the dia specified in the description of the item and shall be in full lengths of 1.8 metres including socket ends of the pipes, unless shorter lengths are required at junctions with fittings. The pipe lengths shall in each case be with sockets. The pipes shall be supplied without ears unless otherwise specifically mentioned.

The pipes supplied shall be factory painted with a tar based composition both inside and outside which shall be smooth and tenacious unless specified otherwise.

Every pipe shall ring clearly when struck all over with a light hand hammer. When shorter pipes are cut from full lengths they shall be cut with a hacksaw.

Where the pipes are to be embedded in masonry they shall be of Class of pipes as are used for soil and vent pipes. For the weights of different sizes of these pipes, the specifications under SCI and vent pipes may be referred to.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 44 of 66
			REVISION : 0
			EDITION : 1

18.5.3 A.C. pipes and fittings the pipes and fittings shall be of approved manufacture and shall conform to IS:1626. These shall be homogeneous and free from cracks and other defects. The pipes shall be straight, smooth and regular in thickness.

The diameter of the pipe shall be as specified. The fittings like heads, bends of different degrees, offsets of different projections, shoes and junctions shall be of the type, diameter and size as required for the work. The pipes shall be used in full lengths as far as possible.


18.6 Sanitary appliances

Sanitary appliances like I.W.C/E.W.C pans, wash basin, urinals and sinks etc. shall be made of vitreous china or fire clay as specified. These shall be of Hindustan Sanitary ware or Parry ware make unless otherwise specified and to be approved by the Engineer. These shall conform to A class quality of IS : 2566 (Part 1 to 15)-1972 to 1985 and IS : 771 (Part 1 to 15) –1979 & 1985 respectively.

18.6.1 European Pattern W.C.

Unless otherwise specified, these shall comprise of :

- White 'glazed earthenware wash down closet set with 'S' or 'P' trap of standard size.
- 'Duco' spray painted 12.5 litres mosquito proof low level M.S or C.I flushing cistern with valveless siphon, 15 mm ball cock, C.P. brass unions & couplings for the 32 mm dia flush pipe, 20 mm dia overflow PVC pipe with mosquito proof cover etc.
- 'Duco' spray painted 1 1/4" (32 mm) dia G.I. telescopic flush pipe with buffer clamp, holder bat clamp and 38mm dia PVC pipe or 35/40mm O.D. high density polythene flush pipe with buffer clamp, holder bat clamp.
- Approved quality solid plastic W.C. seat and cover, bar hinges, screws bolt, rubber buffers conforming to IS : 2548 (Part 1&2)-1983.
- 15 mm PVC connection pipe with brass couplings at both ends and 15 mm brass CP cock.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 45 of 66
			REVISION : 0
			EDITION : 1

- f) Hard wood wooden blocks or other suitable fixing arrangement with screws and detofix for fixing WC in floor and putty joint with flush pipe and soil pipe.

18.6.2 Indian Pattern W.C.


Unless otherwise specified these shall comprise of :-

- a) White glazed earthenware WC pan back entry type.
- b) White glazed earthenware 'P' or 'S' trap with or without vent.
- c) 12.5 litres approved make mosquito proof M.S.high level flushing cistern with valveless siphon, 15 mm ball cock, galvanised iron chain handle, cast iron brackets with wall plugs, brass unions and couplings for flush pipe, 20 mm dia overflow PVC pipe with mosquito proof cover etc.,
- d) 32 mm dia GI telescopic or 35/40 mm O.D high density PVC flush pipe with holder bat clamps.
- e) One pair of white glazed earthen ware foot rest set in cement mortar 1:3.
- f) 15 mm PVC connection pipe with brass couplings at both ends and 15 mm brass stop cock.

18.7 Wash Hand basin

Unless otherwise specified these shall comprise of :-

- a) White glazed earthenware basin with 2 nos. Concealed Cast Iron Brackets with wall plugs.
- b) 1 no. 15 mm C.P. brass pillar tap.
- c) 32 mm C.P. brass waste fitting, C.P. brass chain and rubber plug.
- d) 32 mm PVC waste pipe with brass couplings/32 mm C.P. bottle trap.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 46 of 66
			REVISION : 0
			EDITION : 1

- e) 15 mm PVC connection pipe with brass couplings and 15 mm brass stop cock.

18.8 Flat Back Lipped Urinal

Unless otherwise specified these shall comprise of:-

- a) White glazed earthenware urinal basin back type.
- b) CI/M.S mosquito proof high level automatic flushing cistern of capacity as specified in the Schedule of Quantities with all accessories, cast iron brackets with wall plugs, brass unions and coupling for flush pipe, 20 mm dia overflow pipe with mosquito proof cover.
- c) 25 mm dia CP brass flush pipe and spreaders with wall clips and brackets.
- d) 15 mm PVC connection pipe with brass couplings joint at both ends and 15 mm brass stop cock.
- e) 32 mm C.P. brass outlets complete with PVC waste.


18.9 Mirror Frames

Mirror frame where specified shall be of fibre glass of approved shape, size, colour and make.

- 18.9.1** Mirror shall be of superior glass with edges rounded off or leveled as specified. It shall be free from flaws, specks or bubble and its thickness shall not be less than 5.0 mm. The glass for the mirror shall be uniformly silver plated at the back and shall be free from silvering defects. Silvering shall have a protective uniform covering of red lead paint.

18.10 Toilet Shelf

- 18.10.1** Glass shelf unit shall consist of an assembly of glass shelf, anodised aluminium / CP brass guard rail and supporting brackets. The shelf shall be of glass of best quality with edges rounded off and shall be free from flaws, specks, bubbles and of thickness not less than 5.0

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 47 of 66
			REVISION : 0
			EDITION : 1

mm. The shelf shall have guard rail, resting on rubber washers on glass plate.

18.10.2 Ceramics shelf shall be of shape, size and design as specified in the Schedule of Items.

18.11 Towel Rail

Towel rail shall be of CP brass / anodised aluminium with two brackets of same material, diameter and length as specified.

18.12 Soap Container

Soap container shall be of C.P brass, PVC with cp brass brackets of approved make and design.

18.13 CP Flush Valves for EWC

The CP flush valve for EWC shall be of "Jaquar" brand of Jaquar & Co., 'ACCO' brand of Asia Continental Metallwaren Fabric or equivalent quality.

18.14 CP Flush Valve for Urinals


CP flush valve for urinal shall be of "Jaquar" brand of Jaquar & Co., 'ACCO' brand of Asian Continental Metallwaren Fabric or of equivalent quality.

18.15 Gully Trap

Each gully trap shall have one C.I. grating 150 mm x 150 mm and one water tight pre-cast R.C. cover 300 x 300 x 40 mm thick with 1:1 1/2:3 mix concrete (one cement: one and half sand : 3 stone chips 20 mm down) including neat cement finish.

18.16 CI Manhole Covers & Frames

These shall be of light or medium duty (LD or MD) as specified in Schedule of Items and of cast iron with raised chequered design, lifting key and key hole and shall be coated with black bituminous base material,. Light duty covers and frames shall be of either rectangular type, single seal, pattern 1 and 2 having minimum weight of cover and frame 38 Kg and 25 Kg. respectively or with double seal, minimum

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 48 of 66
			REVISION : 0
			EDITION : 1

weight of cover and frame being 52 Kg. These may be of square type also. Single seal with clear openings of 455 and 610 mm with minimum weight of cover and frame being 20 Kg and 38 Kg respectively, double seal of same openings shall have minimum Wt. of cover and frame 30 Kg and 55 Kg respectively. Medium duty covers and frames shall be either of circular type with 500 and 560 mm clear openings and minimum Wt. of cover and frame 116 Kg and 128 Kg respectively or of rectangular type with minimum Wt. of cover and frame 144 Kg.

The C.I. manhole covers and frames shall conform to IS : 1726-1991.

18.17 Flushing Cisterns

Manually operated high level and low level flushing cisterns are of 5 litre and 10 litre capacities, both single flush and dual flush type. The cisterns shall conform to IS : 774-1984 and be made of Cast Iron, Vitreous China or enamelled pressed steel. The cisterns shall be mosquito-proof.


The thickness of the body including cover shall be not less than 5 mm for Cast Iron and 6 mm for Vitreous China Cisterns. Steel and lead flush pipe shall have internal diameter of 32 plus or minus 1 mm for high level cisterns and 38 plus or minus 1mm for low level cisterns. For high density polyethylene and unplasticised PVC pipes the outside diameter of the pipe shall be 40 mm. In case of PVC plumbing pipes the outside diameter of the pipes shall be 40mm for high level and 50mm for low level cisterns. Steel flush pipes shall be hot dip galvanized electroplated or vitreous enameled.

The flush pipe shall be securely connected to the cistern outlet and made airtight by means of a coupling nut. Float valve shall conform to IS : 1703-1977 or IS : 12234-1988. Polyethylene float valve shall conform to IS : 9762-1981.

Cast Iron Cisterns shall be painted and finished in accordance with recommendation made in IS : 1477 (Part 1&2)-1971 or shall have a coating of enamel.

In general, Materials Construction and operational and performance requirements shall be as specified in para 3, 4 and 6 of IS : 774-1984.

18.18 Plastic Seats & Covers for Water Closets

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 49 of 66
			REVISION : 0
			EDITION : 1

These shall confirm to IS : 2548 (Part 1&2)-1983 and shall be either of thermo-set or of thermo-plastic quality.

Thermo-set Seats and Covers are moulded from phenolic plastics (Type A) or Urea Formaldehyde (Type B). Thermo-plastic Seats and Covers are also of Type A, moulded from Polystyrene or Type B, moulded from Polypropylene.

Underside of the seats may be either flat or recessed and colour shall be as agreed. Table Dimensions of the seats and covers shall be as per Table-I of the Code (both Part 1&2). Hinging device may be either of the following materials :

- i) Bronze or Brass with Nickel Chromium Plating
- ii) Mild Steel with Nickel Chromium Plating
- iii) Aluminium alloy with anodic coating
- iv) Suitable plastic with reinforcement.

19.0 WATER SUPPLY & PLUMBING (INTERNAL)


19.1 General

This section deals with the specification of material for pipes, fittings, fixtures etc., to be used in water supply works.

All materials, pipes, fittings, fixtures to be used in the works shall be of the best quality and of the class specified in various clauses herein under. Where specified these shall be of specific manufacture and quality and shall be procured from the manufacturer or their accredited stockist and be marked with manufacturers name and trade marks. The Contractor shall submit to the Engineer samples of all pipes, fittings, fixtures for approval before being used in the works. Such approved samples shall be retained by the Engineer till completion of works.

Pipes and pipe fittings may be of any or combination of following types:

- i) Wrought iron galvanised pipe
- ii) PVC pipes
- iii) Cast iron pipes

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 50 of 66
			REVISION : 0
			EDITION : 1

- iv) Steel pipes coated with bitumen composition inside and galvanised outside.
- v) Reinforced concrete pipes
- vi) Asbestos cement pipes
- vii) Pre-stressed concrete pipes
- viii) Lead pipe (not to be used for potable water)


19.2 Galvanised Iron Pipes and Fittings

Generally pipes for installations in buildings shall be medium quality malleable steel galvanised pipe 'B' class for cold water supply and 'C' class for hot water supply, having threaded ends with socket at one end.

The details of standard medium quality "B" class pipes and sockets regarding nominal bore thickness and weight in kg/m are given below:-

Pipe Dia (Nominal Bore)	Dimension of Pipe		Thick -- ness	Dimension of ordinary socket		Wt. of Pipe plain end
	Max. (outside dia)	Min.		Outside dia (approx.)	Min. length	
mm	mm	mm	mm	mm	mm	Kg/m
15	21.8	21.0	2.65	26.90	34	1.21
20	27.3	26.5	2.65	33.70	36	1.57
25	34.2	33.5	3.25	42.00	43	2.42
32	42.9	42.0	3.25	51.00	48	3.11
40	48.8	47.9	3.25	57.00	48	3.59
50	60.8	59.7	3.65	70.00	56	5.07
65	76.6	75.3	3.65	88.00	65	6.49
80	89.5	88.0	4.05	101.60	71	8.43

Note :- Manufacturing tolerances shall be permitted on tubes and sockets in addition to above as per IS : 1239 (Part 1&2) 1990 to 1992.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 51 of 66
			REVISION : 0
			EDITION : 1

The galvanised iron pipes shall be of approved make and conform to IS:1239 (Part 1&2) 1990 to 1992 and of tested quality. The GI pipes shall be of threaded ends with a socket at one end only. The fittings for GI pipes shall be either galvanised wrought iron or galvanised malleable iron.

19.3 R.C.C, Asbestos, Prestressed Pipes and Fittings

These shall be of approved manufacture and quality and shall conform to IS : 458 1988, IS : 1592 1989, IS : 9627 1988 & IS : 784 1978 respectively.

19.4 Cast Iron Pipes and Fittings

The cast iron pipes shall be of approved manufacture and quality and shall conform to IS: 1536 1989 "Centrifugally Cast (Spun) iron pressure pipe and/or IS : 1537 1976". Vertically Cast Iron pressure pipe for water, gas and sewage. CI fittings shall conform to IS : 1538 (Part 1 to 23) 1976.


19.5 Steel Pipes

This shall conform to IS: 1239 (Part 1&2) 1990 to 1992) and IS : 3589-1991. Steel pipes shall be coated with bituminous composition inside and galvanised outside.

19.6 Bib Tap and Stop Tap

Bib tap and stop tap for water services shall be of brass screw down type and shall conform to IS: 781. Minimum finished weight of bib and stop taps shall be as given below:

No. of size (mm)	Bib taps (kg)	Stop tap (kg)
10	0.30	0.35
15	0.40	0.40
20	0.75	0.75
25	1.25	1.30
32	-	1.80

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 52 of 66
			REVISION : 0
			EDITION : 1

40	-	2.25
50	-	3.85

The taps shall be tested under internal hydraulic pressure of at least 20 kgf/cm² and maintained at the pressure for a period of at least two minutes during which period it shall neither leak nor sweat.

19.7 Valves

Unless otherwise mentioned in the Schedule of Quantities these shall be copper alloy gate, globe and check valve of nominal sizes 8 to 100mm and shall conform to IS : 778 1984. Valves shall be of class 1 and class 2, suitable upto a temp. of 45 degree C and can sustain non shock working pressure upto 1.0 and 1.6 MPA respectively. They shall have screwed or flanged ends. All the metal parts shall be of brass/brass alloy except hand wheel of Cast Iron or other approved quality.

19.8 Shower Rose

The shower rose shall be of heavy quality chromium plated brass with flat bottom, of diameter 100 mm or as specified with uniform perforations.


19.9 Storage Tank

Storage tank shall be either pressed steel, Galvanised iron, R.C.C or PVC of specified sizes, capacities, make, manufacture as specified in Schedule of Items. It shall have facilities for connecting inlet, outlet overflow and washout pipes and a top cover. Where tanks are to be fabricated by the Contractor the fabrication/R.C.C detailed drawings shall be got approved by Engineer.

19.10 Miscellaneous items

19.10.1 Half round channel

This shall be made of vitreous china channel with or without outlet/stop end as specified in Schedule of Items and shall be of approved manufacture.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 53 of 66
			REVISION : 0
			EDITION : 1

19.10.2 Urinal partition

This shall be made of vitreous china or R.C.C. with mosaic finish or marble as specified and shall be of approved make and quality.

20.0 EXTERNAL SEWERAGE & DRAINAGE

Unless otherwise specified CI pipe and specials, caulking lead, SW pipe, RCC pipe shall conform to the following.

20.1 C.I. Pipes

- i) C.I. pipe shall conform to IS : 1536 - 1989 or/and IS : 1537 – 1976 of class as specified in Schedule of Items.
- ii) C.I. pipe fittings shall conform to IS : 1538 (Part 1 to 23) -1976 as specified in Schedule of Items.
- iii) Bolts and nuts shall be hexagonal bolts and nuts conforming to IS : 1363 (Part 1 to 3) - 1992.

20.2 Washers

Spring washers conforming to IS : 3063 - 1972 shall be used near the pumps to take care of vibration. In other places plain washers conforming to IS : 2016 - 1967 shall be used.

20.3 Gaskets


Gaskets shall be reinforced rubber sheet or compressed fibre board conforming to IS : 638 - 1979 of thickness between 1.5mm to 3mm or as specified.

20.4 Caulking Lead

Lead for the spigot and socket joints shall conform to IS : 782 - 1978.

20.5 Salt Glazed Stone Ware Pipes

Salt glazed stone-ware pipes used shall conform to IS : 651 - 1992 and shall be laid as per IS : 4127 - 1983. The pipes shall be of grade AA unless otherwise specified.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 54 of 66
			REVISION : 0
			EDITION : 1

20.6 Steel Pipes

Steel pipes and fittings used for encasing shall conform to IS : 1239 (Part 1&2) - 1990 to 1992 medium Class upto 150 mm dia and as per IS : 3589 - 1991 for pipes of dia 200 mm and above. For pipes of dia 200 mm and above fittings, if required shall be fabricated from pipes itself.

20.7 Cast Iron Manhole Covers & Frames

These shall be of medium or heavy duty (M.D. or H.D.) as specified in Schedule of Item and of Cast Iron with raised chequered design, lifting key and key hole and shall be coated with black bituminous base material. Medium duty covers and frames shall be either of circular type with 500 mm clear opening and minimum weight of cover and frame 116 Kg and 128 Kg respectively or of rectangular type with minimum weight of cover and frame 144 Kg.

Heavy duty covers and frames shall be either of circular type with clear openings of 500 and 560 mm and 170 and 208 Kg weight respectively or of double triangular type with clear openings of 500 and 560 mm and 229 and 255 Kg weight respectively.

The CI manhole cover and frames shall conform to IS : 1726 - 1991.


21.0 ROAD

21.1 General

Roads shall be understood to include road bed, the wearing surface, berms, foot-paths, kerbs, culverts and bridges.

21.2 Soling Stones

Material for soling shall be natural stone boulders or crushed blast furnace slab. Stones for soling shall be of height equal to thickness of the soling with tolerance of plus or minus 25mm and shall not have a base area of less than 250 sq.cm. nor more than 500 sq.cm. and the smallest dimension of any stone shall not be less than half the largest dimension. Stones shall be tough, angular, durable and generally free from flat, elongated, soft and disintegrated particles. They shall also be free from dirt or other objectionable matter and be obtained from quarries approved by the Engineer.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 55 of 66
			REVISION : 0
			EDITION : 1

Crushed slag obtained from air-cooled blast furnaces slag shall be angular, of reasonably uniform quality and density and generally be free from any thin, elongated, and soft pieces, dirt or other objectionable matter. The density of slag should not be less than 1.12 gm/cc and glassy material shall not exceed 20%. Water absorption when determined in accordance with IS:2386 (Part-III) - 1963. "Methods of Tests for Aggregates for Concrete : Specific Gravity, Density Voids, Absorption and Bulking", shall not exceed 10%.

21.3 Coarse Aggregate for Water Bound Macadam


Coarse aggregate for water bound macadam shall be natural gravel, crushed stone obtained from approved quarries or crushed blast furnace slag. Crushed stone shall be hard, durable, tough and of uniform quality, generally free from flat, elongated, soft and disintegrated particles. It shall have sharp edges and also not have excess of dirt and other objectionable matter. When tested as per IS: 2386 (Part-IV) - 1963 for Los Angeles Abrasion Value or Aggregate Impact Value, the limiting values shall be 50% and 40% respectively for base course and 40% and 30% respectively for surfacing course. The flakiness index shall not exceed 15% when tested in accordance with IS: 2386 (Part-I)-1963 "Methods of Test for Aggregates for Concrete : Particle size and Shape". Crushed slag aggregates shall meet the requirements given for soling stones from blast furnace slag.

Size and grading requirements of coarse aggregates shall be as specified in Table-2 of IRC : 19 - 1981, "Standard Specification and Code of Practice for Water Bound Macadam". The grading number of the table shall correspond to the following layer thicknesses :

Grading Number	Size Range	Layer Thickness
1	90 mm to 40 mm	More than 90 mm
2.	63 mm to 40 mm	90 mm to 75 mm
3.	50 mm to 20 mm	75 mm to 50 mm

21.4 Screenings

Screenings used for filling voids in coarse aggregates for water bound macadam shall generally be of the same material as the coarse

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 56 of 66
			REVISION : 0
			EDITION : 1

aggregate. Non-plastic materials such as Kankar nodules, moorum or gravel (other than river bore rounded aggregates) may be used, provided that the liquid limit and plasticity index are below 20 and 6 respectively. The fraction passing 75 microns sieve shall not exceed 10%. Size and grading of screenings shall be as specified in Table-3 of IRC-19 - 1981. Type-A screenings shall be used for grade number 1 coarse aggregate. Type-B screenings shall be used for grade number 3. Either Type-A or Type-B screenings may be used for grade number 2.

21.5 Stone Chips for Bituminous Surfacing

Coarse aggregate shall consist of crushed stone, crushed slag or crushed gravel (Shingle) retained on 2.36 mm sieve. The aggregates shall be clean, strong, durable and fairly cubical, free from disintegrated pieces, organic and other objectionable matter. The aggregates shall preferably be hydrophobic and of low porosity. The mechanical properties and grading shall be in accordance with IRC-29 - 1988 "Tentative Specifications for 4 cm Asphaltic Concrete Surface Course", having aggregate impact value 30%, Flakiness Index 25% and graded between 20mm and 2.36 mm.

21.6 Sand


Sand for use as fine aggregate in bituminous surfacing shall consist of crushed screenings, natural sand or a mixture of both, passing a 2.36mm sieve and retained on 75 micron sieve. It shall be clean, hard, durable, uncoated and dry, free from injurious, soft or flaky pieces and organic deleterious substances.

21.7 Binder

Binding material for water bound macadam shall consist of fine grained material such as stone dust, kankar modules or moorum. The plasticity index shall be between 4 to 9 when water bound macadam is to be used as surface course and upto 6 when used as sub/base or base course.

21.7.1 Paving Bitumen

It shall conform to IS : 73 - 1992 and shall be of the specified type and grade. The material shall be homogeneous and shall not foam when heated to 175 degree C. Various properties like specific gravity, flash point, softening point, penetration etc. shall be as given in the above code.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 57 of 66
			REVISION : 0
			EDITION : 1

21.7.2 Bitumen Cut Back

Bitumen cut-back shall conform to specification given in IS : 217 - 1988. It shall be of three types, Rapid Curing (RC), Medium Curing (MC) and Slow Curing (SC). These shall comply with the requirements specified in Table - 1, 2 and 3 respectively of the above code.

The above three types of cutback bitumens shall be classified into different grades on the basis of Kinematic viscosity. Rapid curing type shall be used with aggregates containing practically no fine aggregates passing through 2.36 mm sieve. Medium curing bitumen shall be used with aggregates containing less than 20 per cent of fine aggregates passing through 2.36 mm sieve. Slow curing type shall be used with aggregates containing more than 20 per cent of fine aggregate passing through 2.36 mm sieve.

Medium curing bitumen of 30 grae i.e. MC 30 shall be used as primer. Manufacturer shall indicate source and type of the bitumen.

21.8 Kerbs

Kerbs may be of stone, concrete or brick as may be shown in drawing or otherwise directed by Engineer.

21.8.1 Stone kerbs

Stones shall conform to the dimensions and shapes given in drawing.


Exposed faces shall be dressed to lines.

21.8.2 Concrete kerbs

Shape and dimension shall conform to the drawing. They shall be pre-cast and the road side top corner shall be given a chamfer.

21.9 Galvanized Steel Barbed Wire for Fencing

These shall be of two types A&B. In both types Barbs shall have 4 points formed by twisting two point wires, each two turns. In type A (Iowa type) twisting is done around both line wings and in type B (Glidden type) around one line wire, in both cases making altogether four complete turns. It shall conform to IS : 278 - 1978 and shall have the diameter of

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 58 of 66
			REVISION : 0
			EDITION : 1

line and point wire as described in schedule of item. Galvanized mild steel wire shall conform to IS : 280 - 1978.

Line and point wire shall be circular in section, free from scales and shall be uniformly galvanized. Line wire shall be in continuous length and shall not contain any welds other than those in rod before it is drawn.

21.10 Galvanized Steel Chain Link Fabric

It will conform to IS : 2721 - 1979. It shall be of width, mesh and wire dia as per description of Item. For chain link fabric having width upto 2.00 M, of all mesh sizes, two line wires shall be provided. Whereas for width of 2.40 M and mesh size exceeding 50mm three line wires shall be provided. These shall be provided at top and bottom of the fabric, but wherever three line wires have been specified, these shall be provided at top, bottom and middle of fabric.


The mesh wire and line wire of the fabric shall be manufactured from Galvanised steel conforming to IS : 280 - 1978. It will have zinc coating of type medium as given in IS : 4826 - 1979. " Specification for Hot dipped galvanized coatings on round steel wires". Unless otherwise mentioned in the description of item fabric with both ends twisted shall be used.

The galvanised steel pipe posts shall consists of 80 mm and 50 mm nominal diameter. The pipe posts shall conform to IS : 1161 and shall be of medium grade and galvanised.

21.11 Concertina Coil fencing


Angle iron post and strut shall be as specified in Clause 3.3 Part I of specification. Concertina Coil fencing shall be dia 600 mm (having 50 nos. round per 6 metre length), spring core (2.5mm thick) wire of high tensile strength of 165 kg/sq.mm with tape (0.52 mm thick) and weight 43.478 gm/metre.

22.0 LIST OF MATERIALS OF APPROVED BRAND AND/OR MANUFACTURE


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 59 of 66
			REVISION : 0
			EDITION : 1

Unless otherwise specifically mentioned in the Schedule of Items, Contractor has to use materials as listed below, of only these brand names/Company's names, which are mentioned in the approved list for civil, water supply and sanitary items thereon.


SI No	Items/Name of Products	Makes / Brands / Manufacturers
1.	Reinforcement Steel	TATA,SAIL,RINL,IISCO,RATHI
2.	Cement	Ambuja,ACC,JK,Grasim,Ultratech,Birla,L&T,Cement Corporation of India,Maihar
3.	Structural Steel	TATA,SAIL,RINL,IISCO,ESSAR, ISPAT
4.	Pre- engineered building (PEB) firms	Kirby Building system India ltd ,Interach Building Product limited, Tata blue scope steel ,Lloyd Insulation India ltd, Everest Industries. Ltd. Modern Prefab System Pvt Ltd,Aster Building Solution Pvt.Ltd, Octamec Engineering Ltd,Jindal Mectec Pvt Ltd,Fedders Lioyd Corporation Ltd.
5.	Structural Steel Tubes ISI Marked	TATA, JINDAL , SURYA , SWASTIK
6.	(a) Zinalume colour coated steel sheet(COIL) (b) Profile of Sheet(as per tender specification)	(a)Tata Blue scope, Dongbu Steel ,Union Steel, JSW STEEL Ltd. Kirby Building system India ltd ,Interach Building Product limited, Tata blue scope steel ,Lloyd Insulation India ltd, Everest Industries. Ltd. Modern Prefab System Pvt Ltd,Aster Building Solution Pvt.Ltd, Octamec Engineering Ltd,Jindal Mectec Pvt Ltd,Fedders Lioyd Corporation Ltd
7.	Polycarbonate Sheet	Sabic Innovative Plastic , Everest
8.	Mineral wool for thermal insulation of ceilings (Under deck insulation)	Rock wool (india) Ltd. Minwool Rock Fibres Ltd., Lloyd Insulation,
9.	Rolling shutters(ISI marked)	Swastic, Hercules, Shubdwar, M/s Bharat Rolling Shutters Industries Agra, Bengal Rolling Shutter Rama Rolling Shutter Works, Gandhi Entrance Automations Private Limited
10.	Wind driven air Ventilators	Apurva Enterprises (Mumbai), SVS Wind Driven Turbo Ventilator(Ahmadnagar),Real Green Engineers Pvt.Ltd. Bangalore;Sun Green Ventilation system Pvt.Ltd. Mylapore-Chennai,Citadel

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 60 of 66
			REVISION : 0
			EDITION : 1


		Mumbai, Multi colour, Anchit Ispat Pvt Ltd. (Faridabad),
11.	Synthetic Enamel Paint (1st quality only)	ICI Paint (Dulux), Asian Paint (Apcolite), Berger Paints (Luxol). Goodlass Nerolac Paints (Nerolac), Jenson & Nicholson Paints Ltd (Borolac), Shalimar, Garware & Goodlass
12.	G.I SHEET	ESSAR,JSW,,SAIL
13.	Sheeting Screw	Corroshield, Buildex,
14.	Chemical for Antitermite treatment	DE- NOCIL Bombay, Pest Control of India, Trishul
15.	Factory made Panelled Door shutter	M/s Goel Brothers Raipur New Industrial Area Raipur (CG) M/s Hindustan Housing factory Ltd- New Delhi M/s Delhi Construction Eqpt Sadar Bazar Delhi M/s Joinery manufacturing Co Calcutta M/s Goyal Industries Faridabad M/s Surbhi Metal (India) Ltd Jodhpur M/s Jain wood Industries Sonipat/Rohini Delhi (HO) M/s Poineer Timber Products, Chandigarh
16.	Flush doors IS-2191, 2202	M/s Mysore Wood Products M/s Laxmi Doors, Faizabad Road, Chinhat, Lucknow M/s Merino flush doors M/s Poineer Timber Products, Chandigarh, M/S Goyal Industries Faridabad M/s National M/s Century Plyboards (i) Limited.
17.	Fly proof doors (Made out of solid block marine grade)	M/S Laxmi Doors, Faizabad Road, Chinhat, Lucknow, Northern doors Kanpur
18.	Natural Fibre Thermo Composite door/window shutter & frames, roofing sheets etc	Durosam
19.	PVC Panel Door (Solid Core)	Rajshri Plastiwood Limited, Sintex, Hindopan, Marino
20.	Pressed steel door frames/ cupboard and window frames (manufacturers)	M/s SAIL, M/s TATA
21.	Pressed steel door	M/s Loyal safe works Mayapuri, N/Delhi

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 61 of 66
			REVISION : 0
			EDITION : 1


	frames/ cupboard and window frames (fabricators)	M/s Multiwyn Industrial Corpn Calcutta M/s Metal Window Corpn N/Delhi M/s Chhabra Steel Udyog, 260 Sadar Bazar, Meerut Cantt M/s Delite safe works, Rani Jhansi Road, N/Delhi M/s Ishwar Industries, 175/A Bombay Bazar, Meerut Cantt M/s Chandni Industries, J-142, Patel Nagar 1st, Ghaziabad.
22.	Steel Windows, Ventilators(as per IS-1038 of 1983) & frames pressed steel door/window	M/S Multiwyn Industrial Corpn Calcutta M/S Metal Window Corp N/ Delhi Govind Enterprises, Delhi M/S Chhabra Steel Udyog 260, Sadar Bazar, Meerut Cantt, Agent steel MFG Pvt Ltd, Ahmedabad, Godrej, M/S Chandni Industries, J-142, Patel Nagar 1st, Ghaziabad
23.	Al Section for Al Door/ Window/ Partitions	Hindalco, Indal, Ajit India, Jindal
24.	Aluminuml Door/ Window/ Glazing Fabricated and Anodized	M/s Ahlcon M/s Alumilite Pvt Ltd, M/s Ajit India Pvt Ltd, M/s Ramniklal S Raste Agra, Argent Industries, M/s Aluminium Tech Industries, I-2249 DSIDC Narela, Delhi, M/s VR Associates, GH-14/242 Paschim Vihar, Delhi
25.	Aluminium door and windows Fittings	M/s Elite Enterprises C/6 Shalimar Hardware 133, Jarg Mahal, Dhobitalao Mumbai 400002. M/s Mohan Metal Industries 178/2-A, Bhole Nath Nagar, Shahadara, Delhi 110032. Mepro, Argent New Delhi, Classic, New Delhi. Jindal, Argent New Delhi, Golden Industries Pvt. Ltd. ECIE
26.	Automatic Glass Door	Ditec (Gandhi)
27.	Aluminium Grill	Alu Grill, Arihant Aluminium Corporation, Decogrille
28.	Door Closer	Everite, Golden, Gandhi
29.	Floor Spring	Prabhat, Everite
30.	Builders Hardware	M/s Golden Industries Pvt. Ltd., Everite, Solo, Hardwyn
31.	Plywood for general purpose (IS-303)	National Plywood Inds Pvt Ltd, S Fancy lane, 8th floor Calcutta-700001, Merino Plywood, Archid Ply, Kitply, Swastik, Universal

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 62 of 66
			REVISION : 0
			EDITION : 1


32.	Pre laminated Particle board	Kitply, Bhutan board, Ecoboard, Novapan, Archid ply, Merinova, Merino
33.	Laminated Sheets	Formica, Merino Lam, Greenlam, National
34.	Modular Partitions	Godrej, Blowplast
35.	False Ceiling (Mineral Fibre Board)	Armstrong, , Daiken, Luxalon, Llyods, Gypboard,Trac,Aerolite
36.	False Ceiling (POP/ Gypsum Board)	Gypboard, Anchor ceiling tiles, LA
37.	Aluminium False Ceiling	Lloyds,Armstrong,Luxlon,Trac
38.	Flooring Tiles (Mosaic / Terrazzo / PCC) (1st quality only)	M/S Mehtab Tiles, NITCO, Royal Tiles, Gem Tiles, Hindustan Tiles, M/S National Tiles & Industries, Ultra Tiles
39.	Glazed Ceramic Tiles, Non-Skid (Floor/Wall), (1st quality only)	Kajaria, Somany, NITCO. Murudeshwar Ceramic Ltd (Navin Diamond tile), Johnson (Marbonite), Marbito, Somany, Orient, Asian
40.	Vitrified/ Designer Vitrified Tiles (1st quality only)	Asian, Marbonite (Johnson), Kerrogres (Kajaria), NITCO, Orient
41.	PVC Tiles/Flooring (IS 3461) (1st quality only)	Marblex Tiles, Krishna Tiles, Polyfin, Armstrong, Wonder floor.
42.	False Flooring	Godrej or equivalent
43.	Glass Mosaic Tiles (1st quality only)	Paladio, Coral, Accura, Bisazza, Italia, Mridul.
44.	Designer Paver Tiles/ Interlocking tiles ISI marked/ Grass-jointed Tiles (1st quality only)	Pavit, Ultra, Hindustan, Eurocon, Vyara, National Tiles, Gem, Unistone, Konkrete, Unitile
45.	Glass reinforced Paver block	Unistone or equivalent
46.	Wall care Putty for Base preparation (1st quality only)	Birla Wall care putty, Berger, Jenson & Nicholson, JK White
47.	White Cement (1st quality only)	Birla, JK
48.	Cement based Paints (1st quality only)	Super Snowcem, Duracem, Super Acrocem.
49.	Dry Distemper / Oil bound Distemper	Goodlass Nerolac Paint, Shalimar Paint, Jenson & Nicholson, Asian Paint, Berger. ICI Dulux

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 63 of 66
			REVISION : 0
			EDITION : 1

	(1st quality only)	
50.	Acrylic Washable Distemper (1st quality only)	Asian, Berger, ICI Dulux, Jenson & Nicholson, Nerolac, Shalimar, Garware & Goodlass
51.	Plastic Emulsion Paint (1st quality only)	Asian, Berger, ICI, Nerolac, Jenson & Nicholson, Shalimar, Garware & Goodlass
52.	Exterior Acrylic Emulsion (1st quality only)	ICI (Weathercoat), Excel (Nerolac), Apex (Asian), Berger, Jenson & Nicholson, Shalimar, Garware & Goodlass
53.	Polymer based Paint	STP, CICO
54.	Textured Paint / Wall Tile (1st quality only)	Unitile, Heritage, Spectrum, Iokos, Acropaints, Asian
55.	Flexible board for Expansion joint	STP or equivalent
56.	Grout	Shrinkomp, Fosroc, Fairmate
57.	Integral water proofing compound	STP, Pidilite, Fosroc, CICO, Sika.
58.	Concrete Admixture	Pidilite, Fosroc, CICO, Sika.
59.	Water proofing for cementitious surface IS-2645	Acrocrete & Acrocote, CICO, Fosroc, STP
60.	Bituminous Product	M/s Faridabad Spinning & Woolen Mills Pvt Ltd, 837, SP Mukherjee Marg Delhi, M/s STP Ltd (Formerly Shalimar Tar Products) M/s Bitufelt Pvt Ltd 123/377 Fazalm Ganj Kanpur 208012, Texas, Texas India Ltd, Multiplas, IWL Chennai
61.	Hardeners	Ironite, Ferrok, Hardonate
62.	Construction Chemicals	Choksey, CICO, Fosroc, Sika
63.	Non Metallic Surface Hardners	CICO, Fosroc, STP, Sika
64.	Corrugated, Semi Corrugated & AC Sheets (IS-459-1970, IS-2098)	M/s Everest Bldg Products Ltd Jata Sankar Bosa Marg Muland (west) Bombay 400080, M/s Ramco AC Sheets "SWASTIK", M/s Eternit Everest Ltd, UP Asbestos Ltd
65.	GI Sheet ISI Marked	Multicolor, TATA, Bluescope, JSW, Colour Plus, Interarch, Lloyds, Jindal, Everest
66.	Sheet Glass /Structural Glazing	Hindustan Pilkington Glass Works, Saint Gobain, Modi Float, Triveni Float Glass, ASI, Fresca, Emirates.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		 बी एण्ड आर B AND R <i>Building Nation Since 1920</i>
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 64 of 66
			REVISION : 0
			EDITION : 1

67.	Multiell / Multiwall Polycarbonate Panel	M/s Coxwell Domes Engineering , Delhi, M/s Lexan , M/s Gallina India Pvt. Ltd. M/s Vijaynath Interiors & exteriors products
68.	Stainless Steel Cladding	Jindal
69.	Punch Tape Concertina Coil	Global Technocrat, S.G.Engineers Delhi
70.	Punch Tape In Plastic Spool	Global Technocrat, S.G.Engineers Delhi
71.	Stainless Steel Railing	Jindal
72.	FRP/ HDPE Garbage Bins	Sintex, Swift, Nutech, Sheetal
73.	Thermoplastic Road Marking Paint	Shalimark (STP)
74.	Bollard	STP
75.	Cateye	TATA, STP
76.	Readymade Speed Breaker	STP
77.	Fountain	Ripples, Green Evolutions, Agritech Services, Premier
78.	Multi-Vent	Multicolor
79.	Sanitary ware	Neycer Kermag (standard), Hindustan Sanitary Ware (1st quality), Parryware (superfine), Cera (1st quality), Classica (1st / standard)
80.	WC seat cover ISI Marked	Parryware, Neycer Kermag (standard), Hindustan Sanitary Ware (1st quality), Cera (1st quality), Classica (1st / standard)
81.	PVC Flushing Cistern IS: 774-1984 (ISI Certified)	Parryware, Hindustan Sanitary Wares, Cera.
82.	Faucets & Taps, Stop Valves & Pillar Taps, Surgical basin mixer, Shower rose etc.	Gem, Parko, Parryware, HSW, Jaquar, Orient
83.	Kitchen Stainless Steel Sink	Diamond, Nirali, Neel Kanth, Jayna
84.	Looking Mirror	Saint Gobain, Modi Float, Triveni Float Glass, Crown, Atul, Ashai
85.	Ready made Bathroom Cabinets	Commander Gratings (I) Pvt Ltd, Gratolite Cabinet, A-4 Sector Viii Noida-202701, Alpina, Cera.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 65 of 66
			REVISION : 0
			EDITION : 1

86.	Float Valve	Leader, Bombay Metal & Alloy Co, Bombay superflow.
87.	SGSW Pipes (IS-651) ISI Marked	Perfect Agra, Devraj Ind Gaziabad, Buran, RK, Prince, ,Supreme pipe and Fittings.
88.	CI (Centrifugally Cast) Pipes for sewage disposal ISI marked	NICCO, SRIF, A-1 Singhal Casting Co Agra, Jindal Saw, Kesoram, NECO
89.	PVC rain water/sewage pipes (IS-4985)	Reliance, Finolex, Supreme, Kisan, Prince,Hindustan Plastic & machine corporation,Polypack industries (P) Ltd.
90.	HDPE Water storage tanks (Rotational Moulded)	Sintex, Swift, Nutech, Sheetal
91.	Cast Iron Pipes and Fittings	Hindustan Engineering Products Company Calcutta, S..L.C., Standard approved manufacturers of any other brand of fittings having ISI marking,RIF,BIS
92.	RCC Pipes	Indian Hume Pipe Company, Delhi / Allahabad / Chandigarh / Lucknow; Hindustan Pressure Pipes, Kolhapur; Dhere Concrete Products, Pune or any other approved manufacturer conforming B.I.S. Standard
93.	Brass Fittings	Leader Engineering Works, Jalandhar; L & K Mathura; Luster Sanitary, Jalandhar; Annapurna Metal Works, Calcutta; Neta Metal Works, Jalandhar; Honey Industrial Corporation, Bombay.
94.	C.P. Fittings	Ego Metal Works, Ballabgharh; Jaquar Industries, Delhi; Soma Plumbing Fixtures Limited, Calcutta; Gem Sanitary Appliances Pvt. Ltd.,Delhi; Essco Sanitations, Delhi; Bilmet, Bombay.
95.	Stone Ware (Salt-Glazed) Pipes	Hind Ceramics Limited, Orissa; Ceramic Industries Limited, Sambalpur; Shrikamakshi Agencies, Madras; Binary Udyog Pvt. Limited, Howrah; Tirumati Moulds Limited, Nagpur; Kiran Potteries, Hyderabad; Perfect Sanitary Pipes, Bharatpur.
96.	Asbestos Cement Pipes and Fittings	Ganga Asbestos Limited, U.P.; Hyderabad Asbestos Cement Products Limited; J.K. Super Pipe Industries, Nanded; Konark Cement and Asbestos Limited, Orissa; Maharashtra Asbestos Limited, Bombay; Poddar Industrial Corporation, Patna; Sarbamangala Mfg. Company, Calcutta
97.	HDPE pipes and fittings	ORI-PLAST,HASTI

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 66 of 66
			REVISION : 0
			EDITION : 1


23.0 MATERIALS NOT SPECIFIED

Any materials not fully specified in these specification and which may be offered for use in the works shall be subject to approval of Engineer, without which it shall not be used anywhere in the construction works.



SPECIFICATION FOR CIVIL WORKS

PART – II WORKMANSHIP

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 1 of 9
			REVISION : 0
			EDITION : 1


C O N T E N T S

1.0 GENERAL

- 1.1 Standard
- 1.2 Supervision
- 1.3 Temporary Works
- 1.4 Codes
- 1.5 Base Lines and Bench Marks
- 1.6 Setting Out
- 1.7 Dewatering
- 1.8 Safety of Existing Work
- 1.9 Protection of Existing Services
- 1.10 Handing Over of Work Site

2.0 EARTH WORK

- 2.1 Scope
- 2.2 General
- 2.3 Setting Out
- 2.4 Site Clearance and demolition
- 2.5 Classification of Soil
- 2.6 Method of Excavation
- 2.7 Excavation of Soils Other than Hard Rock
- 2.8 Excavation in Hard Rock
- 2.9 Cutting and Filling for Site Levelling

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 2 of 9
			REVISION : 0
			EDITION : 1


- 2.10 Excavation for Trenches
- 2.11 Excavations for Foundations
- 2.12 Excess Excavation
- 2.13 Disposal of Excavated materials
- 2.14 Backfilling of Trenches
- 2.15 Backfilling of Foundations
- 2.16 Filling Under Floors
- 2.17 Load Bearing Fills
- 2.18 Turfing

3.0 ANTI-TERMITE TREATMENT


- 3.1 Scope
- 3.2 Execution
- 3.3 Acceptance Criteria

4.0 CONCRETE (PLAIN & REINFORCED)

- 4.1 Scope
- 4.2 Materials
- 4.3 Grades of Concrete
- 4.4 Mix Design
- 4.5 Water/Cement Ratio
- 4.6 Workability
- 4.7 Durability
- 4.8 Trial Mixes

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 3 of 9
			REVISION : 0
			EDITION : 1

- 4.9 Nominal Mix Concrete
- 4.10 Volumetric Mix concrete
- 4.11 Batching of Concrete
- 4.12 Water
- 4.13 Mixing and Transportation of Concrete
- 4.14 Preparatory Works/Surface Preparation
- 4.15 Placing and Compaction of Concrete
- 4.16 Construction Joint & Cold Joints
- 4.17 Requirements for Concreting in Special cases
- 4.18 Finishes to Exposed Surfaces of Concrete
- 4.19 Curing of Concrete
- 4.20 Testing of Concrete
- 4.21 Steel Reinforcement
- 4.22 Shuttering
- 4.23 Damp Proof Course Concrete
- 4.24 Grout
- 4.25 Concreting in Water Retaining Structures
- 4.26 Application of Live Load
- 4.27 Foam Concrete
- 5.0 MASONRY**
- 5.1 General

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 4 of 9
			REVISION : 0
			EDITION : 1

5.2 Materials

5.3 Selection of Mortars

5.4 Cement Mortar

5.5 Brick work

5.6 Stone masonry

5.7 Hollow Concrete Block Masonary

6.0 PLASTERING AND POINTING

6.1 Materials

6.2 Plastering

6.3 Cement Pointing

6.4 Rough Cast Concrete Facing

6.5 Punning with Lime or Plaster of Paris

7.0 FLOORING, PAVING & FACING

7.1 Scope

7.2 Materials

7.3 General


7.4 Sub-base

7.5 Subgrade

7.6 Cement Concrete Flooring with Integral Finish

7.7 Concrete Flooring with Granolithic Finish (Artificial Stone Flooring)

7.8 Dado & skirting Work (Grey Cement Skirting / Dado)

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 5 of 9
			REVISION : 0
			EDITION : 1

7.9 Flooring & Facing with Redoxide of Iron (Red Artificial Stone Flooring)

7.10 Terrazzo Flooring & Facing

7.11 Glazed Tile Finished Flooring & Facing

7.12 Marble Flooring

7.13 Marble in Facia or Dado

7.14 Flooring/Paving with Hardener like Ironite.

7.15 Chemical resistant tile flooring/facing

7.16 Chemical resistant In-Situ Finished Flooring / Facing

7.17 Acceptance Criteria

8.0 WOOD WORK

8.1 General

8.2 Joinery

8.3 Shrinkage & Tolerance

8.4 Fixing

8.5 Tarring

8.6 Fittings


8.7 Doors

8.8 Panelled Shutters

8.9 Glazed Shutters

8.10 Flush Door Shutters

8.11 Other type of shutters

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 6 of 9
			REVISION : 0
			EDITION : 1

8.12 Inspection

9.0 METAL DOORS, WINDOWS AND ROLLING SHUTTERS


- 9.1 General
- 9.2 Fixing
- 9.3 Fittings
- 9.4 Normal Steel Plate Doors
- 9.5 Pressed Steel Doors
- 9.6 Steel Windows, Sashes, Ventilators, etc.,
- 9.7 Collapsible Gate (Steel)
- 9.8 Steel Rolling Shutters and Grills
- 9.9 Guarantee
- 9.10 Aluminium Doors. Windows, Frames

10.0 GLAZING

- 10.1 General
- 10.2 Doors, Windows and Ventilators.
- 10.3 Northlight Glazing

11.0 WHITE WASHING, COLOUR WASHING & PAINTING

- 11.1 Scope
- 11.2 Materials
- 11.3 White Washing, Colour Washing
- 11.4 Cement Primer Coat
- 11.5 Water Proof Cement Paint

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 7 of 9
			REVISION : 0
			EDITION : 1

11.6 Oil Bound distemper

11.7 Dry Distemper

11.8 Plastic Emulsion Paint

11.9 Bitumen Painting

11.10 Tarring

11.11 Painting to Timber & Steel Surface

12.0 INTERNAL WATER SUPPLY, PLUMBING, DRAINAGE AND SANITATION

12.1 Scope of work

12.2 Water Supply & Plumbing

12.3 Drainage and Sanitation (Internal)

13.0 EXTERNAL SEWERAGE & DRAINAGE

13.1 Scope of work

13.2 Materials

13.3 Excavation of trenches and pits

13.4 Cast Iron pipes

13.5 Stone ware glazed pipelines (S.W.G)


13.6 Man holes

13.7 Marker plates


14.0 ROAD WORK

14.1 General


14.2 Trenching and Preparation of Subgrade

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 8 of 9
			REVISION : 0
			EDITION : 1

14.3	Ash Carpet
14.4	Boulder Soling
14.5	Kerbs
14.6	Water Bound Macadam Surfacing
14.7	Preparation of Base and Shoulders
14.8	Spreading Coarse Aggregates
14.9	Rolling
14.10	Application of Screenings
14.11	Sprinkling and Grouting
14.12	Application of Binding Material
14.13	Setting and Drying
14.14	Surface Evenness
14.15	Bituminous Pavements
14.16	Berms
14.17	Kerbs
14.18	Bridges and Culverts
14.19	Boulder Pitching
14.20	Scarifying & Dismantling
14.21	Diversions
15.0	WATERPROOFING TO ROOFS & BASEMENTS & WATER PROOFING PAINTS
15.1	Scope

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 9 of 9
			REVISION : 0
			EDITION : 1

- 15.2 Material
- 15.3 General Workmanship
- 15.4 Painting with Hot Bitumen
- 15.5 Painting with Bitumen Emulsion
- 15.6 Waterproofing of Roof
- 15.7 Waterproofing for Basement
- 15.8 Surface Application
- 15.9 Guarantee
- 15.10 Waterproofing course with fibre glass R.P. tissue.
- 15.11 Waterproofing course with PVC sheets/membrane
- 15.12 Waterproofing with Non-shrink polymeric waterproof grouting compound.
- 16.0 MISCELLANEOUS
- 16.1 False Ceiling
- 16.2 Wall Panelling & Wooden Partition
- 16.3 Expansion and Isolation Joints
- 16.4 Barbed Wire Fencing
- 16.5 Concertina Coil Fencing

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 1 of 180
			REVISION : 0
			EDITION : 1

1.0 GENERAL

1.1 Standard

A high standard of workmanship in all trades will be required. The Contractor shall ensure that only skilled and experienced workmen are employed.

1.2 Supervision

The Contractor's supervising staff shall be fully qualified and experienced in the types of work being carried out under their supervision and shall be capable of ensuring that work is executed efficiently and as per specification.

1.3 Temporary works

Where required, the Contractor shall furnish such details of his temporary works as may be called for by the Engineer and the Contractor shall satisfy the Engineer as to their safety and efficiency. The Engineer may direct that temporary works, which he considers unsafe or insufficient, shall be removed and replaced in a satisfactory manner.

1.4.0 Codes


1.4.1

The years of publication against various standards, referred in this specification, correspond to the latest standards as on date of preparation of this specification. During use of this specification in future, the latest publication as on date shall be referred to. Where standards are not yet published by the BIS or IRC, adoptable British Standards or other International Standards shall apply.

In case of any conflict in meaning between these specifications and those of BIS or IRC, or British/International Standards, the provisions of these specifications shall prevail.

1.5 Base lines and bench marks

The Contractor shall establish and maintain, to the satisfaction of Engineer, the base lines and bench marks, based on which the works are set out. Where such base lines and bench marks are provided by

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 2 of 180
			REVISION : 0
			EDITION : 1

the Engineer, the Contractor shall maintain these throughout the period of construction without causing any disturbance to them.

1.6 Setting out

The Contractor shall set out all the works to be executed by him, in line with the standard base lines, levels, position and bench marks and truly as per drawings within the accepted tolerance limits at no extra cost to Owner. The Contractor shall be solely responsible for the setting out of all the works, to be executed by him and the approval of such setting out by the Engineer shall in no way absolve the Contractor his responsibility for carrying the work to the true lines, levels and positions as per drawings.

1.7 Dewatering

The Contractor shall carry out all the works, in dry and workable condition and maintain the same in dry condition till the final handing over of works at no extra cost to the Owner. For this the Contractor shall make all the necessary provisions of dewatering, wherever necessary, to the entire satisfaction of the Engineer.

1.8 Safety of existing work


Before taking up any construction adjoining other property or existing work, the Contractor shall take all steps necessary for the safety and protection of such property or work at no extra cost to the owner.

1.9 Protection of existing services

The Contractor shall take all precautions necessary to prevent damage to or interference with underground or overground services such as cables, drains, piping or piles, whether shown on drawings or not. Equipment etc., mounted in position shall be protected against falling debris etc., by means of tarpaulin or such other material at no extra cost to the owner.

1.10 Handing over of work site

On completion of work, the Contractor shall remove all rubbish, debris, surplus materials, temporary work etc., from the site. The site shall be

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 3 of 180
			REVISION : 0
			EDITION : 1

handed over in a tidy and workmanlike manner at no extra cost to the owner.

2.0 EARTH WORK

2.1 Scope

This chapter deals with earth work and excavation for civil works in site, formation/oversite leveling, foundations, cutting and grading for roads/pavement and railways, canals, embankments other than water retaining embankments trenching for drainage and other buried services and the like.

2.2 General


The Contractor shall carry out the excavation strictly to the lines and levels, in conformity with the drawings or instructions of the Engineer.

2.3 Setting out

Before commencement of earthwork block levels of existing ground shall be taken by the Contractor jointly with the Engineer, plotted and signed in token of acceptance of ground levels. Excavation shall not be commenced until the initial ground levels have been recorded and accepted. Reference lines, bench marks and base lines shall be set out by the Contractor for control of earthwork operation. Setting out shall be done with pegs, blocks, bamboo poles or rails, marking boundaries or centre lines, as the case may be, and the same maintained for reference and future checking. Chainage stones at regular intervals shall be set up for embankments. All setting out operations shall be got checked and approved by Engineer. However, such checking and approval by the Engineer shall in no way absolve the Contractor of his responsibilities for carrying out the work to the true lines, levels and positions as per drawing, and in case any error is noticed at any stage in the contractor's work, it shall be corrected/rectified by him without any cost to the Owner.

2.4 Site clearance and demolition

The site shall be cleared of all trees, stumps, roots, brush wood, bushes and other objectionable materials. Useful and saleable material, if any, shall be the property of the owner and shall be stacked properly as directed by the Engineer. The areas to be covered with

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 4 of 180
			REVISION : 0
			EDITION : 1

embankments shall be stripped of top soil to required depths to expose acceptable founding strata. Top soil unsuitable for use in embankment construction and other fills shall be disposed off as directed. All combustible materials shall be stacked and burnt in locations sufficiently remote to eliminate all danger of fire hazards. All old concrete, brick works and drains which interfere with construction works shall be dismantled with the approval of the Engineer taking all necessary precautions prescribed in safety specification. Top soil which is suitable for use in construction work shall be stockpiled for later use. Other objectionable materials such as trash, debris, stones, brick, broken concrete, scrap metal etc., shall be disposed off as directed by the Engineer. Payment for cutting and removal of trees, stumps, dismantling existing structures and stripping shall be regulated by the description in the Schedule of Items or Part V of these specifications.

2.5 Classification of soil

The Engineer will decide the class of any particular soil. Classification of soil shall be as under and the decision of the Engineer shall be binding on the Contractor :


A) Ordinary Soil

Soils which yield to ordinary application of pick and shovel, phawra rake or other ordinary digging implements (including earth moving equipment such as bulldozer, shovels without resorting to blasting) without offering much resistance, shall be classified as ordinary soil. This includes organic soil, turf, sand, gravel, loam clay, mud, peat, black cotton soil, soft shale and loose moorum etc.

B) Hard Soil

This comprises of all soils that cannot reasonably be excavated by the above mentioned digging implements, but can be excavated with close application of pick axe or scarifiers or jumpers to loosen. This includes compact moorum, stiff clay, hard shale, cobble stone etc.,

C) Soft /Decomposed Rock

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 5 of 180
			REVISION : 0
			EDITION : 1

This comprises of rock or boulders which may be quarried or split with crow bars, pavement breakers etc., This include lime stone, sand stone, weathered rocks and hard conglomerates etc .and existing structures embedded in earth and tarred macadam roads, pavements, met in the excavation. The fact that contractor resorts to blasting for his own reasons shall not mean that the rock is hard and classified as hard rock.

D) Hard Rock


This comprises of rocks which require blasting for excavation. Where blasting is prohibited, excavation has to be carried out by chiseling, wedging or any other agreed methods.

2.6 Method of excavation

The Contractor may carry out excavations, filling and compaction by any method considered most suitable, and befitting the site conditions subject to any stipulations contained in the contract and the specifications. All excavations shall be required to be kept completely free from water, from whatever source it may come, during the construction. No foundation work shall be taken up until the surfaces are properly drained.

2.7 Excavation of soils other than hard rock

Excavation shall be carried out in the most expeditious and efficient manner to the lines and levels as indicated in drawings or as directed by Engineer. Prior approval of the Engineer shall be taken for the method to be adopted for excavation including dimensions, side slopes, dewatering, shoring etc., Such approval shall not make the Engineer responsible for any consequent damage or loss caused. All precautions shall be taken to preserve the material below and beyond line of excavation in soundest condition. All damages done beyond limits of excavation shall be made good by the Contractor at his own cost in a manner approved by the Engineer. All excavated materials shall be removed to spoil heaps, dumping yards or transported for filling as may be necessary. When soil heaps are formed for future use, heaps shall be protected from washing away due to rain or surface run off. The sides of excavation shall be maintained in stable condition by adequate stepping and batter. To prevent entry of surface water and accumulation of subsoil water in excavated areas, suitable drainage arrangements as may be needed and directed by Engineer,

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 6 of 180
			REVISION : 0
			EDITION : 1

shall be provided and maintained. Pumped out water shall be drained off properly avoiding damage to other existing works. If any pipelines, cables or service lines are likely to be exposed, excavation around these services shall be carried out manually and all such services shall be adequately supported and protected at no extra cost.


Excavation shall be carried out in any material encountered including road surfaces, pavements, buried parts of old foundations, pits or other structures. Excavated materials shall be placed beyond 1.5 metres of the edge of the excavation pit/trench or half the depth of the pit/trench whichever is more or further away as directed by the Engineer. Sumps made for dewatering must be kept clear of the foundations.

In firm soil the sides of the trenches shall be kept vertical upto a depth of 2.0m from the bottom and for a greater depth, trench shall be widened by allowing steps of 50cm on either side after every 2.0m depth from the bottom, so as to give a vertical side slope of 1/4 : 1. Where the soil is soft, loose or slushy, the width of the steps shall be suitably increased or sides suitably sloped or suitable shoring and strutting provided as directed by the Engineer. For trenches deeper than 2.0m, the Contractor shall obtain detailed instruction from the Engineer in writing regarding the stepping, sloping of sides or shoring and strutting to be done. For these bye-works, no extra cost will be paid to the Contractor.

2.8 Excavation in hard rock

Where hard rock is met and blasting is considered necessary for its excavation, the Contractor shall intimate the Engineer in writing. Excavation in hard rock shall be done either by blasting or chiseling or by such other agreed methods as may be required. Levels of hard rock surface shall be taken and got approved by Engineer before start of excavation. Blasting shall be permitted only when proper precautions are taken for protection of persons, works and property. The Contractor shall obtain the necessary licence for procuring, storing and using explosives.

Blasting operations shall be carried out by a licensed Blaster. The quality and quantity of explosives, size and spacing of holes depth of holes etc., shall be such that they will neither open seams nor damage or shatter the rock beyond the specified lines of excavation. A tolerance of 150 mm will however be allowed beyond the excavation

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 7 of 180
			REVISION : 0
			EDITION : 1

lines. As excavation approaches final stages, the depth of holes and the amount of explosives used shall be reduced progressively to avoid over breakage or damage to founding strata. Any fissures, cracks and voids below prescribed depth of excavation shall be corrected by removing loose pieces, shattered or affected rock and replaced by lean concrete of M-5 grade or (1:5:10) cement concrete in the case of foundations. Where excavated surface is to receive structural concrete, the surface shall be cleaned of dust and other objectionable materials.


In cases where blasting, though otherwise required, is prohibited because of any reason, the excavation shall be carried out by chiseling, wedging or such other agreed methods. All materials excavated from blasting, chiseling or any such methods shall be stacked for measurement as directed by Engineer.

2.9 Cutting and filling for site leveling

Excavation and filling operations for site leveling shall be so planned and executed, that transportation and re-handling are minimised. The sides of excavation and fills shall be maintained in stable condition by adequate batters, stepping and dewatering. Materials not desirable shall be disposed off in area indicated by Engineer. When it is required to blend the material, it shall be done by selective excavation and filling operation. Wells, ponds, cesspools and water logged areas shall be emptied of water and deslushed before filling. Filling shall be done in horizontal layers not exceeding 300mm in thickness as specified or as directed by the Engineer. All clods shall be broken before placing the fill. Earth moving equipment shall be allowed to ply over the fill to permit compaction. Adequate allowance shall be made for subsidence of fill material. Levels shall be taken and excess or shortfall shall be made good by appropriate cutting or filling.

2.10 Excavation for trenches

Excavation for trenches shall be carried out in materials encountered to enable laying of service lines or drainage channels or any other desired purpose. Excavation shall be done to lines and levels shown in drawings and shall be done providing adequate measures for stability. Vertical wooden sleepers or light rails shall be erected at uniform levels at places where changes of direction and gradients occur. Centre lines shall be marked on horizontal sleepers or rails, laid across the trenches. Depths of excavation and pipe invert levels shall be checked

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 8 of 180
			REVISION : 0
			EDITION : 1


by means of boning rods of appropriate lengths. Trench beds shall be trimmed and rammed with sprinkling of sand or moorum to required gradients for continuously supporting the pipelines. Trenches shall be locally deepened and widened to receive sockets and permit joints to be inspected.

Timbering

In case of trenches, tunnels, channels, drains, manholes, chambers, basement and other places where the soil is not capable of being retained without the support, timbering as directed by the Engineer shall be resorted to. It shall be the responsibility of the Contractor to take all the necessary steps to prevent the sides from collapsing.

2.11 Excavations for foundations

Excavation for foundation shall be done to the lines and levels indicated in the drawings. Excavated material shall be transported and stored at convenient spots for reuse in back filling of foundations and other fills. Surplus material shall be transported, spread and levelled at dumping areas. Side slopes of excavation and/or shoring shall be adequate from consideration of stability and working space. When so required and authorised by Engineer, the sides of excavation shall be protected with proper shoring, strutting, sheeting and sand bags etc., These shall be removed only when work in the pit is completed, with the approval of the Engineer. When it is felt that removal of supports may result in side collapse or settlement of adjoining ground or endanger adjoining structures and foundations, they shall be left permanently in position. The last 150 mm of excavation shall be done and the bottom trimmed to the required levels only when concreting is imminent. If at any point the natural ground is disturbed or loosened for any reason, it shall be consolidated by tamping or rolling or made up with concrete of M-5 grade, or (1:5:10) cement concrete if so ordered by the Engineer at no extra cost. Where the soil encountered at depths indicated in drawings is loose or weak, it shall be further excavated to levels of firm strata as may be directed by the Engineer and filled with lean concrete of M-5 grade/(1:5:10) cement concrete or sand as directed. If the bottom of excavation has been left exposed not through neglect or fault of the Contractor and it has become deleteriously affected by atmospheric action and water, such portion of deteriorated foundation material shall be removed and made good by lean concrete of grade M-5/(1:5:10) cement concrete or sand as directed and such extras will be paid for.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 9 of 180
			REVISION : 0
			EDITION : 1

2.11.1 For deep excavation in the proximity of existing buildings, foundations, streets, railway tracks, underground cabling, gas piping, water and drainage lines, and the like, adequate appropriate precautions shall be taken to protect such structures or works from damage, displacement or settlement, either as an immediate result of the excavation or as after effect, discernible with the passage of time. The method of protection of existing structures and services may include sheet piling, shoring, strutting slinging or any other method including dewatering. Payment for such protective work shall be governed by the description given in the Schedule of Items for the particular work.

2.11.2 For excavation adjoining existing piles care shall be taken to ensure that no pile under any circumstances is exposed from the top for a height exceeding 2 metres. No strutting shall be done against exposed piles, nor exposed piles ever used for tying guy ropes or supports either temporarily or permanently.


2.12 Excess excavation

All excavation done beyond the specified limits or directions of Engineer shall be considered as excess excavation. They shall be made good as prescribed below by the Contractor at his cost:

- i) Excess excavation in case of site leveling shall be made good by filling and compacting with material same as the surrounding material. Degree of compaction shall be at least the same as the surrounding material.
- ii) Excess excavation in case of trenches shall be made good by filling and compacting with selected earth to the same compaction as the surrounding material or as directed by Engineer. This shall be done in layers not exceeding 150 mm thick, moistened and thoroughly compacted by tamping.
- iii) Excess excavation in case of foundation beyond required depths shall be made good by filling with lean concrete of M-5 grade/(1:5:10) cement concrete.

2.13 Disposal of excavated materials

Excavated materials that are unsuitable for use in construction works or in excess of construction requirements shall be disposed off in

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 10 of 180
			REVISION : 0
			EDITION : 1

dumping yards or in locations indicated by Engineer. Waste piles/heaps shall be located in such places where they will not interfere with natural flow of rain water access or transport or with the access to nearby structures. When required, they shall be levelled and trimmed to such lines and levels as indicated by Engineer.

2.14 Back filling of trenches


Trenches shall be backfilled after pipes or service lines are tested and approved. Filling shall be done with earth in 150 mm thick layers free from unwanted material and well rammed. Soft material shall be used in bottom of trenches upto a level of 150 mm above the top of pipes before backfilling with other fill materials. All clods and lumps shall be broken before placement. Care shall be taken not to disturb, break or damage the pipes during backfilling and compaction process.

2.15 Backfilling of foundations

Backfilling of foundations shall be done using suitable soils from excavations. Soil shall be free from organic matter and other materials which would affect the stability of the fill and shall be free from boulders, brick bats wood pieces and other injurious materials, lumps and clods. Before commencement of backfilling of foundations. all shoring and formwork, bits of timber, cement bags and all other rubbish shall be removed. Hydro-insulation, Bitumen painting or application of anti-corrosive protective and anti-termite treatments shall have been completed. Backfilling operation shall not commence without approval of Engineer. Backfilling shall be carried out in well compacted layers of 150 mm thickness. Each layers shall have near optimum moisture content. Layers will extend to the entire width of excavation and shall be sprinkled with water during compaction process. Ramming shall be done to achieve firm compaction. Backfill shall be trimmed and finished to lines and levels indicated in the drawings and/or as directed by the Engineer. Mechanical equipment like vibratory roller, vibro earth rammer or vibratory compactor shall be used for compaction.

2.16 Filling under floors

Material for filling under floors shall be soil free from harmful minerals, vegetable matter etc., and shall not be expansive soils. Filling shall be done in well compacted layers not exceeding 150 mm in thickness. Each layer shall be compacted to 95% Standard Procter Density. Sufficient soaking shall be done before compaction. The entire area to

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 11 of 180
			REVISION : 0
			EDITION : 1


be covered by flooring shall be finally dressed and trimmed to required levels. Mechanical equipment like vibratory roller, vibro earth rammer or vibratory compactor shall be used for compaction.

2.17 Load bearing fills

Load bearing fills include embankments for roads and railways and such other earth fills above ground levels provided for protection of fuel oil tanks, pads for storage tanks, drain, bunds and the like. Fill materials shall either be selected earth obtained from excavations for site leveling, trenches and foundations or from selected borrow areas as may be required. Soils selected for filling in embankments shall be of uniform quality and free from boulders, organic materials and other objectionable matter. Soils having high silt and clay content and having laboratory maximum dry density less than 1.44 gms per c.c. shall not be used for load bearing fills. For fills greater than 3 m in height soils shall have laboratory density not less than 1.52 gms per c.c. Soils for top 500 mm of fills for roads and railways shall have laboratory density not less than 1.65 gms per c.c. and shall not have marked swelling and shrinkage properties.

Foundation preparation for embankments shall be done as prescribed under site clearance. The founding strata shall be compacted as much as possible by rolling or tamping before placement of fill material. The water content of founding strata should be same as that specified for embankment fill. Any pockets of loose material or depressions left in founding strata as a result of clearing operation shall be filled and compacted with the same material as the surrounding founding strata. When an embankment is to be placed on steep sloping ground the surface of the ground shall be trenched in steps or trenched or broken up in such a manner that the new materials bonds well with the founding strata.

Fill material shall not be placed until foundation has been inspected and approved by Engineer. Material shall be placed in even, continuous, horizontal layers over full width of embankment in well compacted layers not exceeding 200 mm thickness. Each layer shall be compacted by means of smooth rubber tyred rollers, sheep-foot rollers, tractors, tampers or other mechanical means as may be found suitable for the location. Before rolling, the water content shall be checked and corrected by sprinkling with water or adding dry material or aeration as may be required. This shall be followed by mixing and the layer left for soaking before compaction. The water content shall

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 12 of 180
			REVISION : 0
			EDITION : 1


be within plus or minus 2% of Standard Proctor Optimum. Density of compacted layers shall be determined by sand replacement method. Average compacted density shall be at least 95% of Standard Proctor Density. The number of tests to be conducted for determination of moisture content and density shall be as prescribed by the Engineer. Side slopes of embankments shall be formed along with the main embankment. No side dumping shall be done for the formation of slopes. When required the width of each layer shall be constructed slightly in excess of required width and slopes trimmed to remove loose edge materials and completed to lines shown in drawings or as directed by the Engineer. Subgrades for road works shall be thoroughly wetted sufficiently in advance of placing of any base course and it shall be ensured that it is firm and moist for at least 50 mm below the surface. Should the subgrade for any reason be loose or have density less than required, it shall be recompacted and refinished. Excessive loss of moisture in the subgrade shall be prevented by sprinkling and/or scaling. No traffic or hauling equipment shall be permitted to ply on finished subgrade and any damage caused to such portion shall be made good by the Contractor at his own cost.

2.18

Turfing

The slopes of embankment shall be dressed to line and slightly roughened to bond and hold a surface dressing consisting of 150 mm humus layer of soil. The entire surface shall then be covered with turf consisting of blocks or strips of grass of approved species. The sod shall include a net of roots and earth at least 75 mm thick. The sod shall be laid on slope in close contact and then tamped in place so as to close and fill the joints between blocks.

Immediately after placing the turf, slope shall be thoroughly wetted and kept wet for a sufficient period to assure plant growth. Watering shall be continued until the grass takes root firmly and the whole area presents a uniform appearance. In the event that the plant growth has not taken place within the period of maintenance such areas or patches shall be redone by the Contractor at his own cost.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 13 of 180
			REVISION : 0
			EDITION : 1

3.0 ANTI-TERMITE TREATMENT

3.1 Scope

The scope of work includes setting up a chemical barrier against attack by subterranean termites while the building is under construction.

3.2 Execution

3.2.1 General

Unless otherwise specified all work shall in general be executed as specified in IS : 6313 Part-II -1981 and as per approved specification of the agency having special know-how for the job.

All necessary work to ensure uniform distribution and proper penetration of treating solution shall be done according to the instruction of the Engineer.


Soil treatment shall not be done when it is raining or when the soil is wet with rain or subsoil water. Once formed, the treated soil barrier shall not be disturbed.

3.2.2 Chemicals and rate of application

Chemical like chlorpyrifos 20% EC (Conforming to IS 8963 - 1978) in 1% emulsion shall be applied by pressure pumps, uniformly over the area treated. (1 part chemicals + 20 parts water = 1% emulsion).

3.2.2.1 Treatment of pits, trenches & basement excavations

Foundations, basements etc. may either be fully enveloped by the chemical barrier or the treatment may start 500 mm below ground level. The bottom surface and sides of excavation (upto a height of about 300mm) for column pits, walls, trenches and basements shall be treated with emulsion @ 5 liters per sq.m. of surface area. Backfills around columns, walls, etc., shall be treated @ 7.5 liters per sq.m. of the vertical surface. Treatment shall be done in stages following the compaction of earth in layers. The treatment shall be carried out after the ramming operation is done by rodding the earth at 150mm centers closed to the wall surface and spraying the emulsion in the specified dose.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 14 of 180
			REVISION : 0
			EDITION : 1

3.2.2.2 Treatment of top surface of plinth filling

Holes 50 mm to 75 mm deep at 150 mm centres both ways shall be made with crow-bars on the surface of compacted plinth fill. Emulsion at the rate of 5 litres per sq.m of surface shall be applied prior to laying soling or subgrade. Special care shall be taken to maintain continuity of the chemical barrier at the junction of vertical and horizontal surfaces.

3.2.2.3 Treatment of doors, windows & soil surrounding pipes, Wastes and conduits.

Special care shall be taken at the points where pipes and conduits enter the building and the soil shall be treated for a distance of 150 mm and a depth of 75 mm at the point where they enter the building. All the wooden door/window frames on the ground floor of the buildings shall be treated with the insecticidal solution.

3.2.2.4 Treatment of expansion joints

These shall receive special attention and shall be treated in a manner approved by the Engineer.

3.3 Acceptance Criteria


The Contractor shall give a 10 year service guarantee in writing supplemented by a separate and unilateral guarantee from the specialised agency for the job to keep the building free of termites for the specified period at no extra cost to the Owner.

4.0 CONCRETE PLAIN & REINFORCED

4.1 Scope

This chapter covers the workmanship, special requirements & regulations with which the contractor must comply to achieve the following two objectives :

- The provision, at all locations on the site, of dense workable concrete, having the specified characteristic strength.
- The placing of concrete at all elevations, well compacted by vibrations, in well aligned and well fixed formwork ensuring the

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 15 of 180
			REVISION : 0
			EDITION : 1

internal and external dimensions of structures as per drawings and maintaining the size, shape number and locations of reinforcements, inserts etc., as specified in the drawings providing the surface finish after stripping off the formwork to ensure the structural configurations as per drawings as well within the specified tolerance limits, curing and guaranteeing the characteristic strength, all as specified.

- 4.1.1 The mixing, placing, compacting, curing and finishing of concrete shall be done according to IS: 456-1978 "Code of Practice for Plain and Reinforced Concrete".


4.2 Materials

For materials, reference to Part - I (Materials) shall be made.

4.3 Grades of Concrete

The grades of concrete unless otherwise specified shall be in accordance with the following table. The grade of concrete to be used in each section of work will be shown in the drawings or in the schedule of items :


Grade of Concrete	Characteristic Strength i.e. Compressive Strength of 15 cm cubes at 25 days (N/mm²)	Nominal Maximum Aggregate Size (mm)
M-5A	5	63
M-5B	5	40
M-7.5A	7.5	63
M-7.5B	7.5	40
M-10A	10	63
M-10B	10	40
M-10C	10	20
M-10D	10	12

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 16 of 180
			REVISION : 0
			EDITION : 1

Grade off **Characteristic Strength i.e.** **Nominal Maximum**
Concrete **Compressive Strength of 15 cm** **Aggregate Size (mm)**
 cubes at 25 days
 (N/mm²)

M-15A	15	63
M-15B	15	40
M-15C	15	20
M-15D	15	12
M-20A	20	63
M-20B	20	40
M-20C	20	20
M-20D	20	12
M-25C	25	20
M-25D	25	12
M-30C	30	20
M-30D	30	12
M-35C	35	20
M-35D	35	12
M-40C	40	20
M-40D	40	12

Notes : A,B,C,D mentioned along with grade of concrete correspond to the maximum size of coarse aggregate being 63mm, 40mm, 20mm & 12mm respectively.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 17 of 180
			REVISION : 0
			EDITION : 1

Unless otherwise specified in the drawings or schedule of items the maximum nominal size of coarse aggregates for different grades of concrete shall be as under :

a)	For concreting in very narrow space or in very small thickness	12 mm
b)	For all reinforced concrete work except in massive foundations	20 mm
c)	For all ordinary plain concrete & massive reinforced foundations	40 mm & 63 mm


4.4 Mix Design

4.4.1 General

At the commencement of the contract the Contractor shall make preliminary tests to determine the proportions by weight of cement, fine aggregates, coarse aggregates and water necessary to produce required grades of concrete. The mix proportions shall be selected to ensure that workability of the fresh concrete is suitable for the conditions of handling and placing and when concrete hardens, it shall have the required strength, durability and surface finish. The Contractor shall get approval of Engineer to such proportions before he starts concreting. However, such approval shall not relieve the Contractor of his responsibility to produce concrete having compressive strengths as laid down in the foregoing Table.

No departure from the approved proportions will be permitted during the works unless and until the Engineer gives written authorisation for any change in proportion. The Engineer shall have authority at any time to check whether the mixing of concrete is being carried out according to the approved proportions.

4.4.2 For the all major and important R.C. works and for all special works, the design of mixes shall be made by the Contractor at his own cost, for each grade of concrete as well as for various workability. The design of mixes shall be made according to I.S. 10262-1982 or any other approved standard methods.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 18 of 180
			REVISION : 0
			EDITION : 1

4.4.3 The concrete made by designing the mix is termed hereinafter as "Design Mix Concrete".

4.4.4 The cement content for various grades of concrete shall be based on design mix. However, irrespective of requirement of cement found out from design mix, the minimum cement content & maximum cement content of concrete shall be in accordance with Clause No. 8.2.4.1 & Clause No. 8.2.4.2 of I S 456 -2000 respectively.

4.5 Water/Cement Ratio

4.5.1 Where a particular water/cement ratio is stipulated in the design or drawing along with the characteristic grade of concrete the design of mix shall be carried out by adjusting the other variable factors to obtain the characteristic strength of concrete with stipulated water/cement ratio.


4.5.2 In the structures where the impermeability and shrinkage of concrete have an important bearing on the durability and serviceability of the structures, such as water retaining structures, basements, underground premises, tunnels, pump houses, exposed structures near sea side or deserts, prestressed structure, thin precast members etc. the water cement ratio shall be kept low and preferably not exceeding 0.45.

4.5.3 The water cement ratio, as achieved in the Mix Design, or as specified in the drawings shall be adhered to strictly and shall not be varied without the permission of the Engineer.

4.6 Workability

4.6.1 The workability of fresh concrete shall be such that the concrete is just suitable for the conditions of handling & placing so that after compaction it becomes completely consistent and homogeneously surrounds all the reinforcement and completely fills the formwork.

4.6.2 The workability of fresh concrete at the place of batching/mixing shall be measured by compacting factor test and at the place of disposition by means of slump test. During the finalisation of Trial Mixes, the relationship between compacting factor and slump test shall be established for each grade of concrete as well as for various levels of workability. The workability tests shall be carried out in accordance with IS:1199-1959.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 19 of 180
			REVISION : 0
			EDITION : 1

4.6.3 Normally, in the condition of low water cement ratio as well as for medium/high workability, the workability shall be achieved by increasing the cement content, in consistent with added water.


4.6.4 In cases where the cement content is to be limited to reduce the heat of hydration, and the water/cement ratio is also to be kept low to reduce the permeability or due to other requirements the desired workability may be achieved with use of limited doses of plasticiser or air entraining agent. In such cases the method of mixing and dosage of the plasticiser/air entraining agent shall be according to the manufacturer's specification and with the approval of the Engineer.

4.6.5 The usual limits of consistency for various types of structures are given below :

Limits of consistency

Degree of Workability	Slump in mm with Standard - Cone		Use for which concrete is suitable as per IS : 1199
	Minimum	Maximum	
Very low	0.0	25.0	Large mass concrete structure with heavy compaction equipment, roads and the like.
Low	25.0	50.0	Uncongested wide and shallow R.C.C structures
Medium	25.0	75.0	Deep but wide R.C.C structures with congestion of reinforcement and inserts
High	75.0	125.0	Very narrow and deep R.C.C structures with congestion due to reinforcement and inserts

Note : Notwithstanding any thing mentioned above, the slump to be obtained for work in progress shall be as per direction of the Engineer. With the permission of the Engineer, for any grade of concrete, if the water has to be increased in special cases, cement shall also be increased proportionately to keep the ratio of water to cement same as adopted in

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 20 of 180
			REVISION : 0
			EDITION : 1


trial mix design for each grade of concrete. No extra payment will be made for this additional cement.

4.7 Durability

The durability of concrete, depending on the exposure condition, is to be taken into account while designing the mix. For given aggregates, the cement content should be sufficient to make sufficiently low water cement ratio and Appendix A of IS: 456-1978 shall be taken as guideline for durability considerations.

4.8 Trial Mixes

- 4.8.1 After approval of the Mix Design by the Engineer, the Contractor shall make in presence of Engineer the Trial Mixes for each grade of concrete as well as for required workability.
- 4.8.2 Before starting the trial mixes, necessary preparatory works like sieve analysis of the aggregates, determination of densities of different ingredients and moisture contents in the aggregates, shall be completed according to the I.S. Codes 383-1970 and 2386-1963.
- 4.8.3 Each trial mix shall be handled and compacted by the method which the Contractor proposes to use for that mix in the works and the mixes shall not show tendency of inadequate compaction by the method proposed.
- 4.8.4 The compacting factor and the slump of each trial mix shall be determined immediately after mixing and the values shall not exceed the maximum value obtained in the mix design.
- 4.8.5 Six numbers of 150 mm test cubes shall be made from each trial mix. These shall be cured and tested in accordance with relevant I.S. codes. In order to have the specified characteristic strength in the field, the concrete mix as designed in the Design Mix shall have higher average compressive strength depending on the degree of quality control at site. If the size and special requirement of the work so warrants, the trial may be extended to cover larger ranges of mix proportions as well as other variables such as alternative source of aggregates, maximum size and grading of aggregates and different type and brands of cement.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 21 of 180
			REVISION : 0
			EDITION : 1

4.8.6 Before commencement of the concreting works of particular grade of concrete, the Contractor must complete the work of trial mixes and subsequent testing of the test cubes obtained therefrom the design of the Approved Mix for that particular grade of concrete.

4.8.7 The entire cost of all the trial mixes including all the preparatory works for trial mixes, preparation of test cubes and their testing shall be borne by the Contractor.

4.9 Nominal Mix Concrete

4.9.1 Nominal mix concrete may be used for all concrete of Grade M-10 and below. If design mix concrete cannot be used for any reason for Grade M-15 & M-20, nominal mix concrete may be used with the permission of Engineer, Nominal mix concrete shall not be used, in any case for Grade of concrete above M-20.

4.9.2 The proportioning of materials for nominal mix concrete shall be in accordance with Table-3 of clause 8.3 of I.S. 456-1978. The stipulations of Clauses 8.3.1 & 8.3.2 of IS: 456-1978 shall also be taken into consideration.

4.10 Volumetric Mix Concrete


Where concrete is specified in volumetric proportions such as 1:4:8, 1:3:6, 1:2:4, 1:1 1/2:3, 1:1:2 etc., in the schedule of items, coarse and fine aggregates shall be measured by volume and cement by weight. The water cement ratio shall be within 0.45 to 0.70 depending upon the workability.

4.11 Batching of Concrete

4.11.1 Cement

Cement shall always be batched by weight. A separate weighing device shall be provided for weighing cement. Where the weight of cement is determined by accepting the weight per bag, number of bags shall be weighed separately to determine the average net weight of cement per bag and the same shall be checked regularly

4.11.2 Aggregates

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 22 of 180
			REVISION : 0
			EDITION : 1

4.11.3 For both Design Mix concrete and Nominal Mix concrete, the aggregates (coarse and fine) shall be batched by weight.

4.11.4 In particular cases, or where weigh-batching is not possible proportioning by volume batching may be allowed by the Engineer, provided the Contractor guarantees the uniformity of aggregates through out the period of construction. For this purpose, the Contractor shall submit to the Engineer sufficient data indicating the weight/volume relationship of aggregates for different types of concrete and after such approval, periodic checks on the weight/volume relationship of the aggregates shall be made by the Contractor to the satisfaction of the Engineer. Where aggregates are moist and volume batching is adopted, allowance shall be made for bulking in accordance with I.S. 2386 (Part-III)-1963.

4.11.5 Suitable adjustments shall be made for the variation in the weight of aggregates due to variation in their moisture contents.

4.12 Water


4.12.1 Water may be measured either by weight or by volume. When measured by volume, it shall be by well calibrated conical shaped jar or vessel or from a calibrated tank fitted to the mixer.

4.12.2 Adjustment of water due to moisture contents in coarse and fine aggregates

It is very important to maintain the water cement ratio constant at its correct value. For the correct determination of amount of water to be added in the concrete mix, to maintain the water cement ratio constant, the amount of moisture content in both coarse and fine aggregates shall be taken into consideration, be as frequently as possible, the frequency for a given job being determined by the Engineer according to weather conditions.

4.12.3 Determination of moisture content in the aggregates

Determination of moisture content in the aggregates shall be according to I.S. 2386 (Part-III)-1963. Where tests are not conducted, the amount of surface water may be estimated from the following table :

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 23 of 180
			REVISION : 0
			EDITION : 1

Aggregates	Surface water carried by Aggregates	
	% by weight	Lit / m³
Very wet sand	7.5	120
Moderately wet sand	5.0	80
Moist sand	2.5	40
Moist gravel & stone chips**	1.25 - 2.5	20-40

** - Coarser the aggregate, less the water it will carry.

4.12.4 Admixtures

Any solid admixture, to be added, shall be measured by weight, but liquid or semi-liquid admixture may be measured by weight or volume.

4.12.5 Accuracy of batching

The accuracy of batching shall be within the following tolerance:

Cement within plus or minus 2% by weight.

Aggregate within plus or minus 5% by weight.


Water within plus or minus 0.5% by weight.

4.13 Mixing & Transportation of concrete

4.13.1 Mixing of Concrete

4.13.1.1 Machine mixing

Concrete shall always be mixed in mechanical mixer. Water shall not, normally, be charged into the drum of the mixer until all other ingredients are already in the drum and mixed for at least one minute. Mixing shall be continued until there is uniform distribution of materials and the mass is uniform in colour and consistency. The mixing time

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 24 of 180
			REVISION : 0
			EDITION : 1

from the time of adding water shall be in accordance with IS: 1791-1985 but in no case less than 2 minutes or at least 40 revolutions.

4.13.1.2 Hand mixing

When hand mixing is permitted by the Engineer it shall be carried out on a water tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. In case of hand mixing 10% extra cement shall be added to each batch at no extra cost to the Owner.

4.13.2 Transportation of concrete

4.13.2.1 Concrete shall be transported from the place of mixing to the place of placing concrete as rapidly as practicable by such means which will prevent the segregation or loss of any of the ingredients and maintain the required workability. No water shall be mixed with the concrete after it has left the mixer.

4.13.2.2 Where concrete is transported over long distances, the Contractor shall provide suitable means by which different grades of concrete are readily identifiable at the place of final deposit.


4.13.3 Actions before placement of concrete

4.13.3.1 Programme of works

At the beginning of every fortnight, the contractor shall give his detailed concreting programme for that fortnight to the Engineer. Such programmes, shall specify all information such as the locations where concrete is to be poured, type/grade of concrete, volume of concrete to be poured, number and Type of vibrators proposed to be used as well as proposed to keep as standby, number of skilled technicians and supervisors proposed to be engaged, the proposed time and period of pouring etc.

4.13.3.2 Checking & approval

Before placement of concrete, the contractor shall get all the form works, reinforcements, inserts, conduits, openings, surface preparation etc., checked and approved by the Engineer. To facilitate such checking, the contractor shall complete all his works according to the drawings and specifications well in advance before placement of

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 25 of 180
			REVISION : 0
			EDITION : 1

concrete at least 36 hours for all major/important/complicated works and 24 hours for all minor/ordinary/simple works. The checks are purely in the interest of the work and to draw the contractor's attention to his contractual obligations to execute the works according to the drawings/specification and do not relieve the contractor from his responsibility in getting the end results for the quality & strength of concrete and for maintaining the shape, level & dimensions of the finished concrete, as well as the inserts, openings, other features within the tolerance limits.

4.14 Preparatory Works/Surface Preparation


4.14.1 For concrete directly on earth foundation

4.14.1.1 Earth foundation on which direct placement of concrete is specified, shall be rammed and consolidated as directed by the Engineer such that it does not crumble and get mixed with concrete during or after placement. If the foundation is quite wet, the same shall be kept dry and then sufficiently consolidated, if necessary, a thin top layer of the wet soil shall be removed and replaced by sand or other suitable materials as directed by the Engineer without any extra cost to the Owner. Care shall also be taken that earth from the sides also does not get mixed with the concrete, during or after placement, before it has sufficiently set and hardened.

4.14.1.2 The earth foundation, over which concrete is to be placed direct, shall not be kept abandoned at the specified level and concrete shall be placed immediately following the final preparation of the formation otherwise suitable measures shall be taken, as directed by the Engineer without any extra cost to the Owner.

4.14.2 For construction joints

All such joints shall have continuous square bond grooves to produce a substantial and water-tight key. Where the placement of concrete has to be resumed on a surface which has hardened, it shall be roughened, cleaned by wire or bristle brushing, compressed air, water jet etc., and thoroughly wetted. For vertical construction joints a neat cement slurry shall be applied on the surface immediate before the placement of concrete. For horizontal joints the surface shall be covered with a layer of freshly mixed mortar about 10 to 15 mm thick composed of cement and sand in the same proportion as the cement and sand in the concrete mix and applied immediately before placing of the concrete.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 26 of 180
			REVISION : 0
			EDITION : 1

On this surface (i.e. on the surface of joints) a layer of concrete not exceeding 150 mm in thickness shall first be placed and shall be well rammed against old work, particular attention being paid to corners and close spots. To ensure water tightness, care shall be taken to punn concrete properly against the old surface.

4.14.3 (a) On vertical surfaces of masonry

When the concrete is placed on the vertical surface of masonry (as in the case of thin concrete fins projected from the vertical masonry surface), a groove of dimension as directed by the Engineer shall be cut in the masonry to ensure a proper bond and the surface shall be cleaned thoroughly. Before the placement of concrete, the surface shall be kept moist by spraying water at least for the period of 2 hours and a thick coat of cement slurry shall be applied immediately before the placement of concrete.

b) Over walls


Building paper over average 12mm thick cement sand bearing plaster of 1:4 mix with neat cement finish shall be provided at the bearings of slabs over walls as directed by the Engineer.

4.14.4 Inside the formwork (cleaning, surface preparation etc.,)

The interior of the form works, where the concrete is to be placed, shall be thoroughly washed by high pressure water jet or air jet to completely clean the entire volume from all sort of dirt, grease/oil, foreign and deleterious materials etc. The reinforcement shall be completely clean and free from all sorts of dirt, grease/oil, rust, foreign/deleterious materials etc., Before placement of concrete, the form works coming in contact with concrete, shall be coated with form oil or raw linseed oil material or provided with any approved material to prevent adhesion of concrete to the form work, but utmost care shall be taken so that such oily material do not come in contact with the reinforcement.


4.15 Placing and Compaction of Concrete

4.15.1 The concrete shall be placed and compacted before setting commences & should not be subsequently disturbed. No water shall be mixed with the concrete after it has left the mixer. Method of placing should be such as to preclude segregation. Approved mechanical vibrator shall be used

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 27 of 180
			REVISION : 0
			EDITION : 1

for compacting concrete, and concrete shall not be over vibrated or under vibrated. No concrete shall be placed until the place of deposit has been thoroughly inspected and approved by the Engineer. all inserts and embedments properly secured in position and checked and forms properly oiled. No concrete shall be placed in the absence of the Engineer.

- 4.15.2 Concrete shall be placed on clean bed having the designed level. The bed shall be cleaned of all debris and other objectionable materials. Seepage water, if any, shall be controlled or diverted.
- 4.15.3 Concreting shall not be carried on during rains unless all precautions have been taken by the Contractor and necessary permission has been given by the Engineer. Suitable measures shall be taken to control the temperature of concrete.
- 4.15.4 Where plums are permitted in massive concrete, they shall be washed and carefully placed. No stone shall be closer than 30 cm to an exposed face, nor nearer than 15 cm to an adjacent stone.
- 4.15.5 Concrete shall not be dropped from a height of more than 2m except through a chute, the design and type of which shall be subject to approval of the Engineer.
- 4.15.6 The concrete shall be placed, spread and compacted by approved mechanical vibrator. Vibrators shall not be used for pushing concrete to adjoining areas.
- 4.15.7 For members involving vertical placing of concrete (eg. columns, walls etc.), each lift shall be deposited in horizontal layer extending the full width between shutterings and of such depth that each layer can be easily and effectively vibrated and incorporated with the layer below by means of compaction.
- 4.15.8 For member involving horizontal placing of concrete (e.g. slabs, beams etc.) the concrete shall be placed along the line of starting point in such quantities as will allow members to be cast to their full depth along the full width between side shuttering and then gradually brought towards the finishing point along its entire front parallel to the starting line. Vibration and surface finish shall follow behind the placement as closely as possible.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 28 of 180
			REVISION : 0
			EDITION : 1

4.15.9 Utmost care shall be taken to avoid the displacement of reinforcements/embedded parts or movement of formwork or damage to faces of the form work or transmission of any harmful vibration/shocks to the concrete which has not yet hardened sufficiently.

4.15.10 All members shall be concreted at such a rate that no cold joint is formed and fresh concrete is placed always against green concrete which is still plastic and workable.

4.15.11 Should any unforeseen occurrence results in a stoppage of concreting for one hour or such other time as might allow the concrete, already placed, to begin to set before the next batches can be placed, the Contractor shall make at his own cost, suitable tongue, and groove construction joint, as approved by the Engineer. Any additional reinforcement required as directed by the Engineer shall also be provided by the Contractor at his own cost. Before placement of new batches of concrete over that construction joint, the surface preparation according to this specification stipulated earlier, shall be done by the Contractor at his own cost.

4.15.12 The concrete shall be worked well up against whatever surface it adjoins and compacted to such a degree that it reaches its maximum density as a homogeneous mass, free from air and water holes and penetrates to all corners of moulds and shuttering and completely surrounds the reinforcement. All measures shall be taken to make the shape, size, and location of the finished concrete including its embedments, holes, openings etc., well within the accepted tolerance limit.


4.16 Construction Joint & Cold Joints

4.16.1 Construction joints

4.16.1.1 Normally, the construction joints including crank inducing joints shall be constructed as per locations and details indicated on the drawings.

4.16.1.2 Where the location of the joint is not specified in the drawings, it shall be in accordance with the following guide lines :

(a) In Columns

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 29 of 180
			REVISION : 0
			EDITION : 1

- (i) In case of Projection from basement slab, 300 mm from the top of base slab or 75 mm from the top of the haunches whichever is higher.
- (ii) In framing of beam at different elevation, 75 mm below the lowest soffit of the beam and in case of projection from beams and slabs 75 mm from the top surface of the beam/slab or at the top surface of beam/Slab whichever facilitates formwork.
- (iii) For columns under flat slabs 75 mm below the lowest soffit of the slab.

(b) In walls (horizontal construction joints)

(i)	Walls projecting from base slab	:	300 mm from top of base slab
(ii)	Walls supporting the suspended slab	:	75 mm from the lowest soffit of the slab

Note :


In the case of water retaining structures and structures under the influence of ground water, approved water bars of suitable size shall be provided to make the joint completely water-tight.

(c) In beams

Beams shall be cast, as a rule, without a joint. But if provision of a joint is unavoidable, the joint for simply supported beam shall be vertical and at the middle of the span ; in continuous beam, the same shall be at the point of minimum shear force.

(d) In suspended slabs

- (i) In slab of small span, there shall be no construction joints.
- (ii) In slabs of large span and continuous slabs, construction joint, if allowed by the Engineer shall be vertical at the middle of span and at the right angles to the principal reinforcement.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 30 of 180
			REVISION : 0
			EDITION : 1

(e) In walls (Vertical construction joint)

As a rule, walls shall be cast monolithically without any vertical construction joint, unless specified in the drawing. However, for a long wall, the Engineer may allow vertical construction joint and the same shall be at the place of minimum shear force. In water retaining structures and in structures under the influence of ground water approved water bars of suitable size shall be provided to make the joints completely water tight.

(f) In slabs resting on ground

(i) For Plain concrete

Concreting shall be done in alternate panels not exceeding 10 sq.m in area. The largest panel dimension shall be 5 m.

(ii) For nominally reinforced slab

The area of pour shall not exceed 40 sq.m and the maximum panel dimension shall not exceed 8m.

(i) For the basement slabs which act as structural member


There shall be no construction joint.

(g) In ribbed beam

The beams shall be cast monolithically with the slab in one continuous operation.

4.16.1.3 In all construction joints the reinforcements shall pass through as per drawings and the same shall not be disturbed in any way.

4.16.1.4 The vertical construction joints shall be provided by insertion of board keeping provision for passage of reinforcement/fixtures / embedments. All construction joints shall be made to form a tongue and groove joint.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 31 of 180
			REVISION : 0
			EDITION : 1

4.16.2 Cold joint

An advancing face of a concrete pour, which could not be covered before expiry of initial setting time for unexpected reasons, is called a cold joint. The Contractor shall remain always vigilant to avoid cold joints. If however, a cold joint is formed due to unavoidable reasons, the following procedures shall be adopted for treating it :


- (a) If the concrete is so green that it can be removed manually and if vibrators can penetrate the surface without much effort, fresh concrete can be placed directly over the old surface and the fresh concrete along with the old concrete shall be vibrated systematically and thoroughly.
- (b) In case the concrete has hardened a bit more than (a), but can still be easily removed by a light hand pick, the surface shall be raked thoroughly and the loose concrete removed completely without disturbing the rest of the concrete in depth. Then a rich mortar layer of 12 mm thickness, shall be placed on the cold joint and then the fresh concrete shall be placed on the mortar layer and vibrated thoroughly, penetrating deep in to the layer of concrete.
- (c) In case the concrete at the joint has become so stiff that it cannot be remoulded and mortar or slurry does not rise in spite of extensive vibration, a tongue and groove joint shall be made by removing some of the older concrete and the joint shall be left to harden at least for 12-24 hours. It will then be treated as regular construction joint and the surface preparation of the same, before placement of concrete, shall be as described in the appropriate clauses of these specifications.

4.17 Requirements for Concreting in Special Cases

4.17.1 Concreting in deep lifts

Placing of concrete in lifts exceeding 2 M in columns and walls is in the category of deep lifts.

- 4.17.1.1 Before commencement of work, the contractor shall submit for the approval of the Engineer, the details of the methods he proposes to adopt for concreting.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 32 of 180
			REVISION : 0
			EDITION : 1

4.17.1.2 The placement of concrete shall preferably be by tremie, chute or any other approved method.

4.17.1.3 In structures of heavy/complicated reinforcement or in complicated form works, the contractor shall provide sufficient number of windows in the form works as directed by the Engineer to check the placement and compaction of concrete in different stages. Such windows shall be closed as soon as the concreting reaches the bottom level of the same.

4.17.2 Concreting under water

When it is necessary to deposit concrete under water, the special requirements, over and above those of this specification shall be in accordance with Clause 13.2 of IS: 456-1978.

4.17.3 Cold weather concreting

When conditions are such that the ambient temperature may be expected to be 4.5 C degree or below during the placing and curing period, the work shall conform to IS: 7861 (Part-II)-1981.

4.17.4 Hot weather concreting


When concreting in very hot weather the Contractor shall take all precautions as stipulated in IS: 7861 (Part-I)-1975 and stagger the work to cooler parts of the day to ensure that the temperature of wet concrete used, specially in massive structure, does not exceed 38 degree 'C'.

Positive temperature control by methods like pre-cooling, post cooling or cooling of concrete by circulating cold water through small embedded pipe lines inside concrete, if required, shall be specified and shall be undertaken.

4.18 Finishes to Exposed Surfaces of Concrete

The Contractor is to include in his quoted rate for concrete, the provision of normal finishes in both formed & unformed surfaces as and where required by the Engineer without any extra cost to the owner. Some common finishes are indicated below:

4.18.1 Surface which do not require plastering

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 33 of 180
			REVISION : 0
			EDITION : 1

Surface in contact with casings shall be brought to a fair and even surface by working the concrete smooth against casings with a steel trowel while it is being deposited and also by working over the surface with a trowel immediately after the removal of the casings or centerings, removing any irregularities and stopping air holes, etc. Use of mortar plaster is not permissible for correcting levels, removing unevenness etc. However, if, in the opinion of the Engineer, such plastering is unavoidable then the thickness of plaster shall in no case exceeds 5 mm and the plastering shall be in cement and sand mortar.(1:3).

4.18.2 Exposed surfaces which need plastering

Surfaces of beams/columns flushing with the block work or other structures where intended to plaster, shall be hacked adequately as soon as the shuttering is stripped off so that proper bond with the plaster can develop.

4.18.3 Surface for non-integral finish

Where a non-integral finish such as floor finish is specified or required, the surface of the concrete shall be struck off at the specified levels and finished rough.


4.18.4 For monolithic finish

Where no more finishing course is to be applied as in the case of basement floor, industrial flooring or the screed concrete flooring etc, the concrete shall be completed and struck off at the specified levels and sloped with a screed, board and then floated with a wooden float. Steel troweling is then started after the concrete has hardened enough to prevent the excess of fines and water to rise to the surface but not hard enough to prevent proper finishing. Troweling shall be such that the surface is flat, smooth and neatly finished.

4.19 Curing of Concrete

4.19.1 General

The purpose of curing is to prevent loss of moisture from the concrete itself so that the cement inside the concrete is sufficiently hydrated which of course is slow and prolonged process. As soon as the

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 34 of 180
			REVISION : 0
			EDITION : 1

concrete has hardened sufficiently the curing shall be started. To cure the concrete properly and sufficiently is also the sole responsibility of the contractor.

4.19.2 Different methods of curing

Any one of the following methods may be used for curing as approved by the Engineer.

- (a) Curing by direct water.
- (b) Curing by covering the concrete with absorbent material and kept damp.

4.19.3 Curing by direct water

This is done either by ponding or spraying water.

(a) Ponding


Ponding is widely used for curing slab and pavements. Earth bunds are formed over the slabs and water is pumped or poured into them and the same is replenished at interval to make up for the loss of evaporation. As this type of curing is one of the best methods, 10 days of curing after final setting is sufficient.

(b) By spraying water

Curing is done by spraying water by suitable means at approved time intervals. While spraying, it shall be ensured that the complete area is covered. In order to avoid cracking, cold water shall not be applied to massive members immediately after striking the form work, while the concrete is still warm. Alternate wetting and over drying shall be avoided.

Curing by spraying water shall be continued at least for 18 days after final setting.

4.19.4 Curing of concrete with absorbent material kept damp

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 35 of 180
			REVISION : 0
			EDITION : 1

The entire concrete surface is covered either with hessian, burlap, sawdust, sand, canvas or similar material and kept wet continuously for at least 12 days after final setting.

4.20 Testing of Concrete

4.20.1 General

The Contractor shall carry out, entirely at his own cost, all sampling and testing in accordance with the relevant I.S. standards and as supplemented herein. The Contractor shall get all tests done in approved Laboratory and submit to the Engineer, the test result in triplicate within 3 days after completion of the test.

4.20.2 Consistency test (tests of fresh concrete)

4.20.2.1 At the place of deposition/pouring of the concrete, to control the consistency, slump tests and/or compacting factor tests shall be carried out by the Contractor in accordance with I.S. 1199-1959 as directed by the Engineer.


4.20.2.2 The results of the slump tests/compacting factor tests shall be recorded in a register for reference duly signed by both the Contractor and the Engineer. That register shall be considered as the property of the Owner and shall be kept by the Contractor at site in safe custody.

4.20.2.3 The results of the slump tests/compacting factor tests shall tally, within accepted variation of plus or minus 12% with the results in the respective design mix, in case of mix design concrete and with the values indicated in the table under clause 6.1 of IS: 456 in case of nominal mix concrete.

4.20.2.4 For any particular batch of concrete, if the results do not conform to the requirements as specified in 4.20.2.3 or do not conform to any requirement of this specification, the Engineer has the right to reject that batch and the Contractor shall remove the same immediately from the site, at no cost to the Owner.

4.20.3 Strength test of concrete

4.20.3.1 While placing concrete, the Contractor shall make 6 nos. of 15 cm test cubes from particular batches of concrete as desired by the Engineer.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 36 of 180
			REVISION : 0
			EDITION : 1

The frequency of taking test cubes shall be either according to clause 14.2 of IS: 456-1978 or as directed by the Engineer.

4.20.3.2 The cubes shall be prepared, cured and tested according to IS: 516-1959. Out of 6 nos. of test cubes 3 shall be tested for compressive strength at 7 days after casting and the remaining 3 at 28 days after casting.

4.20.3.3 A register shall be maintained at site by the Contractor with the following details entered and signed by both the Contractor and the Engineer. That register shall be considered as the property of the Owner.


- (a) Reference to the specific structural member
- (b) Mark on cubes
- (c) The grade of concrete
- (d) The mix of concrete
- (e) Date and time of casting
- (f) Crushing strength at 7 days
- (g) Crushing strength at 28 days
- (h) Any other information directed by the Engineer.

4.20.4 Acceptance criteria for test cubes

The acceptance criteria of concrete on strength requirement shall be in accordance with the stipulations under clause 15 of IS: 456-1978.

4.20.5 Non-destructive tests on hardened concrete

4.20.5.1 If there is doubt about the strength or quality of a particular work or the test results do not comply with the acceptance criteria as stipulated under clause 15 of IS: 456-1978, non-destructive tests on hardened concrete like core test and/or load tests or other type of non destructive tests like ultrasonic impulse test etc. shall be carried out, as may be directed by the Engineer, by the Contractor at entirely his own cost.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 37 of 180
			REVISION : 0
			EDITION : 1

- 4.20.5.2 The core tests and load tests shall comply with the requirements of clause 16.3 and 16.5 of IS: 456-1978 respectively. In case of other types of special tests like ultrasonic impulse test etc., the stipulation of clause 16.6 of IS: 456-1978 shall be applicable.


4.20.6 Concrete below specified strength

In case of failure of test cubes to meet the specified requirements the Engineer may take one of the following actions:-

- 1) Instruct the Contractor to carryout additional test and/or works to ensure the soundness of the structure at Contractor's expense.
- 2) Reject the work and instruct that section of the works to which the failed cubes relate shall be cut out and replaced at Contractor's expense and the resultant structures affected due to such rejection shall be made good at contractor's expense.
- 3) Modification/remedial measures if approved by the engineer to be carried out at contractor's expense.
- 4) Accept the work with reduction in the rate in appropriate item subject to the provisions of clause 15 of IS 456-1978 provided it is technically acceptable. The reduction in the rate shall be as given below :-
 - i) When test strength of the sample is above 90% of the characteristic strength, payment shall be made 10% less than the contract rate.
 - ii) When test strength of the sample is between 80-90% of the characteristic strength, payment shall be made 25% below than the contract rate.

4.20.7 Concrete failed in non-destruction tests

In case the test results of the core tests or load tests in a particular work do not comply with the requirements of respective clause (16.3 for core test and 16.5 for load tests) of IS: 456-1978 the whole or part of the work concerned shall be dismantled and replaced by the Contractor as may be directed by the Engineer at no extra cost to the Owner and to the satisfaction of the Engineer. No payment for the dismantled concrete including relevant form work, reinforcement, embedded

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 38 of 180
			REVISION : 0
			EDITION : 1

fixtures etc. shall be made. In the course of dismantling if any damage occurs to the adjacent structure or embedded item, the same shall be made good, free of charge by the Contractor, to the satisfaction of the Engineer.

4.21 Steel Reinforcement

4.21.1 Material

Material shall be as specified in the respective schedule of Items. The specifications of materials shall be as per Part-I.

4.21.2 Storage

Steel reinforcement shall be stored in such a manner that they are not in direct contact with ground. Bars of different classifications and sizes shall be stored separately. In cases of long storage or in coastal areas, reinforcement shall be stacked above ground level by at least 15 cm, and a coat of cement wash shall be given to prevent scaling and rusting at no extra cost of the owner.


4.21.3 Bending and placing

Bending and placing of bars shall be in conformity with IS: 2502-1963 "Code of Practice for Bending and Fixing of Bars for Concrete Reinforcement" and IS: 456 -1978 "Code of Practice for Plain and Reinforced Concrete".

4.21.4 Welding of Reinforcement

Welding of mild steel reinforcement bars conforming to IS:432 (Part-I)-1982 shall be done in accordance with IS: 2751 -1979 "Code of Practice for Welding of Mild Steel Bars used for Reinforced Concrete construction" with additional precaution that for lap welded joints the throat thickness of weld beads shall be at least 3 mm or 0.6 times the nominal size of weld (which is the radius of bar) whichever is more.

Welding of cold worked high strength deformed bars conforming to IS: 1786-1985 shall be done using electric arc welding process using low hydrogen electrodes (Ferro Weld- I or Ferro Weld-II or equivalent). Oxy-acetylene welding shall not be used.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 39 of 180
			REVISION : 0
			EDITION : 1

Butt welding of bars upto 32 mm diameter for vertical splices shall be done either by single bevel groove weld or double bevel groove weld, with bevel angle 45 degree. Butt welding of bars upto 32 mm diameter for horizontal splices shall be done either by single Vee-groove weld or double Vee-groove weld with chamfered angle of 45 degree to 60 degree. The diameter of welded joint shall be 1.2 times the diameter of bar. Edge preparation for butt welding shall be done by shearing, machining and grinding. Oxy-acetylene flame shall not be used for cutting. Chamfered faces shall be smooth finished by hand file if required.

Lap welding of bars upto 20 mm diameter shall have a minimum bead length of 12 times the diameter of bar or 200 mm whichever is more arranged on one or both sides. The throat thickness of weld beads shall be 5 mm or 0.75 times the nominal size of weld (which is the radius of bar) whichever is more. In case of unsymmetrical lap weld with weld bead on one side only, the maximum length of each weld bead shall be 6 times the diameter of bar or 100 mm (whichever is more), separated by an equal length in between weld beads. Splice bars used in symmetrical weld joint shall have same diameter as the parent bars. Lap joint with single splice bars shall have weld beads on both sides.

Lap welding of bars above 20 mm shall be done using splice plate or splice angle. Thickness of splice plate shall not be less than 0.65 times the diameter of bar and width shall not be less than twice the diameter of bar. The size of splice angle shall be such that its area of cross section is at least 1.62 times the area of bar being spliced.


More than one third of the bars shall not be welded at any one section and welded joints shall be staggered at a distance of 50 times the diameter of bars. Welding shall not be done at bends or curved parts of bars and it shall be located at least at a distance of 50 times the diameter of bar from bends.

Tests

Test pieces of welded bars shall be selected and tested in accordance with the provisions of IS: 2751-1979. The number of tests will be as laid down in IS: 2751-1979 or such larger number as the Engineer may decide having regard to the circumstances.

4.21.5

Cleaning

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 40 of 180
			REVISION : 0
			EDITION : 1

All steel for reinforcement shall be free from loose scales, rust coatings, oil, grease, paint or other harmful matters immediately before placing the concrete. To ensure this, reinforcements with rust coatings shall be cleaned thoroughly before bending/placement of the same.

4.21.6 Placing in position

All reinforcements shall be accurately fixed and maintained in positions as shown on the drawings and by adequate means like mild steel chairs and/or concrete spacer blocks as required. Bars intended to be in contact at crossing points, shall be securely tied together at all such points by 20G annealed soft steel wire or by tack welding in case of bars larger than 25 mm dia, as may be directed by the Engineer. Binders shall tightly embrace the bars with which they are intended to be in contact and shall be securely held. The vertical distance between successive layers of bars shall be maintained by provision of mild steel spacer bars. They should be spaced such that the main bars do not sag perceptibly between adjacent spacers.


4.21.7 Clear cover

Clear cover shall be as specified in the drawings. If nothing is specified in the drawing the clear cover shall be in accordance with the relevant clause of IS: 456-1978.

4.21.8 Light structural work and embedded metallic parts, conduits

4.21.8.1 Fabrication of metallic parts & light structural works

Fabrication of all structural steel work shall be done in accordance with IS: 800 -1984 "Code of Practice for use of Structural Steel in General Building Construction". Workmanship shall match to the best practice in modern structural shops. Greatest accuracy shall be observed in the manufacture of every part and all identical parts shall be strictly interchangeable. Steel work shall be shop fitted and shop assembled as far as practicable to minimise site work and to meet transport restrictions. All materials shall be straight and if necessary before being worked shall be straightened or flattened by pressure and shall be free from twists. Shearing or flame cutting may be used and the resulting edges shall be clean and straight. Flame cut edges shall be planed/cleaned by chipping or grinding. Sheared members shall be free from distortion at sheared edges. Welding and welded work shall conform to IS: 816 -

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 41 of 180
			REVISION : 0
			EDITION : 1

1969 "Code of Practice for use of metal arc welding for General Construction in Mild Steel". Mild steel electrodes conforming to IS: 814-1991 "Specification for covered electrodes for metal arc welding of mild steel shall be used.

4.21.8.2 Transportation and Storages

All pieces shall be properly identified and bundled for transportation to work site. Care shall be exercised in the delivery, handling and storage of material to ensure that material is not damaged in any manner. Materials shall be kept free of dirt, grease and foreign matter and shall be stored properly on skids or any other suitable supports to avoid contact with ground, damage due to twisting, bending etc.


4.21.8.3 Erection of light structural work

Erection of light structural work shall be carried out in accordance with the provisions of IS: 800-1984. No component which is bend or twisted shall be put in place until the defects are corrected. Components seriously damaged during handling shall be replaced. No riveting, permanent bolting or welding shall be done until proper alignment has been completed. Whenever field welding is to be done it shall be in accordance with the requirements of shop fabrication. Shop paints shall be removed before field welding for a distance of at least 50 mm on either side of the joints.

4.21.8.4.1 Erection of embedded metallic parts, inserts, conduits

Bolts and inserts shall be securely fixed in position as shown in the drawings, before commencement of concreting. Bolts shall be checked for accuracy in alignment on both the axes. Limits of tolerance in alignment and level shall be as shown in the drawing or described elsewhere in these specifications.

Where bolts are housed in sleeves, special care shall be taken after concreting is over and has partly set to ensure that the bolts move within the sleeves. The annular space of the sleeve shall be plugged with suitable stoppers to prevent the ingress of water, grout, dust, rubbish or other foreign material into it, both during and after concreting. Opened conduits shall be plugged similarly. Where channels, Unshapely profiles or other similar inserts are required to be

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 42 of 180
			REVISION : 0
			EDITION : 1

placed in concrete, special care shall be taken to keep the grooves of such profiles free from the ingress of concrete, slurry etc., by suitable packing material, if necessary.

All threads for bolts and inserts shall be greased at intervals and kept covered to prevent damage.

- 4.21.8.4.2 Necessary templates, jigs, fixtures, supports shall be used as may be specified or required or directed by the Engineer free of cost to the Owner.

Exposed surfaces of embedded materials shall be painted with one coat of anticorrosive paint or bituminous paint, as desired, without any extra cost to the Owner. If welding is to be done subsequently on the exposed surfaces of the embedded parts, the painting for a length of 50mm beyond each side of the weld line shall be cleaned off.

4.22 Shuttering


4.22.1 General

All shuttering, formwork, supports and staging shall be designed by the Contractor and be subject to approval by the Engineer. The Contractor shall submit drawings and calculations to the Engineer for scrutiny when called upon to do so. The shuttering shall be designed for a live load of 400 Kg/m² in addition to the weight of the green concrete, or such other load as the Engineer may specify. The Contractor shall be responsible for the correctness and strength of the formwork including its supports and centering and approval by the Engineer will not relieve him of his responsibilities.

4.22.2 Material

The staging and supports may be of round or sawn timber or tubular or other shapes in steel. Round timber shall preferably extend over the full height in one piece. These shall be securely jointed or otherwise fastened and spaced at suitable intervals as the design may warrant and shall be suitably braced at regular intervals horizontally and diagonally.

The form work shall be of steel plate on steel frame, wooden boards with steel sheet lining, or plywood or seasoned timber board. Where

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 43 of 180
			REVISION : 0
			EDITION : 1

ornamental and curved surfaces are required the material shall be very good seasoned timber or plywood which can be shaped correctly.

4.22.3 Fixing

The shuttering shall conform to the shapes, lines, levels and dimensions shown in the drawing. It shall be fixed in perfect alignment and securely braced so as to be able to withstand, without appreciable displacement, deflection or movement of any kind, the weight of all construction, movement of persons and plant. It shall be so constructed as to remain rigid during the placing and compacting of concrete without shifting or yielding and shall be sufficiently water tight to prevent loss of slurry from the concrete.

All props shall be supported on sole plates and double wedges. At the time of removing props these wedges shall be gently eased and not knocked out. The form work shall be so designed that the sides are independent of the soffits and the side forms can be removed easily without any damage or shock to the concrete.

4.22.4 Wrought shuttering

Wrought shuttering shall be such as to produce a first class fair face on the concrete free from board marks or any other disfigurements. This shall be used for exposed surfaces where specified or directed by the Engineer. It may be made of heavy quality plywood or steel sheets having smooth, plain surface.


The joints in shuttering shall be arranged in a regular pattern approved by the Engineer. Wrought shuttering shall be aligned within a tolerance of 3 mm.

4.22.5 Rough shuttering

Rough shuttering shall be used for all surface of concrete walls, footings etc., which are not exposed in the finished work or which are to receive plaster and as directed by the Engineer. It may be made of timber, ordinary plywood or steel sheets.

4.22.6 Special provision

4.22.6.1 Wherever concreting of narrow member is required to be carried out within shutters of considerable depth, temporary openings in the sides

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 44 of 180
			REVISION : 0
			EDITION : 1

of the shutters shall, if so directed by the Engineer, be provided to facilitate cleaning, pouring and consolidation of concrete.

4.22.6.2 In liquid retaining structures and structures below ground water level, through bolts for the purpose of securing and aligning the form work shall not be used.

4.22.6.3 Forms shall be given an upward camber, if so desired by the Engineer, to ensure that long beams do not have any sag. The camber may be 1 in 250 or as the Engineer may direct.

4.22.6.4 The joints in form work shall be sealed by adhesive tapes or by other means, to prevent any leakage of slurry or mortar if so directed by the engineer.

4.22.7 Preparation for concreting


Before any concreting is commenced the shuttering shall be carefully examined for dimensional accuracy and safety of construction. The space to be occupied by concrete shall be thoroughly cleaned out to remove rubbish, debris, shavings and saw dust. The surface in contact with concrete shall be coated with an approved substance such as mould oil or other non-staining mineral oil to prevent adhesion. Where necessary the surface shall be wetted to prevent absorption of moisture from concrete. Care shall be taken to avoid the reinforcements coming in contact with shutter oil.

4.22.8 Removing

4.22.8.1 Removal of forms shall never be started until the concrete has thoroughly set and aged to attain sufficient strength to carry twice its own weight plus the live load that is likely to come over it during construction

4.22.8.2 Removal of forms shall not entail chipping or disfiguring of the concrete surface. Shuttering shall be removed without shock or vibration and shall be eased off carefully in order to allow the structure to take up its load gradually.

4.22.8.3 Under normal circumstances (generally where temperatures are above 21 degree 'C'), and where ordinary portland cement is used shuttering may be struck after the expiry of the following periods :-

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 45 of 180
			REVISION : 0
			EDITION : 1

i)	Walls, columns & vertical faces	24 to 48 hours as may be directed by the Engineer.
ii)	Bottom of slab upto 4.5 m span	7 days
iii)	Bottom of slab above 4.5 m span, bottom of beam and arch, rise upto 6 m span	14 days
iv)	Bottom of beam and arch rise over 6 m span	21 days

These periods may be increased at the discretion of the Engineer.
Special care shall be taken while striking the shuttering of cantilevered slabs and beams, portal frames etc.,

- 4.22.8.4 Before removing the form work, the Contractor must notify the Engineer to enable him to inspect the condition of the finished concrete immediately after the removal of the form works.

4.22.9 Contractor's responsibility


Any damage resulting from faulty preparation, premature or careless removal of shuttering shall be made good by the Contractor at his own expense.

4.22.10 Irrecoverable shuttering

In cases where the shuttering cannot be removed without damaging the structure itself or where removal of shuttering is rendered impossible due to the nature of construction or where the Engineer may so instruct, such shuttering shall be classified as irrecoverable shuttering. However, such abandoning of shuttering will be permitted only in situations where it will not remain exposed or otherwise cause damage of any kind.

4.22.11 Metal Forms

Where permanently left-in-place metal forms or deck are shown in drawings or otherwise ordered to be provided by the Engineer, they shall satisfy the requirements with regard to load carrying capacity. The metal forms shall be obtained from a reputed manufacturer, whose performance guarantee shall be obtained and submitted to the

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 46 of 180
			REVISION : 0
			EDITION : 1

Engineer. Designs and drawings giving full details shall be submitted to the Engineer in advance for approval.

4.23 Damp Proof Course Concrete

4.23.1 Thickness

It shall be as specified in the drawings or in the items.

4.23.2 Mix

The grade of mix shall be as specified in the drawing or schedule of quantities. If nothing is specified, the mix shall be 1 part of cement : 1 1/2 part of coarse sand : 3 parts of stone chips. The stone chips shall be 12 mm down graded.

Approved water proofing admixture shall be mixed with cement as per manufacturer's specifications. The water cement ratio shall be as low as possible to increase the impermeability of concrete and in no case more than 0.5.

4.23.3 Preparation of base surface

The base surface shall be well roughened by chipping and brushing with steel brush and shall be cleaned of all dirt, dust, grease, oil and all other foreign & deleterious materials. Then the surface shall be well moistened with water.


4.23.4 Placing and compaction

Just prior to placement of D.P.C. Concrete, a thick coat of cement slurry shall be applied on the base surface. The placement shall be as specified for the concrete in beams. The concrete shall be well compacted to make it dense.

4.23.5 Finishing

When the concrete has set enough but remains still green, the top surface shall be marked in regular pattern by steel trowel so as to have proper bond with the future work.

4.23.6 Curing

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 47 of 180
			REVISION : 0
			EDITION : 1

The D.P. course shall be kept continuously moist at least 10 days.

4.24 Grout

4.24.1 Scope

The scope covers the grouting under base plates, grouting between the joints of precast concrete, grouting the pockets/holes/opening etc.

4.24.2 Grouting under base plates

Grouting under base plates of equipments/structures shall be of cement mortar 1:2 for thickness upto 25 mm. For thickness exceeding 25 mm, concrete of grade specified in the drawing or minimum M-20 grade using 10 mm down graded aggregates shall be used. The grout shall be placed in position well rammed until the whole space is completely filled with concrete. No vibrators shall be used. Quick setting cements shall be used in the preparation of mortar or concrete, where so specified.


The grout shall either be "dry" concrete or mortar or "wet expanding" concrete or mortar as the Engineer may direct. A dry grout shall have a slump not exceeding 6 mm. It shall be rammed under the horizontal surface with the aid of suitable tools. A "wet expanding" grout shall have a slump of at least 125 mm but not exceeding 225 mm. To this shall be added an expanding admixture approved by the Engineer and in accordance to the Manufacturer's instructions.

4.24.3 Grouting the pockets/holes in concrete

Depending upon the size of the pockets/holes in the concrete, the mix of the grout shall be either of concrete or of cement sand mortars. Normally the grade of such concrete/mortar shall be M-20 unless specified otherwise. In filling the holes of foundation bolts and expanding admixture of approved type shall be used as per manufacturer's specification.

4.24.4 Workmanship

4.24.4.1 The surface of the concrete over which grouting is to be applied shall be thoroughly prepared to provide a clean rough surface. If necessary, chipping shall be carried out on such surface to make it completely

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 48 of 180
			REVISION : 0
			EDITION : 1

rough. Then the surface shall be wetted. Bolt pockets shall be cleaned immediately before the base plate is placed in position. Before grouting the surface shall be thoroughly cleaned with compressed air/water jet.

4.24.4.2 Before placement of grout, the surfaces (except in the case of bolt holes) shall be wetted with cement slurry. In case of bolt holes/pockets water from such pockets shall be thoroughly removed by some suitable means and no cement slurry shall be applied.

4.24.4.3 Hand mixing is not permitted and the grout shall always be machine mixed. If however in some special cases where the quantity of grout is so small that it cannot be machine mixed, hand mixing may be allowed but the same shall be done under the strict supervision of an experienced supervisor of the Contractor.

4.24.4.4 The grout shall be placed within 30 minutes of being mixed. The grout shall be poured and then worked into position by suitable means until the space is completely filled. The Contractor shall take all possible measures during grouting so that the grout fills the space completely and thoroughly. Where the gap is very small or unapproachable for the placement of concrete, the Contractor shall grout by pressure grouting and in that case the mix may be of cement sand mortar of the appropriate grade but in any case the water cement ratio shall be as low as possible. Neither "Dry" grout (having slump 6mm or less) nor expanding wet grout shall be grouted with any type of vibrating machine


4.24.5 Curing

After 10 hours of grouting, the same shall be covered with wet gunny bags and the surface shall be kept continuously moist at least for 10 days.

4.25 Concreting in Water Retaining Structures

General requirements

The basic specifications as regards 'mix' design, placing, compacting, curing etc. shall conform to the requirements as specified herein before

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 49 of 180
			REVISION : 0
			EDITION : 1

in this Chapter. Over and above the materials and workmanship shall conform to the stipulations of IS: 3370 (Part-I & II)-1965 to make dense and impervious concrete. As specified herein before all the construction joints shall be provided with approved water bars. The expansion and construction joints, if any, shall be provided with the requirements as specified in the drawing or as directed by the Engineer.

4.26 Application of Live Load

The designated live load shall be allowed on any structure only after 28 days, after proper curing is carried out on the last concrete poured in structure.

4.27 Foam Concrete

This shall be of average 50mm thickness or as specified or as shown on the drawings. This may be laid in in-situ in suitable panels or in precast blocks. The insulating properties shall be such that the thermal conductivity shall not exceed 0.125 Kcl m/m²h/degree C. The weight of the insulating material shall be from 0.5 to 0.75 gm/cm³, strength not less than 5 Kg/sq.cm or (0.5N/sq.mm.). In general, the main ingredients of Foam Concretes are cement, fly ash and foaming agent and the work shall be carried on by specialised Agencies/Companies. Before starting the laying of foam concrete sample shall be prepared at site and got tested for approval of the Engineer.


The foam concrete laid shall be sufficiently strong to take the usual work loads and standard loads expected on the roof. Any damaged portion shall be removed and replaced forthwith. Approval of the Engineer shall be taken before laying the waterproofing over the insulation.

While laying the foam concrete, sample batches of mix shall be kept for test if so desired by the Engineer.

5.0 MASONRY

5.1 General

This specification deals with masonry and allied works in foundation, plinth and superstructure.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 50 of 180
			REVISION : 0
			EDITION : 1

5.2 Materials

For specifications of materials Part-I shall be referred.

5.3 Selection of Mortars

Mortar for masonry shall conform generally to IS: 2250-1981 "Code of Practice for Preparation and Use of Masonry Mortars", and proportion shall be as specified in the drawing or in the Schedule of Items.

5.4 Cement Mortar

5.4.1 Cement mortar shall be prepared by mixing cement and sand in specified proportion. It is convenient to take unit of measurement for cement as a bag of cement weighing 50 Kg equivalent to 0.035 cubic metre. Sand is measured in boxes of suitable size (say of 40 x 35 x 25 cm). It shall be measured on the basis of dry volume. In case of damp sand, the quantity shall be increased suitably to allow for bulkage in accordance with IS:2386-1963 (part-III) or by any approved method.


5.4.2 The mixing of the mortar shall be done preferably in a mechanical mixer. This condition may be relaxed by the engineer taking into account the nature, magnitude and location of the work.

If mixed in the mixer, cement and sand in the specified proportion shall be fed in the mixer and mixed dry thoroughly, water shall be then added gradually and wet mixing continued for at least 3 minutes. In case of hand mixing also after mixing dry on a water-tight masonry platform, water shall be added and the mortar turned over and over, backward and forward several times.

5.4.3 Fresh mixed mortar, in case becoming stiff due to evaporation of water may be retempered by adding water as frequently as needed to restore the requirement of the consistency but this shall be permitted only upto a maximum of 2 hours from the time of addition of cement in the mortar.

5.5 Brick Work

5.5.1 Storage and handling bricks

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 51 of 180
			REVISION : 0
			EDITION : 1

Bricks shall not be dumped at site. They shall be carefully handled and carefully stacked in regular tiers to avoid breakage and defacement of bricks and prevent contamination by mud or other materials. The supply of bricks shall be so arranged that as far as possible at least two days' requirement of bricks is available at site at any time. Bricks selected for different situations of work shall be stacked separately.

5.5.2 Soaking & Cleaning bricks

Bricks required for masonry shall be cleaned to be free from dirt, dust and sand and fully soaked in clean water by submerging in vats before use, till air bubbling ceases. The bricks shall not be too wet at the time of use. After soaking they shall be removed from the tank sufficiently early so that at the time of laying they are skin dry and stacked on a clean space.


5.5.3 Setting out

The building lines shall be set out by the Contractor as per clause 7 of IS: 2212-1991 and got checked by the Engineer.


5.5.4 Laying of bricks

5.5.4.1 Brickwork in general shall be as per IS 2212-1991. Bricks shall be laid in English bond, unless otherwise specified, with frogs upward over a full bed of evenly laid mortar, and slightly pressed and tapped into final position to the lines levels and shape as shown in the drawing fully embedded in mortar. All joints including inside faces shall be flushed and packed. Not more than 8 courses shall generally be laid in a day. The first course itself shall be made horizontal by providing enough mortar in the bed joint to fill up any undulations. The horizontality of courses and the verticality of wall shall be checked very often with spirit level and plumb bob respectively.

5.5.4.2 Horizontal joints shall be truly horizontal and vertical joints shall line up in every alternate course. The joints shall not exceed 10 mm in thickness and shall be well finished and neatly struck. The joints shall be kept uniform throughout the brick work. All the brick joints of the face works shall be neatly raked out to a minimum depth of 15 mm with the help of raking tools and the faces of brick wall cleaned with wire brush to remove any splashes of mortar before the close of the day's work, while the mortar is still green and the last brick layer shall be cleaned with wire brush and the frogs free from mortar.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 52 of 180
			REVISION : 0
			EDITION : 1

- 5.5.4.3 Walls coming in contact with R.C.C. structures shall perfectly be bonded with M.S. inserts or lugs where shown on drawings and the sides butting against the R.C.C structures neatly and efficiently flashed and packed with rich mortar & cement slurry at no extra cost (cost of M.S. inserts or lugs used shall be measured and paid separately under relevant items). Where such lugs are not required to be provided, brick work shall be built tightly against columns, slabs or other structural parts, around door and window frames with proper distance to permit caulked joint. Where drawings indicate structural steel column or beam to be partly or wholly covered with brick work, bricks shall be built closely against all flanges and webs, with all spaces between steel and brick work filled solid with mortar not less than 10 mm thick.
- 5.5.4.4 Damaged or broken brick or brick bats shall not be used in brick work. Cut bricks may be used to complete bond or as closers or around irregular openings.
- 5.5.4.5 Bricks shall not be thrown from heights to the ground, but shall be handled carefully and put gently in position to avoid damaging their edges.
- 5.5.4.6 Selected bricks of regular shape and dimension shall be used for face work.
- 5.5.4.7 Making of grooves, sleeves and chases shall be done, during the construction, to the lines, levels and position as shown in the drawing or as instructed by the Engineer. Such sleeves shall slope outward in external walls so that their surface cannot form channels for the easy passage of water inside.
- 5.5.4.8 Fixtures, plugs, frames, pipes, inserts etc., if any, shall be built in at the right places to the lines & levels as shown in the drawings while laying the course and not later by disturbing the brick work already laid.
- 5.5.4.9 Brick walls of one brick thick or less shall have one selected face in true plane and walls more than one brick thick shall have both the faces of wall in true plane.
- 5.5.4.10 All connected brick work shall be carried out simultaneously with uniform heights throughout the work, and in exceptional cases, with the approval of the Engineer, the brick work built in any part of the work may be lower than another adjoining wall/connected wall by a

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 53 of 180
			REVISION : 0
			EDITION : 1

maximum of one metre and the difference in height of adjoining wall/connecting wall shall be raked back according to bond by stepping at an angle not steeper than 45 degree, without sacrificing the necessary bond, horizontality of layers, verticality of joints and the wall. Tothing shall not be allowed in brick work, for raking back. The top layer just below the R.C.C slab or beam shall be laid with frogs down over a layer of mortar on full width.

5.5.4.11 Openings in brick work

Openings shall be made in brick work, which may be of any shape, size, at all levels, heights or depths, including round openings, as shown in the drawing or as directed by the Engineer, maintaining the necessary bond using a minimum of cut bricks. Openings in external face walls, the sills, jambs, soffits of opening may be rebated and the sill shall be sloped slightly for drainage of rain water.

- 5.5.4.12 All exposed brick work shall be rubbed down, thoroughly washed, cleaned and pointed as specified. Where face bricks of specific quality are used the same shall be rubbed with carborundum stone.


5.5.5 Half-brick masonry

- 5.5.5.1 Half-brick work shall be done in the same manner as for brick work except that all courses shall be laid in stretchers. Both faces shall be true to plane and the joints raked on both faces.

Where reinforcement is considered necessary or specified and shown in drawing, M.S. bars or hoop iron shall be provided as stipulated in the Schedule of Items or as directed by the engineer. The reinforcement shall be cleaned of rust and loose scale with a wire brush, and shall be laid straight on the mortar and lapped with the dowel bars provided in the column, securely anchoring them at their ends where the half-brick wall butts. The batching of mortar usually shall be in the proportion of 1:4 or as stipulated in the Schedule of Items. Half of the mortar for the joints shall first be laid and the other half laid after the reinforcement is laid in position, so that the reinforcement is fully embedded in position.

5.5.6 Brick on edge masonry

The work brick on edge masonry wall in superstructure shall be done in the same manner as mentioned for brick work except that it shall always be reinforced with wire mesh netting of approved variety as

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 54 of 180
			REVISION : 0
			EDITION : 1

specified in the item and embedded in cement mortar at interval as specified in the Schedule of Items. The wire netting shall be continuously laid and securely anchored with the dowel bars provided & projecting from the walls/RCC structure or steel structures at their ends where brick on edge wall butts. The batching of mortar usually shall be in the proportion of 1:3 or as stipulated in the Schedule of Items.

5.5.7 Protection of brick work

The brick wall shall be protected and covered with gunny bags or

water proof sheets from the effects of inclement weather, rain, frost, etc., during the construction and until the mortar sets. Care shall be taken during construction that the edges of jambs, sills and soffits of openings are not damaged.


5.5.8 Curing

All brick works shall be kept moist for 10 days after laying.

5.5.9 Scaffolding

5.5.9.1 Necessary and suitable scaffolding shall be provided at all heights to facilitate the construction of brick wall. Scaffolding shall be sound, strong and all supports and other members shall be sufficiently strong and rigid, stiffened with necessary bracings and shall be firmly connected to the walls securing them against swing or sway. Planks shall be laid over the scaffolding at required levels. Scaffolding shall preferably be of tubular steel, although the Engineer may permit other material, depending upon the circumstances.

5.5.9.2 Scaffolding shall be double, having two sets of vertical supports, particularly for the face wall and all exposed brick work. Single scaffolding may be used for buildings upto two storeys high or at other locations, if permitted by the Engineer. In such case the inner ends of horizontal members shall rest in holes provided in header course only. Such holes shall not be allowed in pillars under one metre in width, or immediately near the skew backs or arches. The holes thus left in masonry shall be filled with bricks set in rich mortar and the surface made good on removal of scaffolding.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 55 of 180
			REVISION : 0
			EDITION : 1

5.5.9.3 If for any reason the Contractor is required to erect scaffolding in property other than that belonging to the Owner, including municipal corporation or local bodies, necessary permission shall be obtained by the Contractor from the appropriate authorities and necessary licensing fees if any shall have to be borne by him.

5.5.9.4 All scaffoldings once erected shall be allowed to remain in position, efficiently maintained by the Contractor, till all the finishing works required to be done are completed and shall not be removed without the approval of the Engineer.

The Contractor shall allow workmen of other trades to make reasonable use of the scaffolding without any extra cost.

5.6 Stone masonry

5.6.1 General

All aspects of the work shall be in conformity with the "Code of Practice for Construction of Stone Masonry, IS: 1597 (Part-I & II)-1992. Relevant clauses under brick work, such as setting out, making chases, openings, fixing frames and plugs, protection, curing, scaffolding etc., shall apply to stone masonry and concrete block masonry.


5.6.2 Mortar

The mortar used shall be as specified in the Schedule of Items or drawing.

5.6.3 Holes and Plugs

Holes in stone walls shall be left for water supply, plumbing, sanitation, electrification, etc., where shown on drawings or ordered by the Engineer as the work proceeds. These holes shall, on completion, be made good to match with the adjoining wall. The Contractor shall provide and fix wooden plugs, water supply piping and electric conduit pipes etc. where so specified.

5.6.4 Random rubble masonry

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 56 of 180
			REVISION : 0
			EDITION : 1

5.6.4.1 Laying

All stones shall be wetted and cleaned of all dust and loose materials before laying. Stones shall be laid on their natural beds, fitted carefully to the adjacent stones to form neat and close joints fully packed with mortar and chips and spalls of stone may also be used wherever necessary to avoid thick mortar bed or joints. Walls shall be carried to plumb or to the specified batter. Stones may be brought to level course at plinth, window sills and roof levels and the leveling shall be done with concrete comprising of 1 part of the mortar as used for the masonry and 2 parts of 20 mm down graded hard stone chips at no extra cost. Bond shall be provided by fitting in closely the adjacent stones and by using bond stones running through the thickness of wall in a line from the face to back with at least one bond stone, or a set of bond stones, for every 0.5 sq.m. of the wall surface. Face stones shall extend and bond well into the backing. These shall be arranged to break joints as much as possible, and to avoid long vertical lines of joints.

5.6.4.2 Quoins

Quoins shall be of selected stones, neatly dressed with hammer or chisel to form the required angle and laid header and stretcher alternately. No quoin stone shall be smaller than 0.025cum (25dcum in volume and it shall also not be less than 300mm in length, 25% of them being not less than 500mm in length).


5.6.4.3 Joints

The stones shall be so laid that the joints are fully packed with mortar and chips and face joints shall not be more than 20 mm thick. When plastering or pointing is not required to be done, the joints shall be struck flush and finished at the time of laying, otherwise the joints shall be raked to a minimum depth of 20 mm by raking tool during the progress of work, when the mortar is still green.

5.6.5 Coursed rubble masonry - First sort

5.6.5.1 Laying

All stones shall be wetted before use. The walls shall be carried up truly plumb or to specified batter. All courses shall be laid truly

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 57 of 180
			REVISION : 0
			EDITION : 1

horizontal and all vertical joints shall be truly vertical. The height of each course shall not be less than 15 cm nor more than 30 cm.

Face stones shall be laid alternate headers and stretchers. No pinning shall be allowed on the face. No face stone shall be less in breadth than its height and at least one third of the stones shall tail into the work for length not less than twice their height.

The hearting or the interior filling of the wall shall consist of stones carefully laid on their proper beds in mortar, chips and spalls of stone being used where necessary to avoid thick beds of joints of mortar and at the same time ensuring that no hollow spaces are left anywhere in the masonry. The chips shall not be used below the hearting stone to bring these upto the level of face stones. The use of chips shall be restricted to the filling of interstices between the adjacent stones in hearting and these shall not exceed 10% of the quantity of stone masonry. The masonry in a structure shall be carried up regularly but where breaks are unavoidable, the joints shall be raked back at an angle not steeper than 45 degree. Tothing shall not be allowed.

5.6.5.2 Bond Stones

Bond stone or a set of bond stones shall be inserted 1.5 to 1.8 metres apart, in every course.


5.6.5.3 Quoins

The quoins, shall be of the same height as the course in which these occur. These shall be at least 45 cm long and shall be laid stretchers and headers alternately. These shall be laid square on the beds, which shall be rough-chisel dressed to a depth of at least 10 cm. In case of exposed work, these stones shall have a minimum of 2.5 cm wide chisel drafts at four edges, all the edges being in the same plane.

5.6.5.4 Joints

All bed joints shall be horizontal and all side joints vertical. All joints shall be fully packed with mortar, face joints shall not be more than one cm thick.

When plastering or pointing is not required to be done, the joints shall be struck flush and finished at the time of laying. Otherwise, the joints

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 58 of 180
			REVISION : 0
			EDITION : 1

shall be raked to a minimum depth of 20 mm by raking tool during the progress of work, when the mortar is still green.

5.6.6 Coursed rubble masonry - Second sort

5.6.6.1 Laying

Shall be as specified in 5.6.5.1 except that the use of chips shall not exceed 15% of the quantity of stone masonry, and stone in each course need not be of the same height but more than two stones shall not be used in the height of a course.

5.6.6.2 Bond stone, quoins

Shall be as specified for first sort respectively.

5.6.6.3 Joints

All bed joints shall be horizontal and all side joints vertical. All joints shall be fully packed with mortar, face joints shall not be more than 2 cm thick.

When plastering or pointing is not required to be done, the joints shall be struck flush and finished at the time of laying. Otherwise, the joints shall be raked to a minimum depth of 20 mm by raking tool during the progress of work, when the mortar is still green.


5.7 Hollow concrete block masonry

5.7.1 Construction of hollow concrete masonry shall be done in accordance with procedures laid down in IS: 2572-1963. General procedures for construction shall conform to IS: 2212-1991 except for the following :

5.7.2 Storage, handling and preparation

The blocks shall be stored in stable stacks over planks or other supports with sufficient care taken to prevent ingress or moisture.

Blocks shall be handled carefully to avoid cracking. All damaged units shall be rejected and removed from site.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 59 of 180
			REVISION : 0
			EDITION : 1

Blocks need not be wetted before or during placement. Unless the climatic condition so require, the top and sides may be slightly wetted.

5.7.3 Mortars

Mortar for use in hollow concrete block masonry shall be made from cement, slaked lime and sand unless otherwise specified. The mix preparation shall be as recommended in Table-I of IS: 2572-1963. Preparation of mortar shall be in accordance with IS: 2250-1981.

5.7.4 Laying

Laying of block for first and subsequent courses and requirements of horizontal and vertical joints shall be as described in IS: 2572-1963. Use of hollow blocks in foundations shall be avoided. Use of blocks filled with sand and blocks filled with 1:3:6 concrete for foundation courses, plinths and basements shall be done with approval of Engineer. Closure blocks of superstructure shall have all openings battered with mortar. A course of solid concrete block masonry shall be provided under door and window openings or a 10 cm thick precast concrete sill block shall be provided under windows. This course shall extend at least 20 cm beyond the openings on either side. Solid blocks or hollow blocks filled with 1:3:6 concrete shall be used for jambs or fixing of hold fasts etc., Similarly solid blocks or U-shaped blocks filled with 1:3:6 concrete shall be used for roof course. They shall be finished smooth at top with 1:3 cement mortar and covered with a coat of crude oil, craft paper or oil paper for free roof movement.


5.7.5 Bond

Wherever two walls intersect, bond between at least 50% of the units intersecting shall be provided. If intersecting walls are laid separately pockets shall be left in the first wall at a maximum vertical spacing of 20 cm for the corresponding course of second wall to be built into these pockets.

Pilasters shall be of twice the thickness. Hollow blocks shall not be used for isolated piers unless they are filled with 1:3:6 concrete.

6.0 PLASTERING AND POINTING

6.1 Materials

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 60 of 180
			REVISION : 0
			EDITION : 1

The specification of materials shall conform to the requirements as specified in Part-I.

6.2 Plastering

6.2.1 General

Plastering shall be done in accordance with provisions of IS: 1661-1972. Mix proportions of mortar for plastering and thickness of plaster shall be as given either in the drawing, or as per Schedule of Items or as directed by the Engineer. For special plaster work, necessary admixtures shall be added to mortar in required proportion as per manufacturer's specifications or as specified herein. The thickness mentioned in the Schedule of Items shall be minimum thickness.


6.2.2 Preparation of surface

The surface to be plastered shall be cleaned of all extraneous matter and rubbish. In masonry the joints shall be raked to a minimum depth of 12 mm and cleaned with wire brush. Concrete surfaces to be plastered shall be roughened and hacked to form key for plastering. All plastered surfaces shall be finished smooth with a wooden float in one plane and all internal angles shall be finished slightly rounded. If desired by the Engineer, any unevenness shall be rubbed down by carborundum stones. The surface to be plastered shall be wetted evenly before the application of plastering. Trimming of projections on brick/concrete surfaces wherever necessary shall be done.

For one coat plastering the plaster shall be laid slightly thicker than the specified thickness and the surface then leveled with flat wooden float to the required thickness. For two coat plaster work, the first coat (usually half of total thickness) shall be applied as detailed above except that the surface shall be left rough and keys formed for the application of second coat. The second coat shall be laid on with a wooden float to the specified thickness and shall be applied a day or two after the first coat has set, but has not dried up.

Cement mortar for plastering work shall be used within 30 minutes after adding water to cement and should be kept agitated at intervals of 20 minutes.

If specified cement punning shall be done over the plastered surface by sprinkling neat cement powder evenly on the surface and rubbed

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 61 of 180
			REVISION : 0
			EDITION : 1

smoothly with a trowel to give a fine coating. The plaster shall be kept wet for at least seven days and protected from extreme temperature and weather during this period

The arises of doors and windows shall have richer mortar 1:3 in a width of 75 mm on either side or as required at respective location.

- 6.2.3 Concrete beams, slabs, columns etc. framing into masonry are to be plastered along with masonry walls with these edges wrapped with chicken wire mesh of gauge 24. Overlapping of mesh shall be minimum 75 mm on either side of the edge of the concrete element. Minimum lap for chicken wire mesh shall be 50 mm.

6.3 Cement Pointing

- 6.3.1 Where shown on drawing, Schedule of Items, or as directed by the Engineer, exposed brick faces shall be cement rule pointed. The mortar shall be raked out of the joints to a depth of 12 mm. The dust shall be brushed out of the joints and the wall well wetted.


Unless otherwise specified the pointing shall be made with cement and sand mixed in proportion 1:3. The joints of the pointed work shall be neatly finished truly vertical and horizontal or as directed and the lines shall be kept wet till the cementing material has set and become hard. If required, the whole brick face shall be rubbed and polished with fine grade of carborundum stones. Particular care shall be taken to see that no brick face or brick edge is damaged during this work.

6.3.2 Flush pointing

The mortar shall be pressed into the joints and shall be finished flush and levelled. The edges shall be neatly trimmed with trowel and straight edges.

6.3.3 Ruled pointing

The joint shall be initially formed as for flush pointing and then, while mortar is still green, a groove of required shape and size shall be formed by running a forming tool straight along the centre line of the joint till a smooth and hard surface is obtained. The vertical joints shall also be finished in similar way. The pointing line shall be uniform in width and truly horizontal in case of floors and ceilings.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 62 of 180
			REVISION : 0
			EDITION : 1

6.3.4 Cut or weather struck pointing

The mortar shall first be pressed into joints. The top of the horizontal joints shall then be neatly pressed back by about 3mm with the pointing tool so that the joint is sloping from top to bottom. The vertical joint shall be ruled pointed. The junctions of vertical joints with the horizontal joints shall be at true right angles.

6.3.5 Raised and cut pointing

This type of pointing shall project from the wall facing with its edges cut parallel so as to have a uniformly raised band about 6mm raised and width 10mm or more as directed. The pointing shall be finished to a smooth but hard surface. the superfluous mortar then shall be cut off from the edges of the lines and the surface of the masonry shall also be cleaned off all the mortar.

Curing

The pointing shall be kept wet for 7 days. During this period it shall be suitably protected from all damages.

6.3.6 Pointing on brick flooring


Specification for this shall be conforming to under sub head "Pointing".

6.3.7 Pointing on random rubble stone masonry

In such pointing, the mortar shall be simply struck off with a trowel and the work left showing the natural irregularities in line and surface of the stones themselves. Other specifications shall remain same as per para 8.3 under sub head "Pointing".

6.4 Rough Cast Concrete Facing

6.4.1 The surface shall be prepared as for Cement plaster and then 2 cm backing coat of cement sand mortar 1:3 shall be applied. Subsequently, when the backing coat is in plastic state, a top coat 12 mm average thick cement and stone chips mixture in proportion 1:3 (stone chips 10 mm size and below) shall be applied by dashing the mixture on top with trowel to produce uniform rough texture. The mix shall again be dashed over the vacant spaces if any. The surface shall afterwards be cured for 10 days. After curing, the surface shall be

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 63 of 180
			REVISION : 0
			EDITION : 1

brushed with hard wire brush to remove loose chips from the surface. A coat of cement wash shall then be applied, the cost of which shall be included in the rate of the item.

6.4.2 Rendered sand faced cement plaster

The surface shall be prepared as for cement plaster. The backing coat shall be 12 mm thick of cement plaster proportion 1:4 (1 cement and 4 sand) and keys shall be formed on the surface. After curing this coat sufficiently, the finishing coat 6 mm thick consisting of grey cement and screened coarse sand to required gradation (1:3) shall be applied and finished to the desired texture to the satisfaction of the Engineer. The surface afterwards shall be cured for 7 days.

6.4.3 Plaster moulding


Where specified, plaster moulding shall be strictly as per drawings and details, and shall run clean and true from proper templates and moulds, to the entire satisfaction of the Engineer. Rates shall include for brick or concrete cores and for any necessary dabbings in cement mortar or brick or metal lath curing and final finish as desired. Where desired, all angles in internal moulding work shall be covered to a radius of 50 mm or as directed without any extra charges.

6.4.4 Floating coat with neat cement

When the plaster has been brought to a true surface with the wooden straight edge, it shall be uniformly treated over its entire area with a paste of neat cement and rubbed smooth so that whole surface is covered with neat cement coating. Smooth finishing shall be completed with a trowel immediately and in no case later than half an hour of adding water to cement.

6.4.5 Pebble dash plaster

Specification shall be same as that for rough cast concrete facing vide 8.4.1 except that pebbles or graded crushed stone, of size 10mm to 20mm or as specified/directed by the Engineer, shall be well washed and drained and then dashed/thrown wet on the plaster surfaces while it is still plastic, using strong whipping motion at right angles to the face of wall, pressed flat and filling uncover parts by hand so that finished surface represents homogeneous look. The finished surface shall be lightly tapped with a trowel to ensure good bond.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 64 of 180
			REVISION : 0
			EDITION : 1

6.5 Punning with Lime or Plaster of Paris

6.5.1 Lime Punning

Lime punning shall be carried out with best quality approved lime. Lime shall be properly stirred, tempered with water to form a homogeneous mass and strained through fine cloth. The punning shall be laid and rubbed and troweled to an uniform smooth even finish using special trowels. Any unevenness shall be rubbed down with fine sand paper. The plaster must be dry before the lime punning is applied. The punning shall be kept wet for a period of 7 days. The lime paste shall be kept wet until use and no more quantity than can be consumed in 10 days shall be prepared at a time. No portion of the surface shall be left out initially to be patched up later on.

6.5.2 Plaster of Paris punning

This shall be provided by using the best quality of plaster of Paris from approved manufacturer. Unless otherwise specified same procedure as for lime punning shall be followed for getting uniform smooth finish.


7.0 FLOORING, PAVING & FACING

7.1 Scope

Flooring, Paving and facing includes flooring, skirting and dado of various types encountered in plants, buildings, pavements etc. as described under respective heads. For the items which have not been covered up in this chapter completely or covered up only partly, specifications suggested by the manufacturers for the materials, surface preparation, workmanship and all other byeworks etc., shall be strictly followed. In addition to this the entire job will have to be carried out as per direction of the engineer, which shall be final.

7.2 Materials

Materials shall conform to Part-I of this series.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 65 of 180
			REVISION : 0
			EDITION : 1

7.3 General

Flooring, skirting & dado may have to be done in discontinuous strips or areas to suit the needs of erection and commissioning of equipment. Flooring shall be done in close co-ordination with erection of equipment or other services and shall keep pace with the demands in respect of commissioning of individual equipment. No claims for extra shall be tenable for reasons of discontinuity of work or delay in having areas available for work.

Unless otherwise specifically included in the Schedule of Quantities or stated in the description of work, no extra shall be payable for works such as forming coves at internal angles, nosing at plinths, steps, window sills and stair treads, dishing in bath rooms, toilet & other places and cutting to line and fair finish to top edge of skirting and dado. Thickness mentioned shall be the minimum.

7.4 Sub-base


Flooring at ground level having sub-base of sand or earth as specified shall be laid in layers of 15 cm, watered and consolidated by rolling with hand roller or ramming with iron rammer and with butt ends of the crow bars. When filling reaches the required level, the surface shall be flooded with water for 24 hours, allowed to dry and then rammed and consolidated to avoid any settlement later. The thickness of the sub-base shall be as specified either in the drawing or in the Schedule of Items.

7.5 Subgrade

The surface shall be brought to the desired level before subgrade is laid, loose pockets shall be filled up and whole surface shall be consolidated by tamping. Vegetable growth and other decomposed matter, rubbish etc., shall be removed.

7.5.1 Hard core subgrade

Where hardcore subgrade is specified, stone/slag boulders/laterite boulders shall be laid closely stacked together, the longer edge being laid vertically. All interstices shall be filled with smaller particles of the same material or with gravel or red earth. The top surface shall be spread with loose moorum sufficient to cover the gap and to achieve

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 66 of 180
			REVISION : 0
			EDITION : 1

uniform top surface. The surface shall then be adequately watered and rolled by roller.

Hard core shall be laid to form the desired slope in the finished floor.

7.5.2 Brick Khoa subgrade

Over burnt bricks shall be used for getting brick khoa as per sizes described in Schedule of Items. The khoa shall be laid uniformly and rammed in dry and wet conditions so as to get a uniform compact surface.

7.6 Cement Concrete Flooring with Integral Finish

Cement concrete shall be mixed, laid, consolidated and cured as described in Chapter "Concrete". Laying of concrete shall be done in alternate panels. The size and division of panels shall be as per direction of Engineer. The mix or grade of concrete shall be as specified in Schedule of Items.


The finished surface may be rendered smooth by trowel finishing to provide an appearance of fine and smooth textured surface and in panels or in geometric pattern as specified in Schedule of Items or as directed by Engineer.

7.7 Concrete Flooring with Granolithic Finish (Artificial Stone Flooring)

Granolithic finish shall either be laid monolithically over base concrete or separately over hardened base concrete. The subgrade shall be either brick khoa/lime concrete/cement concrete, as specified. Flooring shall be laid and finished according to IS : 5491-1967.

7.7.1 Thickness

Unless otherwise mentioned the thickness of flooring including topping shall be either 25 mm or 40 mm or 50 mm as shown on drawing/Schedule of Items. The net thickness of topping shall be 6 mm for 25 mm thick floor, 10 mm for 40 mm and 12 mm for 50mm thick floor. An additional allowance of 2mm in thickness of topping shall be made for cutting and grinding margin wherever polishing is specified in the item. The rate of the item will be inclusive of this.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 67 of 180
			REVISION : 0
			EDITION : 1

7.7.2 Mix

For base or under bed course, the mix shall be 1:2:4 concrete, unless specified otherwise. The mix of the topping shall consist of 1 part cement :1 part coarse sand : 1 part coarse aggregated by volume or 1 part cement and 1 part stone chips. The coarse aggregate shall very hard like granite and well graded and size of chips shall be 3mm for 6mm topping & 6mm to 3mm for 10mm or more thick topping. Minimum quantity of water to get workability shall be added.


7.7.3 Laying

a) Laying of monolithic topping

The concrete base or underbed shall be laid as per specification "Cement Concrete" and levelled upto the required grade. The surface shall remain sufficiently rough to take the finish.

To prevent construction cracks, the panels shall be divided in square or rectangular pattern. For floor finish of 40mm thickness or above, the maximum panel area shall be 2.5 sq.m. with none of the sides exceeding 2.5m, however for lesser thickness these shall be 1.5sq.m. and 2.5m respectively. The dividing strip may be aluminium or glass or as specified and shall have the same depth as that of floor. Within about 2 to 3 hours of laying the base while it is still fully 'green' the topping shall be laid evenly to proper thickness and grade. The topping shall be pressed firmly and rigorously to form full bond with the base/underbed.

The laitance brought to the surface during compression shall be removed carefully without disturbing the stone chips. The surface shall then be lightly troweled to remove all marks and shall be left for sometime till moisture disappears from it. Fresh quantity of cement @ 2.2 Kg per sq.m. of the flooring shall be mixed to form a thick slurry and spread over the surface while concrete is still green. The cement slurry then shall be floated even & smooth. Polishing, if specified, shall be done with polishing machine and the portion where machine cannot be used manually to the satisfaction of the Engineer. If specified so the surface of the flooring shall be finished ribbed, chequered or laid in slope without any extra cost unless specified so in the item. On completion, the floor shall be kept flooded with water

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 68 of 180
			REVISION : 0
			EDITION : 1

for 10 days and shall be adequately protected before it is sufficiently hard.

(b) Laying of topping separately on hardened base

The sub base shall be laid as in clause 7.7.3. The surface of the base concrete shall be thoroughly brushed and cleaned free from all dirt, mortar droppings and laitance etc.. Where the surface has hardened too much, chipping or hacking of the surface may be necessary. The surface shall then be wetted with water for several hours and surplus water mopped. Neat cement slurry at 2.75Kg/sq.m. of surface shall be brushed into the clean surface. The topping then shall be laid as described in clause 7.9.3.

7.7.4 General

The junction of the floors with all plaster dado or skirting shall be rounded off with 1:1 cement sand mortar & polished, if specified or shown in drawing.

7.7.5 Curing


Immediately after laying, the finish shall be protected against rapid drying. As soon as the surface had hardened sufficiently, it shall be kept continuously moist for at least 10 days by means of wet gunny bags or ponding of water on the surface. The floor shall not be exposed to use during this period.

7.7.6 Grinding & finishing

Where grinding is specified, it shall start only after the finish has fully set. The grinding shall be done with carborundum stone of No. 60, then No. 80 and then 120 as per the method as specified in in-situ mosaic flooring. After final polishing, the floor shall be rubbed with oxalic acid and then wax polished.

7.8 Dado & Skirting Work (Grey Cement Skirting/Dado)

A backing coat of 12 mm thick and 15 mm thick shall be applied on walls after proper dabbings of the surface for a finished thickness of 18 mm and 21 mm thick respectively, with cement plaster of proportion 1:4

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 69 of 180
			REVISION : 0
			EDITION : 1

(1 cement and 4 approved quality sand) or as specified. Over this a top coat 6mm/7mm thick consisting of one cement to one stone chips 3 mm nominal size shall be applied. If grinding and polishing specified, the same shall be done as per granolithic flooring with carborundum stones.

7.8 Flooring & Facing with Redoxide of Iron (Red Artificial Stone Flooring)

It shall consist of an underbed or base course and topping over already laid & matured concrete subgrade.

7.9.1 Thickness

Unless otherwise specified the total thickness of the flooring shall be either 40 mm or 25 mm of which the topping shall not be less than 6 mm (net) for 25 mm thickness and 10 mm (net) for 40 mm thickness. The topping shall be of uniform thickness, the underbed may vary in thickness to provide necessary slopes. For vertical surfaces the total thickness shall be 18 mm, of which the topping thickness shall be 6 mm (net). Where grinding (cutting) & polishing is specified a minimum allowance of 2 mm shall be kept for cutting & polishing so that the net specified top thickness is achieved. All junctions of vertical with horizontal shall be rounded neatly to uniform radius of 25 mm or as shown in the drawing.


7.9.2 Mix

i) Course or base course

The underbed for floors and similar horizontal surfaces shall consist of a mix of 1 part cement, 2 parts coarse sand and 4 parts 10 mm down graded stone chips by volume. For vertical and similar surfaces the mix shall consist of 1 part cement to 3 or 4 parts coarse sand by volume as specified in the item.

ii) Topping course

For the topping white cement and red oxide of iron pigment powder shall be dry mixed thoroughly (generally 10:1 by weight) to produce the desired colour when laid. The mix shall then be prepared with 1 part white cement (mixed with pigment) and 3 parts coarse sand by volume. The whole quantity required for

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 70 of 180
			REVISION : 0
			EDITION : 1

each visible area shall be prepared in one batch to ensure uniform colour.

7.9.3 Laying

The underbed shall be laid in panels of maximum area 2.5 sq.m. each and no side shall be more than 1.5m long. For outdoor locations the maximum area shall be 2.0 sq.m. or as specified. The forms for the panels shall have perfectly aligned edges to the full depth of the total thickness of finish. Aluminium or glass dividing strips shall be used as forms. The underbed shall be laid compacted, levelled and brought to proper grade with a screed or float. The topping shall be placed after about 24 hours while the underbed is still somewhat 'Green' but firm enough to receive the topping. The surface of the underbed shall be roughhead for better bonding. The topping shall be rolled for horizontal areas and thrown and pressed for vertical areas to extract all superfluous cement and water to achieve a compact dense mass fully bonded with the underbed. The topping shall then be levelled up by troweling and finished smooth with a slurry made with already prepared cement and pigment mixture. About 2.0 kg of the mixture shall be consumed/per sq.m. for horizontal surface, and 1.0 kg for vertical surface.


7.9.4 Grinding & polishing

Where grinding & polishing specified, the same shall be done 36 hours after laying when the surface has hardened sufficiently. It shall be polished with polishing stone, in sequence of different grades of carborundum stones (first No. 60, then No. 80 & then No.120) till a smooth shiny surface to the satisfaction of the Engineer is achieved. After final polishing, the finished areas shall be rubbed with oxalic acid and then wax polished.

7.10 Terrazzo Flooring & Facing

General

The terrazzo work shall be done by approved firm or specialists. Marble chips used for facing coat of terrazzo work shall be of best quality (from Dehradun or other approved source) and of uniform tint and colour and shall be approved by the Engineer before using in the work. All terrazzo work shall be polished on completion followed by a final wax polish of approved quality.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 71 of 180
			REVISION : 0
			EDITION : 1

Terrazzo work shall be done either cast-in-situ or with precast tiles as specified in the Schedule of Quantities Unless otherwise specified thickness for cast-in-situ terrazzo work shall be 25 mm including base course and for tiles 20 mm excluding mortar bed.

7.10.1 Cast-in-situ terrazzo flooring

It shall consist of an underbed and a topping laid over an already matured concrete subgrade.

7.10.1.1 Thickness

Unless specified otherwise, the total thickness of the finished flooring shall be either 25 mm or 40 mm of which the topping shall be minimum 6 mm (net) for 25 mm and minimum 10 mm net for 40 mm flooring. A minimum allowance of 2 mm in the topping shall be kept for grinding and polishing so as to achieve the minimum specified thickness of topping. All junctions of vertical with horizontal planes shall be rounded neatly to uniform radius of 25 mm or as shown in the drawings.


7.10.1.2 Mix

i) Underbed course

The underbed for floors and similar horizontal surface shall consist of a mix of 1 part cement, 2 parts sand and 4 parts stone chips by volume. The sand shall be coarse. The stone chips shall be 10 mm down well graded. Only minimum water to be added to give a workable consistency.

ii) Topping

Topping shall consist of cement (grey or white) as specified with or without colour pigment, marble powder and marble chips. The proportion of cement and marble powder shall be 3 parts of cement to one part of marble powder by weight. The proportion shall be inclusive of any pigments added to the cement. The proportion to which pigments are mixed with grey or white cement to obtain various shades for the binder, shall be as specified in Table-I of IS : 2114-1984.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 72 of 180
			REVISION : 0
			EDITION : 1

The proportion of marble chips and cement marble powder mix shall be 7 parts of marble chips to 4 parts of cement marble powder mix mixed by volume. Care shall be taken to ensure an even and uniform disposition of the marble chips.

7.10.1.3 Laying


i) Laying of underbed

The underbed shall be laid in panels in the same manner as that for artificial stone flooring. The panels shall not be more than 2 sq.m. in area of which no side shall be more than 2.0 m long. Cement slurry @ 2.75 kg/sq.m. shall be applied before laying over cement concrete/RCC surface/ plastered surface.

Dividing strips made of aluminium or glass shall be used for forming the panels. The strips shall exactly match the total depth of underbed plus topping. In case of in-situ dado work, the sections shall not be more than 60 cm x 60 cm and the aluminium, glass or any other material strips provided similarly.

ii) Laying of topping

After laying, the underbed shall be leveled compacted and brought to proper grade with screed or float. The topping shall be laid after about 24 hours while the underbed is still somewhat 'green' but firm enough to receive the topping. A slurry of the mixture of cement and pigment already made shall be spread evenly and brushed in just before laying the topping. The topping shall be rolled for horizontal areas and thrown and pressed for vertical areas to extract all superfluous cement and water and to achieve a compact dense mass fully bonded with the underbed. The terrazzo surface shall be tamped, troweled and brought true to the required level by straight edge and steel floats in such a manner that maximum amount of marble chips come up and are spread uniformly over the surface and no part of the surface is left without the chips. Excessive troweling should be avoided in early stages lest too much cement may come up the surface leading to surface cracking and requiring more grinding to expose marble chip.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 73 of 180
			REVISION : 0
			EDITION : 1

7.10.1.4 Curing

The surface shall be left dry for air curing for about 12 to 18 hours and then cured by allowing water to stand on the surface or by covering with wet sack for seven days.


7.10.1.5 Grinding & polishing

Grinding and polishing shall be done either by hand or by machine. In case of manual grinding, the process of grinding shall begin after 2 days while in case of machine grinding the process shall start after seven days after completion of laying. First grinding shall be done with carborundum stone of 60 grit size. The floor shall then be washed and cleaned to remove mud and grindings, a grout of cement and colouring pigment in same proportion of the topping shall be applied to cover the pin holes. The surface shall be cured for 5 to 7 days and then ground with machine fitted fine grit blocks (No. 120). The surface shall be again cleaned and repaired as mentioned above and shall be cured for 3 to 5 days. Finally the third grinding shall be done with machine fitted with fine grit blocks (No. 320) to get even and smooth surface without pin holes. The finished surface should show the marble chips evenly exposed.

Where use of machine for polishing is not feasible/ possible rubbing and polishing by hand shall be done in the same manner as specified for machine polishing except that carborundum of coarse grade (No. 60, 80 and 120) for first, second & final polishing. After the floor is polished to the satisfaction of the Engineer, it shall be rubbed with oxalic acid and finally wax polished with 'Mansion' or similar approved floor polish to the entire satisfaction of Engineer. For good result, wax polishing shall be applied on the surface with the help of soft linen over a clean and dry surface and then the polishing machine fitted with bobs shall be run over it. Clean saw dust shall be spread over the floor surface and the polishing machine again operated so as to remove excess wax and leave glossy surface. Floor shall not be left slippery.

7.10.2 Terrazzo cast-in-situ facing, skirting and dado

The work shall be carried out in the same manner as that for terrazzo cast-in-situ floors except that the base or bedding course shall consist of 1:3 cement mortar (1 cement & 3 medium sand) of 12 mm or 15 mm or 20 mm thickness for total thickness 18 mm or 21 mm or 26 mm respectively. As specified earlier, the bedding course shall be laid in

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 74 of 180
			REVISION : 0
			EDITION : 1

panel (not more than 60 cm x 60 cm) divided by glass/ aluminium strips. The topping shall be of 6 mm thick finished and shall be laid when the backing plaster is still green. Special care shall be taken to see that the surface are properly cured.

7.10.3 Terrazzo tile finished flooring/facing

The work will consist of manufactured terrazzo tile and an underbed.

7.10.3.1 Thickness

Unless otherwise specified, the total (net) thickness including the underbed shall be 40 mm for flooring and other horizontal surface and 32 mm for vertical surfaces like dado/skirting. The necessary allowance for cutting and grinding shall be kept to have the specified finished thickness.

7.10.3.2 Tiles : Terrazzo

The tiles shall, unless specifically permitted in special cases, be machine made under quality control in a shop and shall be subjected to minimum hydraulic pressure of 140 kg. per sq. cm.


The tiles shall be composed of a backing and topping. The finished thickness of upper layers shall not be less than 5mm for size of marble chips upto 6mm size and not less than 6mm for size of marble chips upto 20mm size.

The ingredients for topping shall be same as cast-in-situ terrazzo. The thickness of the topping, as specified above, shall be net after grinding & polishing. First grinding shall be given to the tiles at the shop before delivery.

The manufacturer shall supply along with the tiles the grout mix containing cement and pigment in exact proportions as used in topping of the tiles.

7.10.3.3 Mix : Underbed

The underbed for floor and similar horizontal surfaces shall be 1 part lime putty : 1 part surkhi : 1 part coarse sand or 1 part cement : 3/4 parts coarse sand mixed with sufficient water to form a stiff workable mass. The thickness of underbed for the flooring shall be 20mm unless

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 75 of 180
			REVISION : 0
			EDITION : 1

otherwise specified. For skirting and dado and all vertical surface it shall be about 12 mm thick and composed of 1 part cement 3 parts coarse sand.

7.10.3.4 Laying

The underbed mortar shall be evenly spread and brought to proper grade and consolidated to a smooth surface. The base surface shall be roughened for better bond. Before laying the underbed, over the base/subgrade, a coat of cement slurry shall be applied over the subgrade. Before the underbed has time to set and while it is still fairly moist but firm, cement shall be hand dusted over it or cement slurry applied at 4.4Kg of cement per sq.m. and the tiles shall immediately be placed upon and firmly pressed by wooden mallet on to the underbed until it achieves the desired level. The tiles shall be kept soaked for about 10 minutes just before laying. The joints between tiles shall be as close as possible and not more than 1.5 mm wide.

Special care shall be taken to check the level of the surface and the lines of the joints frequently so that they are perfect. When tiles are required to be cut to match the dimensions these shall be sawn and edges rubbed smooth. The location of cut tiles shall be planned in advance and approval of the Engineer taken.

At the junction of horizontal surface with vertical surface the tiles on the former shall enter at least 12 mm under the latter.

After fixing, the floor shall be kept moistened allowed to mature undisturbed for 7 days. Heavy traffic shall not be allowed. If desired dividing strips as specified under Cl. 7.10.1.3 may be used for dividing the work into suitable panels.


7.10.3.5 Grinding and polishing

Procedure shall be same as in-situ terrazzo finished flooring. Grinding shall not commence earlier than 14 days after laying of tiles.

7.11 Glazed Tile Finished Flooring & Facing

This finish shall be composed of glazed earthen tiles with an underbed laid over a concrete or masonry base.

7.11.1 Thickness

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 76 of 180
			REVISION : 0
			EDITION : 1

Unless specified the total thickness shall be 21 mm for flooring & 18 mm for dado/skirting for the underbed.

The necessary cutting into the surface receiving the finish, to accommodate the specified thickness shall be done.

7.11.2 Tiles : Glazed

These shall conform to the requirement of IS : 777. The tiles shall be of earthenware, covered with glazed white or coloured, plain or with designs, of 149 mm x 149 mm or 99mm x 99mm nominal sizes and 5,6 & 7 mm thick unless otherwise specified. Specials like internal and external angles, beads, covers, cornices, corner pieces etc., shall match. The top surface of the tiles shall be glazed with a gloss or matt unfading stable finish as desired by the Engineer. The tiles shall be flat and true to shape. The colour shall be uniform, and fractured section shall be fine grained in textures, dense and homogeneous.


The coloured tiles, when supplied, shall preferably come from one batch to avoid difference in colour.

7.11.3 Mix : Underbed

The mix for the underbed shall consist of 1 part cement and 3 parts coarse sand mixed with sufficient water or any other mix if specified and shall be 12mm thick minimum or as specified.

7.11.4 Laying & finishing

The underbed mortar shall be evenly spread and brought to proper grade and consolidated to a smooth surface. Before laying the underbed, over the base/subgrade a coat of cement slurry shall be applied over the subgrade. Before the underbed has time to set and while it is still fairly moist but firm, cement shall be hand dusted over it and the tiles shall immediately be placed upon and firmly pressed by wooden mallet on to the underbed until it achieves the desired level. The joints shall be practically invisible and filled with non-staining white cement/white cement mixed with pigment for coloured tiles. Internal angles shall be provided with 'specials'. Drains shall be provided with 'specials'. The tiles shall be thoroughly cleaned after completion. The tiles shall be laid to the slope specified in the drawings and truly vertical on walls when used as skirting.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 77 of 180
			REVISION : 0
			EDITION : 1

7.11.5 Curing & cleaning

After flush pointing the joints, the surface shall be cured for 7 days by keeping it wet. The surface shall be then cleaned with soap or suitable detergent, washed fully and wiped with soft cloth to prevent scratching before handing over.

7.12 Marble Flooring

7.12.1 Thickness

Unless specified otherwise the underbed shall be average 20 mm for flooring and 12 mm thick for vertical surfaces. The slabs may be 20 mm, 25 mm, 30 mm or 40 mm thick as specified.

7.12.2 Marble slab


The slabs shall be made from selected stock which are hard, sound, homogeneous and dense in texture and free from flaws, angles and edges shall be true, square, free from chipping and surface shall be plane. The slabs shall preferably be machine cut to the required dimensions. Tolerance of plus or minus 5 mm in dimensions and plus or minus 2 mm in thickness will be allowed. Unless specified the slabs shall be minimum 300 mm x 300 mm. The stone slabs shall come from specific regions and in specified quality with top surface fine chisel dressed. All sides shall also be fine chisel dressed to the full depth to allow finest possible joints.

The slabs shall be delivered to the site well protected against damages and stored in dry place under cover.

7.12.3 Mix : Underbed

The underbed, unless specified otherwise for floor and similar horizontal surfaces shall be 1 part lime putty : 1 part surkhi : 1 part coarse sand or 1 part cement : 4 parts coarse sand mixed with sufficient water to form a stiff workable mass and shall be on 20mm thick bed. For skirting and dado and all vertical surfaces it shall be 12 mm thick and composed of 1 part cement and 3 parts coarse sand.

7.12.4 Laying

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 78 of 180
			REVISION : 0
			EDITION : 1

The sides and top surface of the slabs shall be machine rubbed with coarse sand stone and washed clean before laying. The underbed mortar shall be evenly spread and brought to proper level on the area under each slab. The slab shall be laid over the underbed, pressed and tapped down with wooden mallet to the proper level. The slab shall then be lifted and the underbed corrected as necessary and allowed to stiffen a little. Next, a thick cement slurry at 4.4 Kg of cement per sq.m. shall be spread over the surface. The edges of the slab shall be buttered with slurry of cement, grey/ white/mixed with pigment matching the colour of the stone slabs. The slab shall be gently laid and tapped with wooden mallet to bed properly to a very fine joint and to the required level. All surplus cement slurry shall be removed and the surface mopped clean with wet soft cloth. The laid finish shall be cured for 7 days by keeping it wet.

7.12.5 Polishing, finishing


Fine chiseling shall be done to remove the slight undulations that usually exist at the joints. The polishing and finishing shall be done as specified under terrazzo flooring. However, the joints shall be so fine in the case of stone slabs that grouting shall not be called for.

7.13 Marble in Facia or Dado

Marble tiles of approved shade, variety, size and thickness as specified in the item shall be used. They shall be of selected quality, dense, uniform and homogeneous in texture and free from cracks or other structural defects. The exposed face shall have no unsightly stains, veins and defects. They shall have uniform milky white or coloured shade or patterns of colours approved by the Engineer before ordering the tiles. The surface shall be fine polished and sides machine cut, true to square.

When a single course of marble slab is to be fixed as in dado etc., the slabs shall be fixed as described below :

Mortar pads of 1:3 C.M. (1 cement : 3 coarse sand) of uniform width shall be stuck on to the wall at close intervals and the marble slabs shall be pressed on to them firmly. The remaining cavities if any shall then be filled with thin grout of cement mortar of the same proportion. The sound coming, on gently tapping of the slab, will indicate if there are hollows. When the hollow cannot be filled with grout and the finished slab continues to give a hollow sound on tapping, the slab shall

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 79 of 180
			REVISION : 0
			EDITION : 1

be removed and reset. For the facia work where more than one course is required the marble slabs shall be of matching stand and veins to form architectural pattern as per drawings and shall be fixed in the same way as described above except for the horizontal joints of the slabs, where adjacent slabs shall be held together by a brass pin passing through a hole drilled into the slabs. In addition, wrought iron/dowels shall be provided to anchor the slabs to the wall. The metal cramps shall be counter sunk into the joints of the slab and it shall be located about a metre apart subject to a minimum of one for each slab for each horizontal joint.

The facing shall be fixed truly in plumb and in perfect line or curves as shown on the plans. The courses and joints shall be as directed by the Engineer. The surface shall be protected from sun and rain and cured for 10 days and shall be finally polished with carborundum stones as for skirting & dado of cast-in-situ terrazzo.

7.14 Flooring/Paving with Hardener like Ironite

This will consist of a topping (incorporating iron particles) to bond with concrete base while the latter is 'Green'.

7.14.1 Thickness


Unless otherwise specified in the Schedule of Items, the total thickness of the floor with metallic hardener finish shall be 40 mm or 50 mm of which the topping shall be 10 mm (net) for 40 mm & 12 mm (net) for 50 mm

7.14.2 Material (metallic hardener)

The hardening compound shall be uniformly graded iron particles free from non-ferrous metal impurities, oil, grease, sand soluble alkaline compounds or other injurious materials. When desired by the Engineer, actual samples shall be tested.

7.14.3 Mix

Unless otherwise specified, the mix for underbed shall be of 1:2:4 concrete and stone chips shall be 12 mm down grade. For topping the proportion of the metallic hardener shall be as specified or as indicated by the manufacturer. However, in absence of any such direction 1 part metallic hardener shall be mixed dry with 4 parts cement, by weight.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 80 of 180
			REVISION : 0
			EDITION : 1

To this mixture 6 mm nominal size stone chips shall be added in proportion of 1 part cement (mixed with hardener) to 2 parts of stone chips by volume and uniformly mixed. Minimum quantity of water shall be added to make it workable.

7.14.4 Laying & finishing

The under bedding course of base course shall be laid as per specification of laying underbed for Red artificial stone flooring. The surface shall be roughened by wire brush as soon as possible. The finish top coat shall be laid while the concrete base is still fairly 'green' within about 3 hours of laying of the later. The finish shall be of uniform and even dense surface without trowel marks, pin holes etc. This topping layer shall be pressed firmly and worked vigorously and quickly to secure full bond with the concrete base. Just when the initial set starts the surface shall be finished smooth with steel trowel.

7.14.5 Curing

The finished floor shall be cured for 7 days by keeping it wet.

7.15 Chemical Resistant Tiles Flooring / Facing (Either of natural stone or prepared tiles)


This shall include all varieties of special tiles used for specific chemical resistance function and an underbed over already laid concrete or masonry. The Contractor shall get it done by specialised manufacturer & get guarantee of its performance.

7.15.1 Tiles

The chemical resistant tiles as detailed in the Schedule of Items shall be of the best indigenous manufacture unless otherwise specified and shall be resistant to the chemical described in the Schedule of Items. The tiles shall have straight edges, uniform thickness, plain surface, uniform non-fading colour and textures.

Usually the chemical resistant tiles shall not absorb water more than 2% by weight. The tiles shall have at least compression strength of 700 kg/cm². The surface shall be abrasion resistant and durable.

7.15.2 Laying

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 81 of 180
			REVISION : 0
			EDITION : 1

The mortar used for setting or for underbed the tiles shall be durable and strong. The grout which shall be to the full depth of tile shall have same chemical resistant properties as that of tiles. Joints shall be pointed if so desired. The setting and fixing shall be according to the manufacturer's specification approved by the Engineer.

7.16 Chemical Resistant in Situ Finished Flooring/Facing

Chemical resistant in situ finish shall be as called for in the Schedule of Items. About its performance the Engineer shall have to be fully satisfied by test results and examination of similar treatment already in existence. The Contractor shall get it done by a specialised manufacturer, get guarantee of performance from the organisation and pass it on to the owner in addition to his own guarantee.

7.17 Acceptance Criteria


The Contractors shall satisfy the Engineer specially for the workmanship of the following finished floor :

- (a) Level, slope, plumb as the case may be
- (c) Alignment of joints, dividing strip etc.
- (d) Colour, texture
- (e) Surface finish
- (f) Thickness of joints including the workmanship in joints.
- (g) Details at edges, junctions etc.
- (h) Performance
- (i) Precautions specified for durability.
- (j) Effluent treatment plant

8.0 WOOD WORK

8.1 General

Wood work shall be neatly and truly finished to exact dimensions and details as per drawings, without patching or plugging of any kind. Rebates, roundings and mouldings as shown in drawings shall be

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 82 of 180
			REVISION : 0
			EDITION : 1

made before assembling. Exposed work shall be finished smooth with well planed faces.

All assembly of shutters of doors, windows, ventilators and frames thereof shall be exactly at right angles. In the case of frames, the right angle shall be checked from the inside surfaces of the respective members.

All door and window frames shall be clamped together so as to be square and flat at the time of delivery. Door frames without sills shall be fitted with temporary stretchers.


Horns of frames and other parts that go into or butt against the masonry, shall be protected against moisture and decay with two coats of coal tar or other approved protective material.

All surfaces of the door, window and ventilator frames and shutters which are required to be painted ultimately shall be covered evenly by brush with a priming coat of approved primer. In the case of doors to be polished or varnished, a priming coat of approved polish or varnish shall be given before delivery. No primer shall be applied to the wood work until it has been inspected and passed by the Engineer.

8.2 Joinery

All heads, posts, transoms and mullions etc., of doors, windows and ventilators shall be made out of single pieces of timber only. The heads and post shall be through- tenoned into the mortices of the jamb posts to the full width of the latter and the thickness of the tenon shall be not less than 1.25 cm. The tenons shall be close fitting into the mortices and pinned with corrosion resisting metal pins not less than 8 mm diameter or with wood dowels not less than 10 mm diameter. The depth of rebate in frames for housing the shutters shall in all cases be 1.25 cm and the rebate in shutters for closing in double shutter doors or windows shall be not less than 2 cm. Unless otherwise specified, all joints shall be mortice and tenon joints with the ends of the tenons exposed to view. Joints shall fit truly and fully without fillings. The contact surfaces of tenons and mortices shall be treated, before putting together, with an approved adhesive conforming to I.S :848- 1974 and 851-1978.

8.3 Shrinkage & Tolerance

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 83 of 180
			REVISION : 0
			EDITION : 1

The arrangement, joining and fixing of all joinery work shall be such that shrinkage in any part and in any direction shall not impair the strength and appearance of the finished work.

The tolerance on overall dimensions shall be within the limits prescribed in IS : 1003 (Part 1 & 2)-1983 to 1991.

8.4 Fixing

Door and window frames shall generally be built in at the time the walls are constructed. Alternatively, where permitted by the Engineer, the frames may be subsequently fixed into prepared openings for which purpose holes to accommodate the holdfasts shall be left at the time of construction. Where the frames are subsequently fixed into prepared openings in the wall such openings should be 25 mm more than the overall width of the door, window or ventilator frame to allow minimum 12mm plaster on each jamb. The height of the unfinished opening shall depend upon whether a threshold is required or not. While fixing the door care shall be taken to see that at least 6 mm space is left between the door and the finished floor. The M.S. clamps fixed to the frame shall be inserted in the holes and jammed in cement concrete M-15 or (1:2:4 mix) with 20 mm down graded stone chips after holding the frame in proper position to the line, level and plumb.


The size of the concrete block shall be 250 x 125 x 85mm unless otherwise specified.

8.5 Tarring

Timber in contact with earth, concrete, plaster or masonry shall be treated with boiling coal tar or 2 coats of wood preservative treatment like hot solignum or creosote oil etc. before fixing the frame in position.

8.6 Fittings

Unless otherwise specified, three holdfasts shall be fixed on each side of a door frame, one at the centre point, and the other two at 30 cm from the top and the bottom of the door frames. In the case of windows and ventilators, a pair on each side shall be fixed at quarter points of the frames. Unless otherwise specified the hold-fasts shall be of mild steel plate 40 x 3 x 225 mm long, fish tailed at one end and screwed to the frame in the formed rebates.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 84 of 180
			REVISION : 0
			EDITION : 1

Generally, each door shutter shall be fixed to the frame with three hinges of approved manufacture, one at the centre and the other two approximately 24 cm from the top and bottom of the shutter. Each window shutter shall be fixed to its frame with two hinges at the quarter points.

Locks, handles, door closers, stoppers etc., shall be fitted as shown in drawing or described in the Schedule of Items.


8.7 Doors, windows & ventilators etc.

Dimensions of the various components of doors, windows and ventilators shall be in accordance with IS : 1003 (Part 1&2)-1983 to 1991 Table- III or as shown on the drawings. The work shall be carried out as per detailed drawing. The wooden members shall be planed, smooth and accurate. They shall be cut to the exact shape and size without patching or plugging of any kind. Mouldings, rebates, curves and roundings etc. shall be done as shown in the drawing before the pieces are assembled into the shutter.

The thickness of stiles and rails etc shall be as per IS: 1003 (Part 1&2)-1983 to 1991 unless otherwise specified in the item of works. These shall be properly and accurately mortised and tenoned. Rails which are more than 180mm in width shall have 2 tenons. Stiles and rails shall be made out of single piece upto 200mm in width. In case more than one piece of timber is used for members exceeding 200mm width, they shall be joined with a continuous tongued and grooved joint, glued together and reinforced with rust proof metal dowels or headless pins. The tenons shall pass clear through stiles. the stiles and rails shall have a 12mm groove, unless otherwise shown in the drawing, to receive the panel. In case of double shutters the rebate at the closing junction of the two shutters shall be as per clause 5.5 of IS: 1003-1991 or as shown in the drawing. Primer coat shall not be put before shutters are passed by the engineer.

8.8 Panelled Shutters

These shall conform to IS: 1003 (Part I)-1991. Timber panelled shutters shall be constructed in the form of timber frame work of stiles and rails with panel inserts of timber, plywood, block board, veneered particle board, hard board or asbestos cement board.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 85 of 180
			REVISION : 0
			EDITION : 1

Stiles, rails and panels in door shutters shall be of the same species of wood.

Timber panels shall be of minimum width of 150mm. When made from more than one piece, the pieces shall be jointed with a continuous tongued and grooved joint, glued together and reinforced with metal dowels. No single panel shall exceed 0.5 m² in area. Timber panels shall be fixed only with grooves but additional beadings may be provided either on one side or both sides.

Unless otherwise specified thickness of panel for 35mm thick shutter shall be 15mm and for 40mm and above thick shutter, it shall be 20mm. For 25mm thick shutter, panel thickness shall be 12mm.

Apart from timber panels other materials like plywood, Block board, particle board, Hard board and Asbestos cement may also be used for panelling purpose and shall be fixed with grooves or beading or both as per provisions made in IS:1003 (Part-1)-1991.


Timber suitable for manufacture of door shutter have been grouped under class a,b,c & d in Table 1 of IS: 1003 (Part-1)-1991.

8.9 Glazed Shutters

The openings for glazed shutters shall be rebated and moulded out of solid timber. Plain sheet glass for panels shall be of approved quality as specified. Wherever specified, ground glass or frosted glass of approved quality shall be used in place of plain sheet glass. Unless otherwise specified glass panes shall be fixed by means of moulded beads and suitable MS panel pins. A thin layer of putty shall be applied between glass panes and sash bars and also between glass panes & beading.

8.10 Flush Door Shutters

Unless otherwise specified, flush door shutters shall have a solid/cellular core, a teak wood frame, and shall be faced with approved quality of plywood on both faces. The core and stock shall be made from well seasoned approved timber and treated with approved preservatives. The plywood faces shall be glued on to the solid/cellular core with waterproof glue under pressure and heat. The construction of flush doors shall be such that no difficulty should arise in fixing mortice locks, hydraulic door closers etc. The shutters shall

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 86 of 180
			REVISION : 0
			EDITION : 1

be rebated in the case of the double leaf doors. Where specified flush doors shall be provided with vision panels, rectangular/ round or louvered.

If specified so, the flush door shall be solid block board core or solid particle board core construction. The workmanship and overall finish shall be of very high standard and shall conform to IS:2191 (Part 1&2)-1983 & 2202 (Part 1&2)-1983 to 1991. The shutters shall be procured from approved manufacturer bearing IS certification mark only.

8.11 Other types of shutters

8.11.1 Wooden hand rails


Wooden hand rails shall be of approved quality teak wood fixed to concrete or metal balustrade with concealed steel or metal lugs and bolts as per drg. Joints will be made with concealed crews and dowels. All bends, mitres, coves, moulds etc. will be strictly to proper profile and finally smoothened by sand paper. The hand rail shall be finished with wax or french polish or painting as per direction of the engineer.

8.11.2 Hardware fittings for door, windows & ventilators

All mortice or rim locks, latches, cabinet and wardrobe locks, hydraulic door closers, floor springs etc. shall be of Godrej, Everite make or of similar approved make. The rate shall include for all necessary screws, other adjuncts, fixing in position and is for the completed work. the finish shall be as specified in the schedule of quantities. Door, window and ventilator fittings shall be as per specifications already described. The rates for doors, windows and ventilator shutters shall include the cost of fixing the fittings, with the necessary screws to the shutters and the frame. The cost of fittings only shall be paid separately. Where specified in the schedule of quantities, the cost of fittings shall be included in the rates for doors, windows and ventilators shutters. In such case the contractor shall supply and fix the various fittings strictly to the standard laid down in the schedule of hardware fittings and no separate payment for this shall be made.

8.12 Inspection

The Contractor shall provide all facilities to the Engineer for the inspection of the goods at his premises. No primer shall be applied until the wood work has been inspected and passed by the Engineer.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 87 of 180
			REVISION : 0
			EDITION : 1

The Engineer shall have the option of rejecting any article or asking for replacement of any article found to be defective or not complying with the requirements of this specification and the relevant Schedule of Items.

9.0 METAL DOORS, WINDOWS AND ROLLING SHUTTERS

9.1 General


Doors, windows and ventilators etc., shall be truly square and flat, i.e. free from twist and warp. The general fabrication shall conform to IS:1038-1983 & IS : 1361-1978 as applicable.

9.1.1 Frames shall be constructed of sections which have been cut to length and mitred. They shall be morticed, reinforced, drilled and tapped for hinges and lock and bolt strikes. Where necessary, frames shall be reinforced for door closers. Flash butt welding or any other suitable method which gives the desired requirement, with mitred corners shall be used. Rubber door silencers shall be furnished for the striking jamb. Loose "T" masonry anchors shall be provided. Frames shall finish flush with floor and adjustable floor anchors shall be supplied. Frames shall be brought to site with floor ties/weather bars installed in place. All frames shall be square and flat. Door thresholds shall be provided as shown on drawing. Doors without threshold shall have bottom tie of approved type.

9.1.2 The Contractor shall first submit for the approval of the Engineer, the name and address of the manufacturer whose metal casements and doors and windows he intends to use, together with typical drawings and specifications, describing the details of construction for each type of door/window/ventilator etc.

9.1.3 All steel doors, windows and ventilators shall be either galvanised or painted. All steel surfaces shall first be thoroughly cleaned free of rust, scale or dirt and mill scale by pickling or similar process and then shall be painted with one coat of an approved primer conforming to IS : 102-1962 before despatch. Alternatively they may be galvanised by the "Hot Dip" zinc spray or electro- galvanizing process as described in IS : 1361-1978.

9.2 Fixing

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 88 of 180
			REVISION : 0
			EDITION : 1

Doors, windows and ventilators shall not be built in at the time the walls are constructed but shall be subsequently fixed into prepared openings, as laid down in IS : 1081-1960. Holes to accommodate the fixing lugs are to be left or cut, and the casements fixed after all the rough masonry and plaster work have been finalised. The lugs of the casement shall be jammed in cement concrete (15C Mark)/(1:2:4) mix after holding the casement in proper position, line and level.


The width of the clear unfinished opening in the wall should be 25 mm more than the overall width of the door frame to allow for plaster on each jamb. The height of the unfinished opening shall depend upon whether a threshold is required or not. While fixing the door, care shall be taken to see that at least 6 mm space is left between the door and the finished floor.

9.3 Fittings

Hardware shall be fixed as late as possible, preferably just before the final coat of paint is applied. It shall be fitted in a workmanlike manner, so that it may not work loose and in such a way that screws and pins are not marked and mutilated by hammers and screw drivers. It shall be tested for correct operation. Where specified, doors shall be fitted with a three-way bolting device which can be operated from outside as well as inside, and a locking system, which can similarly be operated from either side. Solid steel bolt handles shall be provided, one on the outside and one on the inside of each shutter. In case of doors provided with a service door, the lock shall be fitted on the service door. All materials shall be the best procurable and shall be approved by the Engineer.

9.4 Normal Steel Plate Doors

Steel doors may be of the hinged type or sliding/ folding type, single shutter or double shutter, and of single-walled or double walled construction, as specified on the drawings or Schedule of Items. All doors shall be provided with a sturdy frame and hold fasts for fixing into the wall. Unless otherwise specified, the frame shall be prepared from mild steel angles of size not less than 65 x 65 x 6 mm electrically welded at the corners and the shutter shall be made from flat steel sheet of 18 gauge or 1.25mm thickness with a frame of mild steel angles not less than 50 x 50 x 6 mm all round, suitably braced. The whole shutter shall be of welded construction and shall be hung at the sides by means of three or four hinges as specified.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 89 of 180
			REVISION : 0
			EDITION : 1

9.4.1 Double Plate flush door shutters

Door shutters shall be 45 mm thick, completely flush design and shall comprise of two outer sheets or 18G or 1.25mm thick steel sheets, rigidly connected and reinforced inside with continuous vertical 20G or 0.99mm thick stiffeners, spot welded in position at not more than 150 mm on centres. Both edges of doors shall be joined and reinforced full height by steel channels placed immediately inside and welded to the door faces. Top and bottom of doors shall be reinforced horizontally by steel channels running full width of door. Doors shall not have more than 2.5 mm clearance at jambs and head, shall have proper level on lock stiles and rails and shall be reinforced at corners to prevent sagging or twisting. Pairs of double doors shall have meeting style edges bevelled or rebated. Where shown on drawing, or in the Schedule of Items, the doors shall be sound-deadened by filling the inside voids with mineral wool or other suitable approved materials. Doors shall be mortised, reinforced, drilled and tapped in shop for hinges, locks and bolts. They shall also be reinforced for closers, push-plates and other surface hardware where necessary. Any drilling and tapering required for surface hardware shall be done at site. Where shown in drawing, provisions, shall be made for fixing glazing, vision panels, louvres etc. Glazing mouldings shall be of 18G or 1.25mm thick steel or extruded aluminium sections with profiles shown in drawing and suitable for fixing 6 mm glass. Louvre blades shall be V or Z shaped sections.


9.4.2 Single sheet door shutters

Single sheet doors shall be made from best quality 18g/1mm mild steel sheets, and shall present a flush surface on the outside. The inside shall be stiffened with a semi-tubular edge and central stiffening rail which shall convey the lock and other fixture. The frames shall be made from best quality steel sections. Wherever required or shown on drawings, provision for fixing glass panes, louvres etc., shall be made.

The manufacturing shall done as specified in "Double Plate Flush Door Shutters".

9.5 Pressed Steel Doors

All pressed steel doors shall be obtained from an approved manufacturer. The frame and shutters shall be fabricated from cold

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 90 of 180
			REVISION : 0
			EDITION : 1

rolled or pressed steel sections. Unless otherwise specified, the thickness of all sheets used for frames shall be not less than 5 mm. The shutters shall be made of sheet steel of 2 mm thickness for single shutter doors and double shutter doors with or without service door. The plates shall be adequately stiffened with suitably placed stiffeners

The double-walled door shutter shall consist of two plates each 2.5 mm thick, separated by a gap of 33 mm in between making an overall thickness of 38 mm or as shown in drawing. The plates shall be adequately stiffened by means of suitably spaced horizontal steel stiffeners.

9.6 Steel Windows, Sashes, Ventilators, etc.

These shall conform to IS : 1038-1983 and IS : 1361-1978 as appropriate and as shown in drawings. The details as called for in the above codes shall be applicable for coupling mullions, transoms, weather bars, pivot arrangements for ventilators, etc.

- 9.6.1 Where composite unit openings are shown in drawings, the individual window units shall be joined together with requisite transoms and mullions. Where aluminium glazing beads are specified, they shall be extruded aluminium channel 9.5 mm x 1.6 mm (Indal Section No. 2209) unless otherwise shown in drawings.


All welds at the corner of casement shall be done by flash butt welding process or any other suitable method which gives the desired requirement and dressed flush on all exposed and contact surfaces.

9.7 Collapsible Gate (Steel)


Mild steel collapsible gates shall be obtained from an approved manufacturer. These shall be of mid bar type made out of double channels each 20 x 10 x 2 mm with 20 x 5 mm diagonals and shall be top hung with roller bearings, and fitted with locking arrangement.

Collapsible gates under 3.0 metre height shall generally have 3 sets of lattices and those over 3.0 metre height, 4 sets of lattices. Guide tracks shall be fitted at the top and bottom, of T-iron 40 x 40 x 6 mm with 40 mm dia bearings in every fourth double channel

9.8 Steel Rolling Shutters and Grills

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 91 of 180
			REVISION : 0
			EDITION : 1

- 9.8.1 Unless otherwise specified the shutters shall conform IS:6248-1979. Laths for rolling shutters shall be made from tested bright cold rolled, annealed M.S. strips, not less than 0.9 mm thick for shutters upto 3.5 M wide and not less than 1.25 mm thick for shutters above 3.5 M wide and machine rolled at 75 mm rolling centres, interlocking with each other. The profile will be such as to prevent excessive deflection under specified wind load.
- 9.8.2 Rolling grills shall be constructed out of 6/8 mm dia rods at 35 mm on centres running horizontally flexible connected with vertical links spaced not more than 200 mm centres. Alternatively, rolling grills shall be made from perforated laths of approved design reinforced with 6 mm dia rods. End locks shall be heavy type and shall be provided at each end of alternate laths unless specified otherwise. Bottom bars shall be finished with two angles not less than 6 mm thick for external shutters. When shown in drawings, a flexible weather strip shall be applied to make tight contact with the floor. Guides shall be of such depth as to retain the shutter under a wind pressure of 150 kg/sq.m. or as specified. Shafts shall be of steel pipe of sufficient size to carry the torsional load with a maximum deflection of 1/360 th of span. Grease packed ball bearings or bushings shall be provided for smooth trouble free operation. Hoods shall be formed of not less than 20 gauge or 0.90 mm thick sheet mild steel, suitably, reinforced to prevent sag. Locks shall be slide bolt and hasp, or cylinder lock operable from both sides. Provision for securing hand chain with padlock, removable handle for hand cranks etc, shall be made as described in scheduled of items and as directed by the Engineer.
- 9.8.3 **Laths for rolling shutters shall be made from tested bright cold rolled, annealed M.S. strips, not less than 0.9 mm thick for shutters upto 3.5 M wide and not less than 1.25 mm thick for shutters above 3.5 M wide and machine rolled at 75 mm rolling centres, interlocking with each other. The profile will be such as to prevent excessive deflection under specified wind load. Rolling grills shall be constructed out of 6/8 mm dia rods at 35 mm on centres running horizontally flexible connected with vertical links spaced not more than 200 mm centres. Alternatively, rolling grills shall be made from perforated laths of approved design reinforced with 6 mm dia rods.**
- 9.8.3 End locks shall be heavy type and shall be provided at each end of alternate laths unless specified otherwise. Bottom bars shall be finished with two angles not less than 6 mm thick for external shutters.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 92 of 180
			REVISION : 0
			EDITION : 1

When shown in drawings, a flexible weather strip shall be applied to make tight contact with the floor. Guides shall be of such depth as to retain the shutter under a wind pressure of 150 kg/sq.m. or as specified. Shafts shall be of steel pipe of sufficient size to carry the torsional load with a maximum deflection of 1/360 th of span. Grease packed ball bearings or bushings shall be provided for smooth trouble free operation. Hoods shall be formed of not less than 20 gauge or 0.90 mm thick sheet mild steel, suitably, reinforced to prevent sag. Locks shall be slide bolt and hasp, or cylinder lock operable from both sides. Provision for securing hand chain with padlock, removable handle for hand cranks etc, shall be made as described in scheduled of items and as directed by the Engineer.

9.8.5 Manually operated shutters/grills

Manually operated shutters shall be easily operable by one person. The speed of operation shall be about 0.3 metres per second. In general, manually operated shutters shall be push pull type for openings upto 9 sqm in area. Larger shutters shall be either chain and gear operated or crank and gear operated. The crank/handle shall be removable. All shutters shall be lockable from one or both sides as described in Schedule of Item or as desired by the Engineer.


9.8.6 Priming coat of shop coat

Shutters shall be painted with one coat of red lead or zinc chromate primer after they are inspected and found in order and acceptable. Where specified, doors shall be galvanized and subsequently painted one coat of zinc chromate for adhesion of field coat.

9.8.7 Erection

Door shall be installed by the manufacturer or his authorised representative and all work shall be as per manufacturer's instructions. Any drilling or cutting to concrete, masonry etc., shall be made good after erection of shutters and all abrasion to shop coat shall be touched up. All electrical work shall be in strict accordance with prevailing Indian Electricity Rules.

9.8.8 Inspection

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 93 of 180
			REVISION : 0
			EDITION : 1

After completing the manufacture of the different components of the rolling shutter, an arrangement for shop inspection by the Engineer shall be made to check the conformity with approved shop drawings.

9.8.8.1 Field inspection

After installing the shutters, the Contractor shall test the performance of the shutter in the presence of the Engineer. The doors shall be smoothly operable under all ambient conditions. All control and locking devices shall give fault-free performance.

9.9 Guarantee

The Contractor shall give one year's guarantee for the successful operation of the shutters. This shall be supported by a separate and unilateral guarantee from the manufacturer of the shutters.


9.10 Aluminium Doors, Windows, Frames

9.10.1 Anodised tubular aluminium doors shall be of approved make and shall be of size and design as per relevant drawing. Unless otherwise specified, the door frame shall be of 101.4mm x 44.6mm and shutter of 50mm tubular extrusions, 3mm thick. The opening arrangement shall be single action or double action as shown in drawing with spring hinges in floor. The glazing shall be 5.5mm thick plain glass panes fixed with necessary gaskets and aluminium beading strip. The door shall be provided with one security lock. The shutters shall be provided with 1.6mm thick 300x150mm push plates and 1.6mm thick 300mm wide kick plate of anodised aluminium for full width of door inside and outside.

The door frames shall be polished and anodized with approved colour. The average thickness of anodic coating shall not be less than 15 microns as per IS: 1868-1982. Door frame shall be provided with approved anchors @ 90 cm c/c maximum for fixing.

9.10.2 Aluminium windows

Aluminium windows and ventilators shall conform to IS:1948-1961 or equivalent as approved by the Engineer. Fixed frame shall be

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 94 of 180
			REVISION : 0
			EDITION : 1

manufactured from aluminium alloy conforming to ISS-HE-9 WP. The fixtures like handles, stoppers, stays, etc., shall also be anodized aluminium and shall be of approved make. Glazing shall be 4mm thick plain glass and shall be fixed with glazing clips and metal putty. It shall conform to IS:1081-1960. Average anodizing coating to windows, ventilators and fixtures shall not be less than 15 microns as per IS : 1868 - 1982.

- 9.10.3 All work shall be fitted and shop assembled to a first job, and ready for erection. Shop joints shall be made to hair lines and then welded or braced by such method as will produce a uniform colour throughout the work. Wherever possible, joints shall be made in concealed locations and on edges of doors. Field connections of all work may be made with concealed screws or other approved type of fasteners. Glazing beads shall be shape fit type without visible screws and shall be of sizes to accommodate glazing. All work shall be adequately braced and reinforced as necessary for strength and rigidity.


10.0 GLAZING

10.1 General

Glazing shall be done with plain, frosted, ground glass or wired cast glass, laminated safety glass or toughened glass etc. as shown on drawings, described in the Schedule of Items or approved by the Engineer. The method of glazing adopted shall be such that movement of the structure, to which the securing is done, does not transmit strain to windows, doors or ventilators as the case may be. The work shall generally conform to IS:1081-1960 "Code of Practice for Fixing and Glazing of Metal Doors, Windows & Ventilators". The material for putty shall consist of whiting and linseed oil, raw-mixed in such proportion as to form a paste conforming to IS : 419-1967.

10.2 Doors, Windows and Ventilators

Windows and ventilators shall be designed for putty glazing fixed from outside and glazed doors for fixing from inside. In addition, spring type glazing clips shall be provided at intervals of 30 cm, or as shown otherwise on drawings or described in the Schedule of Items. These shall be inserted into holes drilled in the shutters or frames as the case may be.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 95 of 180
			REVISION : 0
			EDITION : 1

All glazing shall be puttied to the shutters of frames with good quality putty in addition to glazing clips. Glass panes shall not be placed directly against the metal/timber. A thin layer of putty shall be even spread over the glazing rebate and the glass pressed firmly against it. It shall be secured in position by means of teak wood beads for wooden shutters. Glass panes shall be set without springing & shall be bedded in putty and back puttied, except where moulding or gasket are specified. Putty etc. shall be smoothly finished to even lines. Figured glass shall be set with smooth side out. After completion of glazing work, all dirt stains, excess putty etc., shall be removed and the glass panes shall be left in perfectly acceptable condition. All broken cracked or damaged glass shall be replaced by new ones at the Contractor's cost.

10.3 Northlight Glazing

This shall consist of aluminium or steel glazing bars as shown on drawings or described in the Schedule of Item and be subject to approval of Engineer. The glazing parts shall be securely fixed in their frame and shall be weather-proof. All glazing shall be flashed to the surrounding so as to be weather-proof. Glass shall be fixed to the astragals with glazing clips and putty.

11.0 WHITE WASHING, COLOUR WASHING AND PAINTING

11.1 Scope


This chapter deals with white washing, colour washing, distempering, cement washing, emulsion painting, silicate painting etc., to concrete and masonry surfaces and painting to the wood works and steel works. For the items which have not been completed or partly covered in this chapter, specifications suggested by the manufacturers for the materials, surfaces preparation, workmanship and all bye works shall be strictly followed and shall be carried out as per direction of the Engineer.

11.2 Materials

Materials shall conform to Part - I

11.3 White Washing, Colour Washing

11.3.1 General

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 96 of 180
			REVISION : 0
			EDITION : 1

Wherever scaffolding is required/necessary, it shall be erected on double support tied together by horizontal pieces, over which the scaffolding planks shall be fixed. No part of it shall rest on or touch the surface which is being washed/painted. Where ladders are used, pieces of old gunny bags shall be tied on their tops to avoid damage or scratches to walls. For white washing the ceiling, proper stage scaffolding shall be erected. The surface on which wash is to be applied shall be thoroughly brushed free from mortar droppings and foreign matter.

11.3.2 White Wash


The wash shall be prepared from fresh stone white lime of approved quality and shall be thoroughly slaked on the spot mixed and stirred with sufficient water to make a thin cream. This shall be allowed to stand for 24 hours and then shall be screened through a clean coarse cloth. 4 Kg of gum dissolved in hot water shall be added to each cubic metre of the cream.

The approximate quantity of water to be added in making the cream will be 5 litres of water to 1 Kg of lime. Indigo/ultramarine blue upto 3 gm per kg of lime dissolved in water shall then be added and wash stirred well. Water shall then be added at the rate of about 6 litres per kg of lime to produce a milky solution. The white wash shall be applied with approved brushes to the specified number of coats. The operation for each coat shall consist of stroke of brush given from the top downwards, another from the bottom upwards over the first stroke and similarly one stroke horizontally from the right and another from the left before it dries. The white washing on ceiling shall be done prior to that on walls.

Each coat shall be allowed to dry before the next one is applied and shall be subjected to inspection and approval by the Engineer. No portion of the surface shall be left out initially to be patched up later on.

The finished dry surface shall not show any signs of cracking and peeling nor shall it come off readily on the hand when rubbed. Doors, windows, floors and such other parts of the building not to be white washed shall be protected from being splashed upon.

11.3.3 Colour Wash

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 97 of 180
			REVISION : 0
			EDITION : 1

A priming coat of white wash with lime shall be applied before applying two or more coats of the colour wash (as specified). Entire surface should represent a smooth and uniform finish. Sample of colour wash shall be duly approved by the Engineer before application. Same specification as that of white wash shall be followed for colour wash also using necessary amount of colouring ingredient of approved tint.

11.3.4 White Washing with Whiting


Whiting (ground white chalk) shall be dissolved in sufficient quantity of warm water and thoroughly stirred to form a thin slurry which shall then be screened through a clean coarse cloth. 2 Kg of gum and 0.4 Kg of copper sulphate dissolved separately in hot water shall be added for every cum. of slurry which shall then be diluted with water to the consistency of milk so as to make wash ready for use. Other specification remains same as per white washing with lime.

11.4 Cement Primer Coat

The surface shall be thoroughly cleaned of dust, mortar, droppings etc., and shall be allowed to dry for at least 48 hours. It shall then be rubbed thoroughly be sand paper to give a smooth and even surface. Any unevenness shall be made good by applying putty, made of plaster of paris mixed with water on the entire surface including filling up the undulation and then sand papering the same after it is dry. The cement primer shall preferably be applied by brushing and not by spraying. Horizontal strokes shall be given first and vertical strokes shall be applied immediately, afterwards. This entire operation will constitute one coat. The surface shall be finished as smooth as possible, leaving no brush marks.

11.5 Water-proof cement paint

The prepared surface shall be thoroughly wetted with clean water before water proof cement paint is applied. The paint shall be prepared strictly as per manufacturer's specifications, in the absence of which it shall be mixed in two stages. The first stage shall comprise of 2 parts of water proof cement paint and one part of water stirred thoroughly and allowed to stand for 5 minutes. Care shall be taken to add the paint gradually to the water and not vice versa. The second stage shall comprise of adding further one part of water to the mix and stirring thoroughly to obtain a liquid of workable and uniform

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 98 of 180
			REVISION : 0
			EDITION : 1


consistency. The paint shall be mixed in such quantities as can be used up within an hour of its mixing.

Paint shall be applied with brushes or spraying machine. The solution shall be kept well stirred during the period of application. It shall be applied as far as possible on the surface which is on the shady side of the building so that direct heat of the sun on the surface is avoided. Painted surfaces shall be sprinkled with water 2 or 3 times a day. This shall be done between coats and for at least 2 days following the final coat. The curing shall be started as soon as paint has hardened so as not to damage by sprinkling of water say about 12 hours after the application. A uniform shade should be obtained after application of paint. Cement paint shall not be applied on surfaces already treated with white wash, colour wash, distemper, varnish paint etc., and on gypsum, wood and metal surfaces.

11.6 Synthetic washable distemper

The surface shall be prepared as for Cement Primer Coat. A primer coat of cement or distemper primer shall be applied as specified in the description of the item. Unevenness in the plaster shall be made good by applying plaster of Paris putty mixed with distemper of the colour to be used on the entire surface including filling up the undulations. The surface shall then be rubbed down with a fine grade sand paper and made smooth. After the primer coat has dried for at least 48 hours, the surface shall be lightly sand papered to make it smooth, taking care not to rub the priming coat out. All loose particles shall be dusted off. One coat of distemper properly diluted with thinner, shall be applied with brushes/rollers in horizontal strokes followed immediately by vertical ones which together constitute one coat. The subsequent coats shall be applied in the same way. Two or more coats of distemper as are found necessary shall be applied to obtain an even shade. A time interval of at least 24 hours shall be allowed between consecutive coats. The brushes shall be of 15 cm. double bristled type. They shall be maintained in proper condition and those that are dirty or caked will not be allowed to be used. The finished surface shall be even and uniform without patches, brush marks, distemper drops etc. Sufficient quantity of distemper shall be mixed to finish one room for applying one coat in one operation.

11.7 Dry Distemper

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 99 of 180
			REVISION : 0
			EDITION : 1

The surface shall be prepared in the same manner as for synthetic washable distemper. A primer coat using approved whiting shall be applied over the prepared surface. Distemper prepared as per manufacturer's direction shall be applied and each coat shall be allowed to dry before subsequent coat is applied. The finished surface shall be free from chalking when rubbed, even, uniform and shall show no brush marks.

11.8 Plastic emulsion paint

The surface on which plastic paint has to be laid must be thoroughly cleaned and prepared and all defects rectified and finally prepared in the same manner as for synthetic washable distemper. The surface shall be dry and rubbed smooth by means of sand paper to the satisfaction of the Engineer. One coat primer and two coats of plastic emulsion paint are to be applied. The work is to be carried out under direct guidance and instructions from the manufacturers whose expert advice and supervision are to be made available in order to achieve the high grade finish. The painters employed for this work must be capable of producing the highest standard of workmanship required. If the finish is of doubtful nature, the contractor shall have to rectify at his own cost to the entire satisfaction of the Engineer.

11.9 Bitumen painting


Bitumen painting to concrete surface shall be done as follows :

(i) Hot application

The surface shall be cleaned of all mud etc., before painting. The honey-combs and other defects of concrete surfaces to be painted shall be rectified properly. Any projection of binding wire shall be cut to keep it 10 mm inside the concrete surface and then filled with mortar. Before application the surface shall be absolute dry.

Bitumen of standard quality as specified shall be heated to the temperature specified by the maker and then applied hot with brushes on the prepared surface. The surface shall be allowed to cool before applying the second coat.

(ii) Cold application

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 100 of 180
			REVISION : 0
			EDITION : 1

The surface shall be prepared in the same way as for hot application. The bitumen emulsion of approved quality shall be applied with special brushes. Where acid resistant treatment is specified such surface shall be covered with approved acid resisting coating to the satisfaction of the Engineer. Before the coating is applied, the surface shall be properly cleaned and prepared in the manner described above.

11.10 Tarring

- (i) Timber surfaces in contact with earth/concrete/ plaster shall be treated with one coat of hot tar or as specified in schedule before fixing.
- (ii) If required steel work in holdfasts and the like shall be treated as above and sanded in addition before being fixed in position.

11.11 Painting to Timber & Steel Surface

11.11.1 General


The priming coat for steel/wood work shall be applied after the surface has been prepared. After the priming coat has dried, all nails, screw holes and cracks shall be filled with putty and surface smoothed with sand paper.

All surfaces must be thoroughly dry before painting work is started and painting in exterior/exposed parts shall not be taken up in wet/humid or otherwise unfavourable weather.

All stains of paint to glasses, walls, fittings and fixtures etc. shall be cleaned thoroughly by applying required turpentine or thinner. The contractor's rate shall include all these.

11.11.2 Painting to timber

- (i) Unless otherwise specified, all timber surfaces shall be treated with one priming coat, one under coat and one finishing coat. Under coat and finishing coat shall be synthetic enamel or as specified. Priming coat shall be of approved primer. In case the surface is to be polished or varnished, a priming coat as approved or specified shall be given. No primer shall be applied to wood work until it has been inspected and passed by the Engineer.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 101 of 180
			REVISION : 0
			EDITION : 1

(ii) Polishing

The surface to be polished shall be prepared in the same manner as specified under painting.

(iii) French Spirit Polish

After preparation of the surface it will be well dusted and then the pores of the wood shall be filled up with a filler made of a paste of whiting in water or methylated spirit with a pigment if so required. The spirit polish shall be prepared by dissolving pure shellac in methylated spirit, @ 0.75 Kg of shellac to 5 litres of spirit, with the addition of pigment if so required.

The polish shall be applied with a pad consisting of cotton wool inside a clean white cloth. Several coats shall be applied with light sand papering from time to time and cleaning the dust before applying next coat except the final coat. The final coat of the polish shall be rubbed thoroughly until the wood feels perfectly dry when touched and gives a satisfactory smooth shining.

(iv) Wax Polishing

After preparation of surface wax polish will be applied. The polish shall be prepared by heating together 2 parts of pure bees wax and boiled linseed oil each over a slow fire. When the wax is completely dissolved the mixture shall be cooled till it is just warm and one part of genuine turpentine is to be added and entire mixture shall be well stirred.


Polish shall be applied in the same manner as specified for spirit polish.

11.11.3 Painting to Steel Surface

11.11.3.1 General

All surfaces shall be thoroughly cleaned of all dirt, grease, rust and mill scale. Areas which become inaccessible after assembly shall be painted before assembly after cleaning the surfaces as described above. The surfaces shall be perfectly dry before painting.

Wherever shop primer painting is damaged, the surfaces shall be thoroughly cleaned and touched up with corresponding primer.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 102 of 180
			REVISION : 0
			EDITION : 1

Site painting shall not be done in frosty or foggy weather or when humidity is such as to cause condensation on the surface to be painted.

11.11.3.2 Steel Structures

Unless otherwise specified all structures shall be painted with two coats of primer. One coat shall be applied at shop and the second coat at site. All structures after erection shall be given two coats of finishing paint and shall be of synthetic enamel of approved colour. The under coat shall have different tint to distinguish from the finishing coat.

11.11.3.3 Galvanized Iron Sheets

All plain and CGI sheets requires surface pre-treatment or use of other patented primer to ensure adhesion of paint to zinc coated surfaces. Such pre-treatment shall be as per manufacturer's specifications. Where pre-treatment is adopted one coat of primer paint of suitable quality shall be applied. Unless otherwise specified the finishing coats shall consist of an under-coat of an aluminium paint having blue tint and a second coat of aluminium paint having aluminium colour.

11.11.3.4 Structures embedded

Exposed surfaces of embedded parts shall be given two coats of red lead graphite primer at shop and finished with two coats of anti-corrosive paint at site after embedment. Type of paint and procedure of painting shall be as per manufacturer's specification. Surfaces to be field welded shall have no paint applied within 100 mm of the welding zone.


12.0 INTERNAL WATER SUPPLY PLUMBING, DRAINAGE & SANITATION

12.1 Scope of Work

The work comprises supply, laying testing, commissioning etc. of water supply, plumbing, drainage & sanitation.

The work includes the following activities connected with the job :

- i) Supply and delivery of all required pipes and other materials.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 103 of 180
			REVISION : 0
			EDITION : 1

- ii) Earthwork in excavation for trenches, pits/chambers/manholes etc.
- iii) Civil works connected with the laying/erection of pipe lines such as making holes in the wall etc. and repairing them after pipe erection, construction of pipe supports, valve chambers, manholes, bedding and covering of pipe laying wherever required.
- iv) Laying and jointing of pipe lines as specified in this chapter
- v) Testing of pipe lines after laying as per standard tests specified in this chapter.
- vi) Back filling of trenches after successful and satisfactory testing.
- vii) Disinfection of the complete piping system in the case of water supply.
- viii) Commissioning of entire network.
- ix) Safe custody of the pipes/materials/equipment/work and other obligation stated elsewhere in the specification.
- x) Any other activities which are not mentioned above but essential and required.

12.1.1 Materials


The materials shall conform to Part-I of this series.

12.2 Water Supply & Plumbing

12.2.1 General

12.2.1.1 General Requirements

The Contractor shall lay all the pipes and fittings in the best workman like manner by skilled workmen and licensed plumbers in conformity with the regulations and requirements of the local appropriate authorities and to the satisfaction of the Engineer. Unless otherwise specified water supply works in buildings shall be carried out in

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 104 of 180
			REVISION : 0
			EDITION : 1

accordance with IS:2065-1983 "Code of Practice for Water Supply in Buildings" & IS:2064-1993 "Code of practice for selection, installation and maintenance of sanitary appliances".

12.2.2 Installation

All works like earth work, masonry, concrete, steel work, cutting holes, chases in brick, concrete & RCC works, cutting of roads, repairs and rectifications associated directly with the installation of water supply system shall come under the scope of the contractor and shall be governed by the specification of the relevant chapter.

12.2.3 Laying


Before lowering down for laying in the trenches, the pipes shall be checked against crack by means of light hammering and for any other damage. All fixing shall be carefully aligned and spaced at a distance from the main structure to give reasonable all round access for maintenance and inspection and laid true to line plumb and level. Any deviation shall need approval of the Engineer. Meticulous care shall be taken to avoid chances of airlock and water hammer.

Pipes shall be laid on continuous unyielding surface holder or on reliable supports at least one near each joint and spacings as directed by the Engineer. The support must be strong, neat and shall have provisions for securing the pipes in every direction and easy maintenance. If situation requires, pipes shall be encased or concealed in masonry or concrete if shown on drawing or directed by the Engineer. Pipes embedded in floors and wall shall be securely bound so as not to allow any movement due to expansion and contraction. adequate width shall be provided to lay the pipes as per standard practice.

Excavation below the required level is not permitted. The contractor shall make good any excess excavation as directed by the Engineer.

Soft spots in the bottom of beds for pipe lines in rock shall be leveled with sand or soft soil or concrete as approved by the Engineer and the thickness of the layer shall not be less than 100mm.

12.2.4 Excavation for pipe lines in trenches

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 105 of 180
			REVISION : 0
			EDITION : 1

Excavation shall comply with chapter 2. The sides of pits and trenches shall be adequately supported at all times, except where otherwise directed by the Engineer.

12.2.5 Underground piping in and around building

Underground piping shall be laid at such a depth that it is not likely to be damaged by traffic and other loads and frost, where applicable, and as shown in the drawing and instructed by the Engineer. The thrust blocks shall be provided wherever required.

The size and depth of the trench shall be as approved by the Engineer. Backfilling in trenches shall be done with selected fine earth, unless otherwise permitted, in 150mm layers and carefully consolidated and well treated so that it does not set as a drainage channel. Special care shall be taken while filling in the vicinity of the pipe to avoid damages. Before backfilling the laid pipe shall be fully tested and approved.


12.2.6 Concealed piping

Where desired by the Engineer or shown on the drawings the pipes shall be concealed in masonry or concrete of the adjoining structure by making chases in walls/floors and these shall be secured by hooks and the chases filled with concrete 1:2:4 (1 cement, 2 sand and 4 aggregate). The contractor will rectify, if required the chases, openings and pipes, supplement and make good after laying and testing of the concealed pipelines.

12.2.7 GI.Piping

12.2.7.1 The pipes shall be fixed in longest lengths possible with all necessary bends, tees, couplings, reducing sockets, short piece, jamnut and tees etc. in perfect straight lines both vertically and horizontally.

12.2.7.2 All exposed GI pipes shall be fixed at least 15mm clear of wall face with holder bat clamps at suitable places not exceeding (2.5 metres) centre to centre. Where the pipes are laid in chases in walls as shown in the drawing, these shall be secured to walls by hooks. Chases in walls and floors shall be filled in with cement concrete 1:2:4. Where the pipes are to be run underground these may be laid at least 60 cm below ground level.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 106 of 180
			REVISION : 0
			EDITION : 1

12.2.7.3 The joints of pipes and fittings shall be sealed with red lead paint and fine spun yarn. Joints must be perfectly water tight when put under maximum test pressure.

12.2.7.4 Unless otherwise specified the exposed portion of pipes and fittings shall be given two coats of approved synthetic enamel paint over a coat of approved priming. Pipes laid underground or concealed in walls/floors shall be treated with two coats of bituminous paint.

12.2.8 Jointing of pipes

The interior of all pipes and joints shall be cleaned before jointing commences. Jointing of pipes shall be done in such a manner as to render them completely leakproof and durable. Instruction of the manufacturer shall be followed unless desired otherwise by the Engineer. However, the general norms and recommended practices for different types of pipes are given below for guidance :

(a) Cast Iron

i) Spigot and socket joints :

Interior surface of bells and exterior surface of smooth ends of pipes shall be cleared of redundant insulating cover and other foreign materials particularly of oil, burning off materials from bells and smooth pipe ends. Sharp rises on interior bell surface shall be smoothed out.


Bells should be lined up, in compliance with direction of pipe. Laying work shall be started from lower points.

ii) Lead and Flanged Joint :

Lead joints shall be made as per Sl. 15.4.6.1 and flanged joints as per Sl. 15.4.6.2 of chapter 15.

b) Steel Pipes

Plain ended steel pipes may be jointed by welding. Screwed and socketed joints shall be carefully tightened. Care shall be taken to remove

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 107 of 180
			REVISION : 0
			EDITION : 1

burring from the ends of the pipes. Jointing compound, if used, shall be lead free and approved by the Engineer.

c) G.I Pipes

Threads shall be cut with, sharp tools, and before jointing all scale shall be removed from pipes by suitable means. The screw threads of the pipe shall be cleaned out and the joint made by screwing the fitting after treating the threads with approved pipe jointing compound. Once a joint has been screwed up it shall not be backed off unless threads are recleaned and new compound applied.

d) Asbestos cement pipes


Socket and spigot ended pipes shall be jointed by caulking with tarred gaskets and grouted with 1:3 cement sand mortar.

12.2.9 Precautions

- All water supply pipes shall be so laid and so fixed and maintained as to be and remain completely water tight.
- During installation open ends of each pipe shall be protected by suitable covers or plugs so that the ends, thread, sockets or spigot are not damaged and no foreign materials can make its way into the pipe line.
- Due care should be taken to ensure that there shall be no cross connection whatsoever between a pipe or fitting for conveying or containing wholesome water and a pipe or fitting containing impure water or water liable to contamination or of an uncertain quality of water which has been used for any other purposes.
- Fittings and fixtures liable to be stolen shall be fitted and fixed just before testing and handing over.

12.2.10 Painting

When mentioned in the schedule of item underground steel and cast iron pipes shall be treated with 2 coats of anticorrosive bituminous paint on the outside surface after cleaning the surface from soil, dust,

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 108 of 180
			REVISION : 0
			EDITION : 1

moisture, rust, scales soot etc. When painting is to be done for pipes above ground, G.I. pipes shall be given a coat of zinc chromate primer, C.I. & M.S. pipes shall be given one coat of red lead or zinc chromate primer over which at least 2 coats of paint of best quality and manufacture as approved by the Engineer shall be provided or as specified in the schedule of item.

12.2.11 Ferrule and stop cock box with chamber

Square cast iron surface box 15 cm square and 22.5 cm deep weighing not less than 4.54 Kg with hinged lid shall be provided in masonry chamber. Top of box shall be made flush with the finished level of the chamber. The chamber 25cm x 25cm inside shall be with half brick wall in cement mortar 1:4 over a cement bed concrete of 75mm thick in proportion 1:4:8 with stone chips. The inside wall faces shall be plastered with 12mm thick cement mortar 1:4 finished smooth with a floating coat of neat cement.

The exposed surfaces of cast iron box and cover shall be treated with two coats of bituminous paint.

12.2.12 Inspection, Testing and Acceptance


12.2.12.1 Pipes, fittings and fixtures before laying

All pipes, fittings and appliances shall be inspected, before delivery at the site to see whether they conform to accepted standards. The pipes and fittings shall be

inspected on site before laying and shall be sounded to disclose cracks. Any defective items shall be clearly marked as rejected and forthwith removed from the site.

12.2.12.2 Testing of pipes after laying

General

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 109 of 180
			REVISION : 0
			EDITION : 1


- a) The contractor shall ensure the safety of the pipe work under test and provide all necessary stoppers, testing apparatus etc. that are required for testing.
- b) The contractor shall be responsible for any damage done to pipe work and ancillary work while testing and shall replace any pipe or fitting which does not satisfactorily withstand the test.
- c) The contractor shall give written notice of the times at which tests are to take place. On completion of each test two copies of the complete records shall be given to the Engineer.
- d) The work will not be considered complete until the tests are found satisfactory and a certificate issued by the Engineer.

After laying and jointing, the main shall be slowly and carefully charged with water, so that all air is expelled from the main by providing a 25mm inlet with a stop-cock, allowed to stand full of water for a few days if time permits and then tested under pressure. The test pressure shall be 6Kg/cm² or double the maximum working pressure, whichever is greater. The pressure shall be applied by means of a manually operated test pump, or in the case of long mains or a large diameter, by a power driven test pump, provided that pump is not left unattended. In either case due precaution shall be taken to ensure that the required test pressure is not exceeded. Pressure gauges shall be accurate and shall preferably have been re-calibrated before the test. The pump having been stopped, the test pressure shall maintain itself without measurable loss for at least five minutes. The end of the main shall be closed by fitting a water-tight expanding plug and the plug shall be secured by struts to resist the end thrust of the water pressure in the mains.

12.2.12.3 Testing of service pipes and fittings

The service pipes shall be slowly and carefully charged with water allowing all air to escape avoiding all shock or water hammer. The service pipe shall then be inspected under working conditions of pressure and flow. When all draw-off taps are closed, the service pipes shall be absolutely watertight. All pipings, fittings and appliance shall be checked for satisfactory support and protection from damage, corrosion and frost.

12.2.13 Storage Tank

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 110 of 180
			REVISION : 0
			EDITION : 1

12.2.13.1 Pressed steel tank


Pressed steel water storage tanks shall be of nominal size and capacity as mentioned in the Schedule of Item and fabricated with all flanges external / internal or bottom flange internal and side flanges external, as shown on drawings or schedule of items. Inlet, overflow, vent pipes and manholes shall be arranged and provided as shown in drawing or mentioned in the schedule. Unless otherwise specified, the outlet pipe shall be 50mm above the bottom of the tank and there shall be 150mm free board at the top of the tank. The fabricator shall supply 5 prints of fabrication drawing to the Engineer for prior approval showing thickness of plates, method of jointing the plates. All supports, stays, gussets etc. Pads, cleats etc., required for supporting the tanks shall also be supplied by the manufacturer.

All tanks shall be supplied with mosquito-proof top with manhole not less than 450mm diameter. Tanks deeper than 1.00 Metre shall be provided with M.S. internal access ladder adjacent to the manhole. Meter level indicator shall be provided if asked for. Two coats of anticorrosive paint over a suitable primer shall be applied to both internal and external surface of tanks. The paint shall be so selected as not to impart any taste or odour of water and be of lead free composition.

12.2.13.2 G.I. Water Tank

G.I. water tanks shall be procured from a reputed manufacturer. The design shall be good enough to withstand the loads safely. Galvanized iron water storage tank shall be made of minimum 16 gauge galvanized iron sheet. Unless otherwise specified plain sheets shall be fixed at the corner to angle iron frames by means of 6 mm rivets at 40 mm pitch for tanks upto 1000 litres capacity and 8 mm rivets at 35 mm pitch for tanks above 1000 litres capacity. Tanks above 1000 litres shall have 20 mm dia. galvanised iron stays, one fixed to angle framing at top and two in the body of the tank for extra strength. Holes for rivetting shall be drilled and not punched. Lead shall be applied to the joints before rivetting.

Tanks shall have 400 mm dia. holes at the top with hinged covers. The covers shall be made of galvanised iron sheet with angle iron frame. The cover shall be just loose but close fitting to keep out dust and

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 111 of 180
			REVISION : 0
			EDITION : 1

mosquito and will not be airtight. It shall be complete with lockable arrangement.

Tanks unless otherwise specified shall be provided with rising main inlets of 40 mm dia. galvanised iron pipe or as shown on drawing and 40 mm dia. G.I. overflow pipe and 25 mm washout with plug. If specified the rising main shall be connected to the tank with a ball valve near the top which disconnects the supply when tank is full up to the point of overflowing.


The ball valve shall permit the entry of water when the tank is empty and disconnect the supply when the tank is full. It consists of a hollow floating ball made of copper, plastic or hard rubber, 110 mm in diameter attached to an arm which is so pivoted that the end near the pivot close the orifice of the main when the ball is raised to the required height of water in the tank and opens the main as soon as the ball drops with the fall of water level as it is drawn off through the distribution. The ball valve shall be fixed to the tank in such a position that the body of the ball valve submerge when the tank is full upto the water line. The ball valve shall be so adjusted as to limit the level of the water in the tank below the lip of the over-flow pipe, and above the maximum water filled level shall be as per the standard norms for GI water tank.

- 12.2.13.3 Water reservoirs made of concrete or masonry shall be governed by the specification in the relevant chapter. It shall have, inlet, outlet, overflow and wash out with plug and a top MS/CI cover as per schedule of items and drawings.

12.3 Drainage and Sanitation (Internal)

12.3.1 Scope

This section covers the layout and construction of drains for waste water, surface water and sewage together with all fittings and fixtures inclusive of ancillary works, such as connectins, manholes and inspection chambers used within and around the building and the connection to a public sewer upto treatment work, septic tank and soak pit. All sewerage and drainage works shall be executed in accordance with specifications given for different works. All sewerage and drainage works shall be executed by a licensed plumbing supervisor or a licensed plumber and in accordance with IS : 1742-

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 112 of 180
			REVISION : 0
			EDITION : 1

1983 "Code of Practice for Building Drainage" unless otherwise specified.

12.3.1.1 Installation

All pipe lines, locations of fittings and fixtures, etc. shall be as per drawings or as directed by the Engineer. Correctness of lines, plumbs, orientation, symmetry and levels shall be strictly ensured. All items shall be fully secured against movement in any direction and shall be located so as to allow easy maintenance.


All pipelines, fittings and fixtures shall be installed leakproof; when the works under scope of this specification are linked up with works executed by others, the connections shall be such as to prevent any splashing or spilling or emission of foul odour and gasses.

12.3.2 Rainwater Downcomers

Rainwater downcomers shall be standard cast iron or asbestos cement pipes. In case where specifically desired, M.S. pipes may also be used. M.S. pipes shall be painted outside with two coats of anticorrosive paint over a coat of primer. Rain water downcomers shall run along and be secured to walls columns, etc. Where desired by the Engineer these may have to be installed in chases cut in the structure. All pipes shall be well secured and supported by adequately strong brackets. The brackets may be wrought iron clamp type, split ring type or perforated strap iron type as approved by the Engineer. For vertical runs each pipe shall hang freely on its brackets fixed just below the socket. Suitable spacer blocks shall be provided against the vertical surface to which the pipe is fixed. Roof and floor drains and yard gullies shall be installed, if required, by cutting into the structure and grouted with 1:2:4 cement concrete. All gutters shall be provided with removable gratings. All horizontal pipes shall have a minimum fall of 1 in 100.

12.3.3 Gutter

The gutters shall be made of G.I. or A.C. Gutters shall be supplied by reputed specialised firms. Each section shall be sufficiently rigid, edges and corners straight and the slopes perfectly uniform. GI gutters shall have the edges strengthened by suitable means. The joints may be made by rivetting, bolting or soldering.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 113 of 180
			REVISION : 0
			EDITION : 1

Unless specified otherwise the gutters shall have a minimum fall of 1 in 120. Adequate number of string supports shall be provided so that there is no deflection even when the gutter is full. Each joint must have a support. Unless otherwise specified the supports shall be fabricated of MS brackets. All junctions shall be thoroughly watertight. The joints may be made by rivetting, bolting or soldering. All joints between successive lengths of gutters shall have an overlap of at least 5 cm. The drop in the overlap shall always be in the direction of the fall of the gutter. Ends of gutters shall be closed watertight. Junction with rainwater downcomers shall be made fully watertight and secured.

12.3.4 Soil and Drainage Pipes

12.3.4.1 Gradients

If not specified the minimum gradients of soil and drainage pipe line shall be as follows :


100 mm nominal dia	: 1 in 35
150 mm nominal dia	: 1 in 65
230 mm nominal dia	: 1 in 120
300 mm nominal dia	: 1 in 200

12.3.4.2 Relation with water supply pipe lines

Unless specifically cleared by the Engineer, under no circumstances shall drainage and soil pipes be allowed to come close to water supply pipelines.

12.3.4.3 Laying

Each separate pipe shall be individually set for lines and levels. Where lengths of sewer or drain pipes are laid in trench, properly painted sight rails shall be fixed across the trench at a height, equal to length of the boning rod to be used, above the required invert level of the drain or sewer at the point where the sight is fixed. More sight rails shall be required at manholes, change of gradient and intermediate positions if the distance for sighting is more than 16 m apart. The excavation shall be boned in at least one in every 2 m. The foot of the boning rod shall be set on a block of wood of the exact thickness of the wall of the pipe.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 114 of 180
			REVISION : 0
			EDITION : 1

Each pipe shall be separately and accurately boned between sight rails.


12.3.4.4 Support and protection on pipelines

All pipes shall be laid with sockets leading uphill. Preferably the pipe shall rest on solid and even foundations for the full length of the barrel. However, the pipe manufacturer's instruction as approved by the Engineer shall be followed in the matter of support and jointings.

Where pipes are not bedded on concrete, the bed shall be left slightly high and carefully placed so that the pipe barrels rest on undisturbed ground. If anywhere the excavation has been carried too low packing shall be done in concrete. Where laid on rock or very hard ground which cannot be easily excavated to a smooth surface, the pipes shall be laid on a cradle of sand or gravel as desired by the Engineer. PVC or similar pipes shall be laid directly on stable soil and packed with selected soil.

The minimum support and protection for glazed stoneware pipes shall be as follows :

- When cover is less than 1 metre and where pipes are unavoidably exposed above ground surface, the pipes shall be completely encased surrounded with concrete as per IS:4127-1983.
- Where pipes are laid on soft soil with the maximum water table laying at the invert of the pipes, the sewer shall be bedded on concrete 1:4:8 mm with 20mm down aggregates as per IS:4127-1983.
- Where the pipes have to be laid on soft soil with the maximum water table rising above the invert of the pipe, but below the top of the barrel, the pipe sewer shall be haunched with concrete 1:4:8 mm with 20mm down aggregates as per IS:4127-1983.
- Where maximum water table is likely to rise above the top of the barrel the pipe sewers shall be completely encased/surrounded with 1:4:8 concrete with 20mm down aggregate as per IS:4127-1983.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 115 of 180
			REVISION : 0
			EDITION : 1

Vitrified clay pipes shall be laid on a bed of 150mm thick cement concrete (1:3:6) nominal mix by volume.

Cast iron pipes and concrete pipes may be supported on suitable concrete or brick support, where specified. The support shall be unyielding and strong enough. At least one support shall be located close to ends. Spacing of intermediate supports shall be as decided by the Engineer. Pipes shall be secured to the supports by approved means.

Anchoring of pipes where necessary shall be achieved by suitable concrete encasing designed for the expected thrust.

12.3.4.5 Entry into structures


For entry of the pipes lines into any building or structure suitable conduits under the structure or sleeves shall be used. The conduits and sleeves shall be such as to allow easy repairs and replacement of the pipes. Where openings or chases are required to be made in the structure for entry of pipe lines, locations and sizes shall be marked and checked by the Engineer. After laying of the pipeline, the openings and chases shall be mended.

12.3.4.6 Traps and Ventilating pipes

- a) Pipes carrying the sewage from water closets and waste water and overflow water from baths, wash basins, sinks shall be trapped immediately beneath such fixtures. Traps shall have minimum water seal of 50mm and shall be ventilated whenever such ventilation is necessary to maintain water seal of the trap. Ventilating pipes shall be carried up vertically from the drain to a height of at least 600mm above the outer covering of the roof top of the building or as shown on drawings. All vertical ventilating, anti-siphonage and similar pipe shall be covered on top with a cowl. The cowl shall be made of C.I. unless desired otherwise by the Engineer.

Connecting to existing sewer lines shall be through a manhole.

- b) **Sand Cast Iron Spigot and Socket pipe and fittings**

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 116 of 180
			REVISION : 0
			EDITION : 1

All soil waste and vent pipes and fittings used in the work shall be cast iron and shall conform to IS:1729-1979. The pipes shall have spigot and socket ends, with bead on spigot end and shall be with or without ears. The pipes shall be free from cracks and other flaws. The interior of the pipes and fittings shall be clean and smooth and painted inside and outside with Dr. Angus Smith's solution or other approved anticorrosive paint. Fittings shall include bends, offsets, branches of various types, junctions etc. as required for the work which shall be provided according to drawings and directions of the engineer.

The fittings shall be provided with access doors where so specified or directed by the engineer. The access door fittings shall be of proper design so as not to form cavities in which the filth may accumulate. Doors shall be provided with 3mm thick rubber insertion packing, and when closed and bolted they shall be watertight. The access doors shall have MS studs and bolts or screws or bolts and nuts.

Fixing


The pipes and fittings shall be fixed to wall by means of MS holder bats clamp of approved type and steel bolts or by pipe nails, bobbins etc. as the case may be, keeping the pipe clear from the finished surface of the wall. The holder bat nails shall be fixed to the wall in wooden block. The soil pipe shall be supported at the foot upon a bed of cement concrete of proportion 1:3:6 and firmly attached to the wall.

The pipes shall be laid truly vertically or along the line as shown in the drawing. Connection between main pipe and branch pipe shall be made by using branches and bends with access door for cleaning.

All vertical soil waste, ventilating and anti-siphonage pipes shall be carried up above the roof and provided with suitable C.I. cowl on top.

Pipes outside the building shall be laid underground for which trenches shall be excavated as required for the work. The trenches shall be back-filled with excavated material after the drainage system has been tested and passed.

Jointing (Lead Caulked Joint)

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 117 of 180
			REVISION : 0
			EDITION : 1

Unless otherwise specified, the pipes and fittings shall be jointed with lead joints as described below :

The annular space between the socket and spigot will be first well packed in with tarred gasket or hemp yarn leaving 25mm from the lip of the socket for the lead. The joint may be leaded by using proper leading rings or if they are not available by wrapping a ring of hemp rope covered with clay round the pipe at the end of the socket, leaving a hole through which lead shall be poured in (for pipes with sockets facing a upwards 15mm high small clay band on socket edge may be used).

The lead shall be rendered thoroughly fluid and each joint filled in one pouring. Before caulking, the projecting lead shall be removed by flat chisels and then the joint caulked round with proper caulking tools and a hammer of 2 to 3 pounds in weight in such manner as to make the joint quite sound. After being well set up the joint is to be left flush neat and even with the socket.

Lead for caulking shall conform to IS:782-1978.

Painting

All the exposed CI pipes and fittings shall be painted to match the colour of the surroundings. The surface of the pipes and fittings to be painted shall be cleaned thoroughly and painted 2 coats with approved paint over and including 1 coat of approved primer. Pipes laid underground shall be painted with 2 coats of anti-corrosive paint.


12.3.4.7 Cutting of pipes

Manufacturer's instructions shall be followed for cutting of pipes where necessary. Suitable and approved tools shall be used for the cutting so as to leave surface clean and square to the axis of the pipe.

12.3.4.8 Jointing

Jointing of laid pipes shall be so planned as to avoid completely any movement or strain to the joints already made. If any joint is suspected to be damaged it shall be opened out and redone.

All joints between pipes, pipes and fittings and man- holes shall be gas tight when above ground and watertight when underground. Method of

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 118 of 180
			REVISION : 0
			EDITION : 1

jointing shall be as per instructions of the manufacturer and as approved by the Engineer. However, in the absence of any instruction available from the manufacturer the methods as detailed hereunder shall be used.

(a) Sand Cast Iron Pipes

Jointing of cast iron pipe shall be done as described in SI. No. 12.3.4.7(b).

(b) Concrete pipes

i) Spigot & Socket Joint


The opening of the joint shall be filled with stiff mixture of cement mortar 1:2 (1 cement : 2 fine sand) which shall be rammed with caulking tool.

ii) Collar Joint

Joint shall be done by slipping the collar over and clear of the end of the pipe. The recess at the end of the pipe shall be filled with jute braiding dipped in hot bitumen. Care shall be taken that no off-set of the jute braiding shall be visible either outside or inside the pipe. The collar shall be then set up over the joint covering equally both the pipes and leaving an even caulking space all round. cement and sand mortar (1:1.5) shall then be well punched or pressed home with a caulking tool.

(c) Glazed stoneware pipes

Tarred gasket or hemp yarn soaked in thick cement slurry shall first be placed round the spigot of each pipe and the spigot shall then be placed into the socket of the pipe previously laid. The pipe shall then be adjusted and fixed in the correct position and the gasket caulked tightly so as not to fill more than 1/4 of the socket. The remainder of the socket shall be filled with a stiff mixture of cement mortar of 1:1 proportion. When the socket is filled, a fillet shall be formed round the joint with a trowel,

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 119 of 180
			REVISION : 0
			EDITION : 1

forming an angle of 45 degree with the barrel of the pipe. The newly made joints shall be protected, until set, from sun and rain and shall be covered with damp sacking or other suitable materials.

12.3.5 Trenches and other excavations

Excavation shall be carried out according to chapter-2, Earthwork.

Width of the trench at the bottom shall be such as to provide 200 mm clearance on either side of the pipe for facility of laying and jointing.

Excavated material shall be stacked sufficiently away from the edge of the trench. The spoil bank shall not be allowed to endanger the stability of the excavation. Spoil may be carted away and used for filling the trench behind the work. Turf, top soil or other surface material shall be set aside, turf being carefully rolled and stacked for use in reinstatement. All excavations shall be properly timbered, where necessary. Efficient arrangements for dewatering during excavation and keeping it dry till back filling shall be made to the satisfaction of the Engineer. Sumps for dewatering shall be located away from the pipe layout.


Where the excavation proceeds through roads necessary permissions shall be secured by the contractor from the appropriate authorities.

Special care shall be taken not to damage underground services, cables etc. These when exposed shall be kept adequately supported till the trench is backfilled.

The backfilling shall be done only after the pipeline has been tested and approved by the Engineer. Special care shall be taken for packing with selected material in areas 300 mm around the pipe. At least 300 mm over the pipe shall also be filled with soft earth or sand.

Consolidation shall be done in 150 mm layers. The surface water shall be prevented from getting into the filled up trench. Traffic shall not be inconvenienced by heaping up unduly the backfilling material to compensate future settlement. All settlements shall be made good regularly to minimise inconvenience or traffic where applicable.

12.3.6 Installation of fittings & fixtures

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 120 of 180
			REVISION : 0
			EDITION : 1

12.3.6.1 General

All fittings & fixtures shall be laid out as per drawings and in proper line, level and shall be firmly secured to floors with screws and ditto fix and to walls with wall plugs and screws. Unless otherwise specified only C.P. Brass screws shall be used for fixing sanitary fittings to wall plugs and floors.

12.3.6.2 European pattern WC

Water closet shall be fixed with floor by means of 75 mm long, 6.5 mm diameter counter sunk bolts & nuts embedded in floor using rubber or fibre washers so as not to allow any lateral displacement.

12.3.6.3 Indian Patttern W.C.

The water closet pan shall be sunk into the floor and embedded in a cushion of average 150 mm cement concrete 1:4:8 (1 cement, 4 sand and 8 broken brick ballast of 40 mm size). The concrete shall be left about 125 mm below the top level of the pan so as to allow for flooring and its bed concrete. The joint between the pan and trap shall be made with C.M. 1:1 and joint between trap and CI soil and waste pipe to be made with lead. All the joints shall be leak proof. The WC floor shall slope towards the pan. The foot rest shall be set in cement mortar 1:3 (1 cement : 3 sand).


The cast iron cistern, brackets and flush pipe etc. shall be painted with two coats of approved paint, over and including a coat of approved priming.

12.3.6.4 Wash basin

Wash basin shall be fixed to C.I./R.S. brackets fixed in cement mortar 1:3 (1 cement :3 sand). The brackets shall be fixed to approved wooden wall plugs with screws. C.P. brass trap and union shall be connected to waste pipe if specified.

12.3.6.5 Urinals

The urinal shall be fixed to the walls with C.P. Brass screws fixed to wooden wall plugs. Urinal partitions shall be fixed to walls by making chases in walls and grouting the same in 1:2:4 cement concrete.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 121 of 180
			REVISION : 0
			EDITION : 1

12.3.6.6 Mirror

Fixed type mirror shall be screwed to wall plugs with CP brass screws and shall have a backing of asbestos or similar material as specification in the item.

Swivel type mirror shall be fixed with C.P. brackets which shall be fixed to wall plugs with CP brass screws

12.3.6.7 Soap tray / toilet paper holder

This shall be of flush mounting design and shall be housed in walls by making chases and grouting the same in cement mortar 1:3 unless otherwise specified. All other fittings shall be fixed with screw or as per manufacturer's specification

12.3.6.8 Towel rail & Toilet glass-shelf unit


This shall be fixed with CP Brass screws which shall be fixed to wall plugs.

12.3.6.9 Gully trap

This shall be fixed on 100 mm thick bed and encasement of size 600mm x 600mm x full height of trap shall be provided with cement concrete of proportion 1:4:8 with 40mm stone aggregate. The gully outlet shall be jointed to the branch drain as specified or directed by the Engineer.

12.3.6.10 Masonry chamber for Gully Trap

After fixing and testing gully and branch drain, a brick masonry chamber 300mm x 300mm x 450mm deep or as specified (internal dimensions) in cement mortar 1:4 (1 cement and 4 sand) shall be built with half brick thick wall round the gully trap from the top of the concrete. The internal faces of the chamber shall be finished smooth with 15 mm thick cement plaster (1:4) and neat cement finish. Brick wall exposed to outside shall be finished with 12 mm thick cement plaster 1:4. P.C.C. (1:2:4) band 100 mm thick shall be provided over the brick work with suitable grooves for accommodating R.C.C. cover

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 122 of 180
			REVISION : 0
			EDITION : 1

to be supplied as per drawing and made water tight by providing suitable beading in the band.

12.3.6.11 High level flushing cistern - (fixing flush pipe & cistern)

The W.C. pan shall be connected to the cistern by G.I. 32mm dia or 40mm (O.D) high density polythene flush pipe with holder clamp and brass coupling.

12.3.6.12 Low level flushing cistern

Unless otherwise specified, it shall be connected to the closet by means of 40mm dia white porcelain enameled flush bend using rubber adaptor joints.

12.3.7 Septic tank and effluent disposal

12.3.7.1 Septic tank


Septic tank shall consist of the tank itself with inlet and outlets therefrom complete with all necessary earthwork and backfilling. The details of septic tank shall be as shown on drawing. This item shall also include ventilating pipe of at least 100mm dia whose top shall be provided with a suitable mosquito proof wire mesh and cowl. Generally ventilating pipe shall extend to a height of about 2 metres when the septic tank is at least 15 metres away from the nearest building and to a height of 2 metres above the top of building when it is located closer than 15 metres. Ventilating pipes can be connected to the normal soil ventilating system of the building where allowed.

12.3.7.2 Effluent disposal

The effluent from the septic tank shall be disposed by allowing it into an open channel or a body of water if the concerned authority approves or into a soak pit for absorption by soil or shall be allowed to be absorbed by soil through open jointed S.W pipes laid in a trench filled with broken bricks.

12.3.7.3 Soak Pit

Shall be complete as shown on drawing. In absence of a detailed drawing it shall consist of a 900mm dia pit 1000mm in depth below the invert level of the inlet pipe. The pit shall be lined with stone, brick or

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 123 of 180
			REVISION : 0
			EDITION : 1

concrete blocks with dry open joints backed with at least 75 mm of clean coarse aggregate. The lining above the inlet level shall be set in cement mortar (1:6). The pit shall be filled with brick bats. Inlet pipe shall be taken down to a depth of 900mm from the top as an anti-mosquito measure.

12.3.7.4 Open jointed S.W pipes

Minimum dia of the S.W pipes shall be 200mm nominal. The trench for laying the pipes shall be minimum 600x600mm. The joints of the pipes shall be left unsealed.

12.3.7.5 Commissioning septic tank


After the septic tank has been proved water-tight and the sewage system is checked, the tank shall be filled with water to its outlet level before the sewage is let into the tank. It shall be seeded with well digested sludge obtained from septic tank or sludge digestion tank. In the absence of digested sludge a small quantity of decaying organic matter such as digested cow dung may be introduced.

12.3.8 Manhole/Inspection chambers

Necessary excavation as required for the manhole shall be done true to dimensions and levels as shown in the drawing. The manhole chamber shall be built with brick work in C.M. 1:4 with minimum one brick thick on a base of 100mm thick cement concrete 1:4:8 with 40mm down aggregate or as specified. The concrete bed shall extend beyond the external face of brick work on all sides by at least 75mm. The thickness of wall shall be as indicated. The work shall be carefully built in English bond, the jointing faces of each brick being well buttered with cement mortar before laying so as to ensure a full joint.

The inside of the walls shall be plastered with 15mm thick cement mortar 1:4 and finished with a floating coat of neat cement and outside shall be plastered with 12mm thick C.M. 1:4.

The channels and benching shall be done in cement concrete 1:2:4 with 20mm down stone aggregate and finished with 12mm thick cement plaster in C.M. 1:3. The channels shall be semicircular in the bottom half and of diameter equal to the sewer. Above the horizontal diameter the top edge shall be suitably rounded off. The Branch channels shall also be similarly constructed with respect to benching

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 124 of 180
			REVISION : 0
			EDITION : 1

but at their junction with the main channel an appropriate fall suitably rounded off in the direction of flow of the main channel shall be given. The benching at the sides shall be carried up in a slope of 1 in 3.

All angles shall be rounded to 75mm radius with cement mortar 1:4 and shall be rendered smooth. The internal surfaces shall have a hard impervious finish obtained by using a steel trowel.

The manhole chamber shall be covered on top with RCC (1:2:4) slab with necessary reinforcement as per drawings. Unless otherwise specified circular type light duty M.H. cover with single seal weighting 25 kg. will be provided in each RCC cover.

12.3.9 Testing and acceptance

12.3.9.1 Inspection before installation

All pipes, fittings and fixtures shall be inspected, before delivery at the site to see whether they conform to accepted standards. The pipes shall again be inspected on site before laying by sounding to disclose cracks. All defective items shall be clearly marked and forthwith removed from the site.

12.3.9.2 Testing of pipelines


Comprehensive tests of all pipe lines shall be made by simulating conditions of use. The method of actual test shall be decided by the Engineer. All test data shall be recorded and submitted to the Engineer for review and instruction. The Engineer's discretion regarding tolerance shall be final.

General guidance for the tests are given below :

12.3.9.3 Smoke Test

Soil, waste, vent and all other pipes, when above ground, shall be tested for gas tightness by a smoke test conducted under a pressure of 25mm water gauge and maintained for 15 minutes after all trap seals have been filled with water. The smoke is produced by burning oily waste or tar paper or similar material in the combustion chamber of a smoke machine. Chemical smokes are not satisfactory.

12.3.9.4 Water Test

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 125 of 180
			REVISION : 0
			EDITION : 1

For pipes other than cast iron Glazed ware and concrete pipes shall be subjected to a test pressure of at least 1.5m head of water at the highest point of the section under tests. The tolerance figure of two litres per centimetre of diameter per kilometre may be allowed during a period of 10 (ten) minutes. The test shall be carried out by suitably plugging the low end of the drain and the end of connections, if any, and filling the system with water. A knuckle bend shall be temporarily jointed in at the top end and a sufficient length of the vertical pipe jointed to it so as to provide the required test head or the top end may be plugged with a connection to a hose ending in funnel which could be raised or lowered till required head is obtained and fixed suitably for observation.

Subsidence of test water may be due to one or more of the following causes :

- a) Absorption by pipes and joints.
- b) Sweating of pipes or joints
- c) Leakage at joints or from defective pipes
- d) Trapped air


Allowance shall be made for (a) by adding water until absorption has ceased and after which the test proper should commence. Any leakage and the defective part of the work shall be cut and made good.

12.3.9.5 For cast iron pipes

Cast iron sewers and drains shall be tested as for glazedware and concrete pipes. The drain plug shall be suitably strutted to prevent their being forced out of the pipe during the test.

12.3.9.5.1 For straightness

- i) By inserting at the high end of the sewer or drain a smooth ball of a diameter 13mm less than the pipe bore. In the absence of obstruction, such as yarn or mortar projecting through the joints, the ball will roll down the invert of the pipe and emerge at the lower end and;

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 126 of 180
			REVISION : 0
			EDITION : 1

- ii) By means of a mirror at one end of the line and lamp at the other. If the pipe line is straight, the full circle of light may be observed. The mirror will also indicate obstruction in the barrel if the pipeline is not straight.

12.3.9.6 Testing septic tank

The septic tank shall be tested for water tightness. It shall be filled up with water and allowed to soak for 24 hours. Then, it shall be topped up and allowed to stand again for 24 hours and loss of level recorded. The fall shall not be more than 15mm.

12.3.9.7 Fixtures etc.

All fixtures and fittings shall be connected by watertight joints. No dripping shall be accepted.


13.0 EXTERNAL SEWERAGE & DRAINAGE

13.1 Scope of Work

The work comprises supply, laying, testing, commissioning etc., of sewerage & drainage network as specified.

The work includes the following activities connected with the job.

- i) Supply and delivery of all required pipes and other materials including erection.
- ii) Earth work in excavation for trenches and pits/ manholes.
- iii) Civil works connected with the laying/erection of pipe lines such as making holes in the walls etc., and repairing them after pipe erection, construction of pipe supports, brick / concrete manholes, preparation of concrete bedding and covering for pipe laying wherever required etc.
- iv) Laying and jointing of the pipelines as specified in this chapter
- v) Testing of the pipelines after laying as per standard tests as specified in this chapter.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 127 of 180
			REVISION : 0
			EDITION : 1

- vi) Back filling of the trenches after successful and satisfactory completion of tests for the pipeline laid.
- vii) Cleaning, painting/coating and wrapping etc of pipes and fittings etc.
- viii) Commissioning of entire network laid.
- ix) Safe custody of pipes/material/equipment/work and other obligations stated elsewhere in the specification.
- x) Any other activities which are not mentioned above but essential and required.
- xi) If specified, at road crossing the pipe shall be laid in encasing pipes, wrapped & coated M.S pipes shall be used as encasing pipes. The encasing pipe shall project beyond the berm or both sides of the road. The encasing pipe shall be supported on P.C.C saddles if the site condition warrants so.

13.2 Materials

The materials shall conform to part-I of this series. Sewerage net work in Township shall generally be of R.C.C/S.W.G pipes, R.C.C pipes being used normally for pipe sizes of 400mm dia and above. In plant area, at road crossings etc Cast Iron Pipes may be used.


13.3. Excavation of trenches & pits

Excavation shall be carried out according to Chapter of Earthwork.

Before starting earth work in excavation, temporary drainage arrangement shall be provided to prevent surface water entering the trenches and pits at the cost of Contractor.

Excavation of trenches and pits for pipelines shall be carried out in shortest possible time so as to avoid sinking of ground and consequent damage to the pipelines.

Excavation of trenches for pipelines and surface drains, shall be in exact accordance with the plans and section, alignment, levels and gradients as indicated on the drawings or as directed at site by the Engineer. The final bed must be dressed, levelled or trimmed to proper

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 128 of 180
			REVISION : 0
			EDITION : 1

gradient and rammed with sprinkling of sand and got passed by the Engineer. No excavation shall be made below the specified levels without written permission of the Engineer. Should any excavation be taken below the specified level due to carelessness of the Contractor, he will fill in such excavation at his own expense as specified in clause 2.12.

13.4 Cast Iron Pipes

I.S 3114-1985 has to be followed in general for Laying and jointing of pipes unless otherwise specified.

13.4.1 Back filling

For the purpose of back filling, the depth of the trench shall be considered as divided into the following three zones from the bottom of the trench to its top.

ZONE-"A" From the bottom of the trenches to the level of the center line of the pipe.


ZONE-"B" From the level of the center line of the pipe to a level 300 mm above the top of the pipe.

ZONE-"C" From a level 300 mm above the top to the top of the trench.

Trenches shall not be back filled until the pipe joints have been tested, alignment and gradient passed by the Engineer but back filling shall be done, at least from the bottom of the trench to the level of the center line of the pipe (ZONE "A") leaving 450 mm on either side of the joints uncovered, with earth till testing is completed. These joints should however be kept covered with mats, gunny, straws etc., to avoid damage to joints by temperature effects.

While back filling care should be taken to ensure that no damage should be done to the pipeline. All back fill materials shall be free from cinders, ashes, slag, refuse, rubbish, vegetables or organic material, lumpy or foreign material, boulders, rocks or stones or other materials which in the opinion of the Engineer is unsuitable or deleterious. However, materials containing stones up to 20 cm as the greatest dimension may be used in Zone-"C" unless specified otherwise herein.

Backfilling in Zone-"A" shall be done by hand with sand, fine gravel or other approved material placed in layers of 80 mm and compacted by

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 129 of 180
			REVISION : 0
			EDITION : 1

tamping. The back filling material shall be deposited in the trench for its full width of each side of the pipe, fitting and appurtenances simultaneously.

Backfilling in Zone-"B" shall be done by hand or approved mechanical methods. Special care being taken to avoid injuring or moving the pipes. The type of back fill materials to be used and the method of placing and consolidating shall be prescribed by the Engineer to suit individual locations.

Back filling in Zone-"C" shall be done by hand or approved mechanical methods. The type of back fill materials and method of filling shall be as prescribed by the Engineer.

Paving and metaling shall be reinstated in as good order as before removal and the Contractor shall do adequate ramming and watering of under layers to guard against subsequent settlement all at his cost.

13.4.2 Custody of pipes


The Contractor shall remain responsible for the safe custody of pipes, specials and other materials supplied by him/issued to him either free or on cost recoverable basis till these are laid installed, tested, back filled etc., and handed over to the Engineer.

The Contractor shall verify the conditions of the pipes, specials etc., at the time of receipt from sources and shall be responsible for all damages during handling, transporting, laying, installing, testing etc., and the cost of such damages shall be borne by the Contractor.

13.4.3 Erection/laying of pipelines

- i) Erection of all equipment shall be carried out with highly skilled workers.
- ii) The pipelines shall be laid and supported properly and it shall be deemed as a contractual obligation that the lines are not thrown out of alignment or lifted off during commissioning and subsequent operation.

13.4.4 Pipeline erection

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 130 of 180
			REVISION : 0
			EDITION : 1

All the underground pipelines shall be laid in accordance with IS : 3114-1985.

13.4.5. Handling of pipes & fittings

Unloading of pipes & fittings

While unloading, pipes shall not be dropped down from trucks on hard surface. This should be done with the help of a steadying rope and timber skids. Pipes should not be dragged, specially to the spigot end along hard surface.

Lowering of pipes & fittings

Proper implements, tools etc. shall be provided and used by the contractor while lowering pipes & fittings in the trenches and in no case these should be dropped. Pipes over 300mm dia shall be handled with the help of chain pulley blocks with tripod supports.

Detection of cracks in pipes and fittings


The pipes and fittings shall be inspected for defects and cracks by ringing with a light hammer preferably while suspended. Smearing the outside with chalk dust helps location of the crack. If doubt persists, pouring a little Kerosene on the inside of the pipe at the suspected spot will confirm it as it will seep through.

Cleaning of pipes and fittings

All foreign materials shall be cleaned from the socket and spigot ends both from inside and outside. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being laid. When pipe laying is not in progress, the open ends of the pipe shall be closed suitably.

Cutting of pipe

The cutting of pipe for inserting valves, fittings or closure pieces shall be done in a neat manner without damage to the pipe. Pipe cutting machine may be used for this purpose and in case it is not available, for large diameter pipes electric arc cutting method using a carbon or steel rod may be adopted. The pipes can be cut by using chisels also depending on the circumstances.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 131 of 180
			REVISION : 0
			EDITION : 1

Permissible deflection at socket and spigot joints

Direction

On level ground the socket ends should face the upstream. When the line runs uphill the socket ends should face the upgrade.

Permissible deflection

In case it becomes necessary to deflect pipe from a straight either in the vertical or horizontal plane, due to obstructions or where long radius curve is permitted, the following norms shall be adhered to:-
Lead joint 2.5 degrees Rubber joints

for nominal bore	80 to 300mm	5 degrees
for nominal bore	350 to 400mm	4 degrees
for nominal bore	450 to 750mm	3 degrees

Anchor and thrust blocks

Suitable concrete thrust blocks shall be installed, wherever the thrust is appreciable, specially at dead ends and bends. In case of unbalanced also this may be required. In case of steep gradients and under influence of temperature change also thrust blocks may be required for rigidly joined pipes.


It is advisable to avoid sharp bends above 45 degrees. In soft ground as far as possible two bends should not be put together and be separated by at least one length of straight pipe.

Anchor or thrust blocks shall be generally as per IS : 5330-1984 and thrust resistant design pressure shall be equal to the test pressure.

13.4.6 Pipe jointing

The type of jointing will be defined in the detailed working drawing and Schedule of items i.e. whether they should be (i) socket and spigot with molten lead or lead wool joint or (ii) flanged joint.

13.4.6.1 Socket & spigot joints

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 132 of 180
			REVISION : 0
			EDITION : 1

a) Molten lead joints

Unless otherwise specified, socket and spigot joints shall be done with molten lead.

The spigot shall be cleaned of the coating, carefully entered in the socket of the adjacent pipe by one or more laps of white hampen spun yarn, sufficient yarn only being driven into the socket to leave the depth of the lead specified. The proper depth of each joint shall be tested before running the lead by passing completely round it a wooden gauge, notched out to the correct depth of lead, the notch being held close up against the face of the socket. The pipes shall be carefully packed underneath so that they shall bear properly throughout their whole length.

The lead shall be carefully skinned of all scale when melted in a cast iron pot or patent melting machine. The joints must be perfectly dug before being run with lead. The pipes shall again be examined for line and level and the space left in the socket shall be filled in generally by pouring in melted lead. This may be done best by using proper loading rings or if these are not available, by wrapping a ring or hemp rope, covered with clay round the pipe at the end of the sockets leaving a hole into which lead shall be poured. For large pipes, it is also necessary to leave one or more air vents around lower half of the joints. The lead shall be rendered thoroughly fluid and each joint shall be filled at one pouring. If the pipe is too large for the joint to be filled from one ladle, two or more ladles shall be used. It is to be noted that the lead should be heated to such a temperature as will ensure that it flows completely around the joint. Overheating of lead shall be avoided.

After a section of convenient length has been laid, lead caulking shall be commenced. The lead shall be freed from the loading pipe outside the socket of the other pipe with a flat chisel, and then caulked around 3 separate times, with proper caulking tools of increasing thickness and a hammer 2 to 3 kg in weight in such a manner as to make the joints sound and water tight. After being well and evenly set, the joint is to be left flush neat and even with the socket. The approximate weight of lead and spun yarn for different size of cast iron pipe socket and spigot joints, as per IS : 3114-1985 are given in the Table-I.



BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 133 of 180
			REVISION : 0
			EDITION : 1

TABLE – I

**QUANTITY OF LEAD AND SPUN YARN
FOR DIFFERENT SIZES OF PIPES**

Nominal	Lead / Joint kg
of pipe mm	
80	1.8
100	2.2
125	2.6
150	3.4
200	5.0
250	6.1
300	7.2
350	8.4
400	9.5
450	14.0
500	15.0
600	19.0
700	22.0
750	25.0
800	31.5
900	35.0
1000	41.0
1100	46.0
1200	50.0
1500	66.5

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 134 of 180
			REVISION : 0
			EDITION : 1

Note : The quantities of lead given are provisional and a variation of 20% is permissible either way.


b) Lead wool joint

In the event of the Engineer specifying or permitting the use of lead wool the joint shall be made as follows :

Hempen spun yarn shall be driven into the socket and thoroughly caulked with suitable caulking tools. Lead wool shall then be introduced and this caulking shall be repeated with each turn of lead wool under which the socket is full within 3 mm and the wool of the lead wool is compressed into dense mass. The joint shall then be finally pressed with finishing tool. The table giving the quantity of lead wool and yarn to be used in different sizes of pipes is given in the Table-2

TABLE – 2

Nominal Internal dia	Lead wool weight	Spun yarn weight
in mm	in kg	in kg
80	1.30	0.17
100	1.70	0.23
150	2.41	0.34
175	2.89	0.37
200	3.37	0.57
225	3.63	0.64
250	4.11	0.74
300	4.82	0.82
350	6.04	1.17
375	6.52	1.25
400	7.00	1.33
450	9.64	1.84
500	10.86	1.99

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 135 of 180
			REVISION : 0
			EDITION : 1

Nominal Internal dia	Lead wool weight	Spun yarn weight
in mm	in kg	in kg
600	12.79	2.83
750	15.68	3.52
825	17.12	3.88
900	18.80	4.25
1200	28.44	6.01

Note : Higher tolerance may be permitted under special circumstances depending upon site condition for quality of lead wool and spun yarn.


13.4.6.2 Flanged joints

Flanged joints should be made by painting the facing of the flanged with graphite or red lead freely. Packing should be of rubber insertion sheet or compressed fibre board and of approved thickness. The packing should be of full diameter of the flange with proper pipe hole and bolt holes cut out and even at both the inner and outer edges. All the bolts shall be tightened up evenly on all sides keeping the longitudinal axes of adjoining pipe in exactly the same straight line.

The interior of the pipe must be checked carefully so as to be free from all dust and other foreign matters as the work proceeds. For this purpose a disc plate or brush sufficiently long to pass two or more joints from the end of the pipe last laid shall be continuously drawn forward as the pipes are laid. The ends of the pipes must be securely protected preferably with wooden plugs during the process of the work. The pipes laid must not be made receptacles either for tools, cloth or any other material during progress of the work.

13.4.7 Inspection & testing

- If required all materials shall be inspected by the Engineer before dispatch to site. All the tests shall be carried out in the manufacturer's works and necessary test certificates shall be furnished as proof of such testing. The Contractor shall intimate the Engineer at least two weeks in advance for any such

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 136 of 180
			REVISION : 0
			EDITION : 1

inspection / testing. All facilities for inspection / testing including necessary test certificates shall be provided by the Contractor at his own cost.

- b) After completion of erection all pipelines shall be inspected by the representative of the Contractor and the Engineer. Any discrepancy, defect pointed out during this inspection shall be made good by the Contractor to the entire satisfaction of the Engineer without additional cost.
- c) All pipes with valve and fittings shall be tested to 1.5 times maximum working pressure. The pressure should remain constant for a period of 8 hours. All arrangements for testing shall be done by the Contractor. Any defect found during testing shall be made good by the Contractor to the entire satisfaction of Engineer and the test shall be repeated till acceptable results are achieved. Any special tools, instrument or equipment required for these tests shall be provided by the Contractor for tests only.
- d) All oils, lubricants and other consumables required during tests and trials of different equipment shall be supplied and arranged by the Contractor at his own cost.


13.4.8 Painting

- i) All equipment, valves and other exposed steel parts shall be given a coat of red oxide, zinc chromate or red lead and two coats of final approved quality paint according to the colour scheme of the Purchaser.
- ii) **All the exposed pipes and fittings shall be painted with two coats of paints of approved quality.**

13.4.9 Commissioning

After pressure testing the main, it should be flushed with water of sufficient velocity to remove all dirt and foreign materials.

The system shall be commissioned after all necessary tests have been conducted successfully. All lubricants, oils, and other consumables required for commissioning of the system shall be supplied by the

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 137 of 180
			REVISION : 0
			EDITION : 1

Contractor at no extra cost. Commissioning of the equipment to be supplied, if any, by the Owner, shall be carried out by the Contractor under guidance of the representatives of the supplier of these equipment and Engineer. Any adjustment and/or changes/rectifications that may be found necessary during commissioning of these equipment shall be carried out by the Contractor at his cost.

13.5. Stoneware Glazed Pipelines (S.W.G)

13.5.1 Back filling

Trenches shall not be back filled until the pipe joints have been tested, alignment and gradient passed by the Engineer, but back filling shall be done at least for a depth equal to the diameter of the pipe or 300 mm whichever is greater over the pipes leaving 450 mm on either side of the joints uncovered with earth till the testing is completed. These joints should however be kept covered with mats, gunny bags, straws etc., to avoid damage to joints by temperature effects.


While back filling care should be taken to ensure that no damage is done to the pipelines. The first 300 mm of filling material immediately over and around the pipe should be of soft material free from clods and stones etc. The remainder of the filling materials shall be watered and rammed in layers not exceeding 250 mm at a time.

Paving and metalling shall be reinstated in as good order as before laying of the pipelines.

Unless otherwise required by the Engineer, there shall be a minimum cover of 700 mm over the pipes and at road crossing etc., it shall not be less than 900 mm.

13.5.2 Laying of pipes

The laying of the pipelines shall commence only after the levels of the bottom of the trench at various points have been checked by the Engineer. Cracked pipes whether at the socket or in the body shall be rejected. All SW pipes shall be fitted together on the surface of the ground to ensure a proper fit before they are lowered. The spigots and sockets shall be properly cleaned and brushed, if necessary & then lowered by hand to the bottom of the trench.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 138 of 180
			REVISION : 0
			EDITION : 1

The pipes shall be carefully laid to the alignment, levels and gradients shown on the plans and sections, and great care shall be taken to prevent, sand, earth or other matter from entering the pipes during laying. As it is not permitted to rectify errors of grade by packing up underneath with earth, care should be taken in excavating and slight scraping, if necessary, done to bring to grade. The pipes between manholes shall be laid truly in straight lines without vertical or horizontal undulations.

Bedding, haunching or encasing of the pipes during laying shall be in accordance with IS : 4127-1983 and shall be done with cement concrete in proportion (1:4:8) to prevent ground water from entering the pipelines.

All inverts shall be laid from site rail fixed at the true levels, with proper boning rod. The sight rails and boning rods shall be provided, fixed and maintained by the Contractor at his own expense.

The pipes shall be laid, sockets facing up the gradient, beginning at the lower end, and with the sockets, resting in the socket rest holes cut in the trench bottom. Each pipe shall be laid singly and no pipe shall be laid until the trench has been excavated to its required depth to a distance of twenty yards in front of the pipes to be laid.


No pipes of any description shall be covered until they have been passed by the Engineer.

13.5.3 Jointing of pipes

(a) Cement joint

The stoneware pipes shall be cement jointed normally. In case, if specified so, bituminous joints shall be used. In each joint, spun yarn soaked in neat cement slurry or gasket of tarred yarn shall be passed round the joint and inserted in it by means of suitable jointing tools. More skeins of spun yarn or gasket shall then be added and well rammed home. The yarn shall be moistened to avoid absorbing moisture from cement mortar.

The yarn should be so placed as to centre the spigot of one pipe within the socket of the other and shall prevent the jointing mortar penetrating inside the pipe where it might set and interfere with the flow of sewage.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 139 of 180
			REVISION : 0
			EDITION : 1

Yarn or gasket (cemented or tarred) so rammed shall not occupy more than one-fourth of the depth of socket.

The cement shall be thoroughly mixed with medium sand in the proportion of 1:1 (1 cement : 1 sand) and then just enough water shall be added to make the mix plastic. On no account, the mortar shall be made soft or sloppy. The mix shall then be carefully inserted by hand into the joint.

Special care shall be taken for inserting the mortar into the portion of the joint underneath the pipe. When the cement mortar has been inserted, it shall be punched or caulked into the joint with wooden caulking tools, and more cement mortar shall be added until the space of the joint has been filled completely with tightly caulked cement. No fillet of cement shall be added.

No mortar which is older than 30 minutes shall be permitted for jointing. The cement mortar joints shall be cured at least for seven days before testing.

The inside of each pipe shall be carefully wiped out with a mop or scrapper sufficiently long to pass two joints from the end of the pipe and any projecting cement shall be removed.

All pipes entering the manholes should be set in cement mortar 1:3 and a completely watertight junction effected.


(b) Bituminous joints

If specified so this joint will be used. Asphalt and sand in the ratio of 1:7 shall be boiled together and filled into the socket in a molten state with the aid of special moulds.

13.5.4 Testing of pipes

Testing of pipes shall be done wholly at contractor's expense inclusive of apparatus, provision of water etc., and/or as per IS : 4127-1983.

After cement has had time to set, the pipes shall be tested in lengths between manholes in the following 'manner'. In the lowest manhole a plug shall be inserted in the pipe. The disc in the pipe and at the upper manhole shall be fitted with a filling pipe with a right angle bend and an

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 140 of 180
			REVISION : 0
			EDITION : 1

air cock. The length of pipe shall then be filled with water by means of the pipe connection on the upper disc. The air cock in the upper disc shall be kept open, while the pipeline is being filled to permit the escape of air.

When the pipes have been filled with water and air excluded, the air cock shall be shut and water shall be poured into a conical "Filler" attached to the testing and filling pipe of the disc in the upper manhole until water remains in the filler. The testing or filling pipe shall then be raised and fastened so that the height of the pipe is six feet, which will be the usual test pressure for stone ware pipe joints.

The test will be for an hour or such longer period as may be set by the Engineer. If the water level does not fall more than 25 mm in the length of 90 metre, the test may be considered satisfactory.

If it is found that certain pipe joints are leaking, the water shall be run off and joints recaulked with cement mortar and the test repeated till it is proved by the Contractor that the joints are leak-proof.

13.5.5 Concrete bedding, haunching & encasing


Unless otherwise specified in the Schedule of Quantities, all SW pipes shall be laid in accordance with IS: 4127-1983 As per site condition haunching or/and encasing of pipes with cement concrete may be required as per clause 4.2 & 4.3 of IS 4127-1983. The concreting shall be done with 1:4:8 cement sand concrete.

Where sewers have less than 1.2 m cover at places of heavy traffic, these shall be surrounded with mass concrete if directed by the Engineer.

13.5.6 Handling of pipes

While unloading, pipes shall not be dropped from the trucks/carts on the ground. Timber skids and steadying rope should be used while unloading or lowering in trenches. To avoid damage specially to spigot end, pipes should not be dragged on the hard surface.

13.6 Manholes

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 141 of 180
			REVISION : 0
			EDITION : 1

All manholes shall be of the size and type as given in the Schedule and shall be provided as per drawing or as directed by the Engineer. All the manholes shall be circular or other shape as shown in drawing. The bed shall be in cement concrete of Mark-10B (or 1:3:6 mix) (Size of coarse aggregate 40 mm and down) of 100 mm thickness or as shown in the drawing and shall be projected out 75 mm from the outside face of the wall all round. or as shown in the drawing. The working part including channeling, benching etc., made of P.C.C. shall be of grade-15C (or 1:2:4 mix). All manholes shall be plastered inside with 1:3 cement plaster 20 mm thick and finished with a floating coat of neat cement unless otherwise specified.

Concrete used for precast RCC cover slabs shall be of grade 20C (or 1:1.5:3 mix) and shall be constructed as per drawing.

The top level of manholes shall be generally 100 mm above the surrounding ground levels or as directed by the Engineer. Channeling inside the manhole shall be done in smooth bends.


The end of pipe shall be neatly built in and finished in cement mortar 1:3.

Circular medium duty Cast iron water sealed manhole cover and frames, 560 mm dia (clear opening) and nominal weight 128 kg shall be provided for each manhole and shall be in accordance with IS:1726-1991 Manhole covers with double seals (Light duty) with wt. as specified in schedule of item shall be provided within compound near the buildings if specified so. If specified heavy duty cover and frames, either circular or double triangular type, shall be provided. Step irons shall be provided with two coats of bituminous paint and shall be as per drawing.

In cases where branch pipe sewers enter the manhole or main pipe sewer at a level more than 1m, from the main sewer, a drop connection shall be provided. The extra pipe length required for this connection will be paid under item for pipelines. No other extra payment will be allowed.

All exposed surfaces of cast iron frame and cover shall be painted with two coats of bituminous painting

13.7 Marker plates

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 142 of 180
			REVISION : 0
			EDITION : 1

Marker plate indicating the particular service installed shall be provided along the routes of pipes laid below ground. These shall be of mild steel, with the type of service and direction of flow, painted on it. The markers shall be set firmly in a concrete base and installed at all corners and turning points. Over straight runs markers shall be spaced at 100 m intervals generally.

14.0 ROAD WORK

14.1 General

Road works in general shall be constructed according to the requirements to the various specifications and codes of practices of the Indian Roads Congress.

Works such as earthwork, masonry, concreting and the like, wherever they occur in association with construction of roads, shall be governed by the respective specifications of these series.

14.2 Trenching and Preparation of Subgrade


The surface of the formation of width equal to that of soling coat shall first be cut to a depth below the proposed finished level equal to the combined depth of soling and wearing coat, (due allowance being made for consolidation), and dressed parallel to the finished profile. Any roots of bushes, trees etc., shall be taken out to the full depth and the cavities thus formed shall be filled up and rammed by the contractor at his cost.

In slushy soil or in areas where water logging is frequent, adequate arrangement shall be made for drainage of the area so that the sub-soil water level is kept as low as possible.

The sub-grade shall then be consolidated with a power road roller of 8-10 tonne capacity by rolling with minimum of 5 numbers of passes till it is densely consolidated to the satisfaction of the Engineer.

Surplus earth shall be disposed of as directed by the Engineer and the areas where it is disposed of shall be neatly dressed.

All undulations of the sub-grade surface that might develop due to rolling shall be made good with earth and sub-grade re-rolled.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 143 of 180
			REVISION : 0
			EDITION : 1

14.3 Ash / Moorum Carpet

Wherever the ground is soft and slushy, ash carpet consisting of common boiler ash shall be laid to 5 cm thickness over the subgrade and then rolled. In firm ground no ash carpet is necessary and boulder soling shall be laid directly over the sub-grade. If decided by the Engineer, a bed of moorum of specified thickness shall be provided for to form a sub-grade.


14.4.1 Boulder Soling

The width of the soling coat shall be 30cm (15cm on either side) more than that of the wearing coat. Its depth shall be 15cm in cutting and 23cm in filling and made up soil, unless otherwise specified in the schedule of quantities or shown in the drawing.

The edges of the soling shall be marked out by strings and stakes. Soling stone shall be hand packed and set on edge with greatest length across the road. This shall be laid closely in position on the sub-grade, firmly set with their broadest side downwards. The joints shall be staggered. All interstices between the stones shall be wedged in with locking smaller stones well driven into gaps to ensure tight packing and complete filling of interstices. Such filling shall be carried out simultaneously with the placing in position of soling stones and shall not lag behind.

After packing, surface shall be checked with template of approved shape and high and low spots corrected by removing soling and re-packing. The top surface of the soling coat shall be perfectly true to camber and grade.

The soling shall then be thoroughly consolidated with power roller of 8-12 tonne weight depending upon the type of soling stones, starting at "edges" and working towards the centre. In case of super-elevated curve the rolling shall commence from the inside edge of the curve to the outside edge. The roller shall run over the same surface of soling at least 10 times or more till the soling coat is well consolidated to the satisfaction of the Engineer. The surface shall be checked by templates and any disturbance in grade or camber corrected after every rolling and finally consolidated. After that, at least 50mm thick moorum shall be laid on top of soling coat and rolled with water to proper compaction so that the top surface seems smooth. The rate for soling coat shall be

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 144 of 180
			REVISION : 0
			EDITION : 1

inclusive of the cost of the moorum as blinding materials for which no separate payment shall be made.

14.4.2 Laterite soling

In case of laterite soling the thickness of soling shall be as follows :

- (i) For road width of 7m and above the sub-base shall consist of two layers of laterite stones 150mm maximum size. The sub-base shall be rolled to a thickness of 230mm after compaction.
- (ii) For road width of 4m to 7m, the sub-base shall consist of one layer of laterite stone of 150mm maximum size consolidated to 115mm thick.
- (iii) A layer of moorum, 33.3 % in volume of laterite, shall be spread over the laterite to a uniform thickness and rolled with 8 tonne roller with constant watering until the mixture penetrates into the voids of laterite layer. Care shall be taken to maintain the camber and slopes.

Other steps for laying, compacting etc. of the laterite soling shall be same as given under clause 14.4.1 "Boulder soling".

14.5 Kerbs


Concrete or stone kerbs, where shown in drawings, shall be fixed in position after laying and consolidation of soling. They shall be fixed true to line and level and secured in position by approved means.

14.6 Water Bound Macadam Surfacing

The construction of water bound macadam shall be carried out according to IRC : 19-1981 "Standard Specification and Code of Practice for Water Bound Macadam".

14.7 Preparation of Base and Shoulders

The subgrade shall be reshaped to the required grade and camber. Where water bound macadam is to be laid over existing black top surface, 50 mm x 50 mm furrows shall be cut in the existing surface at 1 m intervals inclined 45 degree to the centre line of the carriageway, before laying of coarse aggregates. Necessary arrangements shall be

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 145 of 180
			REVISION : 0
			EDITION : 1

made for the lateral confinement of aggregates by constructing shoulders in the form of two parallel mud walls 20 x 15cm which shall be made along the outer edges of the wearing course.

14.8 Spreading Coarse Aggregate

The coarse aggregates shall be spread uniformly and evenly upon the prepared base in required quantities from stock piles along the roadside or directly from vehicles. In no case shall these be dumped in heaps directly on the base. The aggregates shall be spread to proper profile by using templates placed across the road about 6m apart. Where possible, mechanical devices shall be used to spread the aggregates uniformly.


The water bound macadam course shall be constructed in layers of not more than 75 mm thickness. However, the Engineer may permit courses of 100 mm compacted thickness to be constructed in a single layer. Each layer shall be tested by depth blocks. No segregation of large or fine particles shall be allowed.

14.9 Rolling

The coarse aggregates spread as described above shall be compacted to full width by rolling with either three wheel power roller of 6 to 10 tonnes capacity or an equivalent vibratory roller. The weight of roller shall depend on the type of coarse aggregate.

The rolling shall begin from edges and after the edges have been compacted, progress gradually towards the centre, parallel to the centre line of the road, uniformly lapping each preceding rear wheel track by one half width. On super elevated portions, rolling shall commence from the lower edge. Where screenings are to be applied, rolling shall be discontinued when the aggregates are partially compacted with sufficient voids to permit application of screenings. Where screenings are not to be applied, as in the case of crushable aggregates compaction shall be continued until the aggregates are thoroughly keyed, with no creeping of stones ahead of the roller. Slight sprinkling of water may be done during rolling, if necessary.

Rolling shall not be done when the subgrade is soft or yielding nor when it causes a wave like motion in the base course. If irregularities develop during rolling, and exceed 12 mm when tested with a 3m straight edge, the surface shall be loosened and aggregates added or

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 146 of 180
			REVISION : 0
			EDITION : 1

removed before rolling again. The surface shall be checked by template for camber. In no case shall screenings be used to make up depressions.

14.10 Application of Screenings

After coarse aggregates have been rolled, screenings to fill the interstices shall be applied gradually over the surface in thin layers. Dry rolling shall be done when the screenings are being spread, so that the jarring effect of roller causes them to settle into the voids of the coarse aggregates. Damp and wet screenings shall not be used and the spreading, rolling and brooming of screenings shall be taken up on sections which can be completed within one day's operation.

14.11 Sprinkling and Grouting


After application of screenings, the surface shall be copiously sprinkled with water, swept and rolled. The sprinkling, sweeping and rolling operations shall be continued and additional screenings applied where necessary until the coarse aggregates are well blended and firmly set and a grout of screenings and water forms ahead of the wheels of the roller.

14.12 Application of Binding Material

After the application of screenings, approved binding material, where it is required to be used, shall be applied at a uniform and slow rate in two or more successive thin layers to a thickness of 2.5 cm. After each application of binding material, the surface shall be copiously sprinkled with water and the resulting slurry swept in with brooms, so as to fill the voids properly. This shall be followed by rolling with a 6-10 tonne roller, during which, water shall be applied to the wheels to wash down the binding material that may get stuck to them. The spreading of binding material, sprinkling of water, sweeping with brooms and rolling shall continue until the slurry of binding material and water forms a wave ahead of the wheels of moving roller.

14.13 Setting and Drying

After final compaction the road shall be allowed to cure overnight. Next morning, hungry spots shall be filled with screenings or binding

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 147 of 180
			REVISION : 0
			EDITION : 1

material, lightly sprinkled with water and rolled. No traffic shall be allowed till the macadam sets.

14.14 Surface Evenness

The surface evenness of completed water bound macadam course in longitudinal direction shall be within 12 mm when tested with a 3 m straight edge and in cross profile within 8 mm when checked with a template.

14.15 Bituminous Pavements

14.15.1 Bitumen premix carpet with seal coat

The consolidated thickness of this type of treatment shall be 2cm/2.5cm/4cm or as specified.

14.15.1.1 Surface preparation

Water bound macadam surface on which black topping is to be provided shall be thoroughly cleaned of dust, loose materials, caked mud and other foreign material with the help of wire brush, chisel, picks etc. Cleaning shall be such as to expose the stone metal to a depth of about 6mm without dislodging the interlock of the metal. All dust and other materials thus removed shall be thrown away at a suitable place as directed by the Engineer.


Any potholes, depressions and undulations found after cleaning shall be made good with premixed chippings, and well rammed.

14.15.1.2 Tack coat

Just before the application of tack coat, the surface shall be thoroughly cleaned by brooms and then by fanning with gunny bags.

Bitumen of specified grade heated to a temperature of 177 to 188 degree 'C' shall be spread on the prepared surface uniformly at the rate of 0.75 kg/sq.m. by means of sprayers. It shall be applied just ahead of and keeping pace with, laying of premix carpet.

14.15.1.3 Preparation of mix, laying & consolidation

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 148 of 180
			REVISION : 0
			EDITION : 1

The stone grit (aggregate) shall be surface dry and contain not more than 2% moisture before use. It shall be first screened of dust and measured in boxes and then loaded into the drum mixer according to the capacity of the mixing drum in the proportion given in the table below. The aggregate shall be heated to facilitate mixing with the binder in cold weather, where so directed by the Engineer.

The binder heated in boilers, to a temperature of 149 to 177 degrees C or as specified for the grade used and maintained to that temperature, shall be drawn off from the boiler into a suitable container or in bucket gauged to show the weight of bitumen in it. This shall then be poured over the aggregate in the mixer at the correct rate of 64 Kg/cum of aggregate or as specified and mixing started and continued till aggregate is uniformly coated with bitumen.

Immediately after applying the tack coat, the hot mix shall be discharged from the mixer, carried to the road surface and spread to a thickness sufficient to achieve after consolidation the specified thickness. Rakes or drag spreaders shall be used for spreading the mixture.


When the premix has been laid for a length of 15-20 metres it shall be rolled. Rolling shall commence from edges and proceed towards the centre. The roller wheels shall be moistened continuously so as to prevent metal chips sticking to it. Any high spot or depression which become apparent shall be corrected by addition or removal of premix materials.

Further the prepared finished surface shall be protected from the traffic for 24 hrs or such period as may be specified by the Engineer.

14.15.1.4 Materials

Quantity of materials required per 100 sqm of road surface shall be as given in the table below, unless otherwise specified.


Sl. No.	Consolidated thickness of premix carpet	Stone chips (cum)	Sand (cum)	Tack coat (kg)	Binder Carpet (kg/cum)	Seal coat (kg/cum)
Using Paving bitumen 80/100 or 30/40 grade						
1.	Priming tack coat					

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 149 of 180
			REVISION : 0
			EDITION : 1

Sl.	Consolidated	Stone chips	Sand	Binder
a)	on a water bound macadam surface		75	
b)	on an existing black top surface		65	
2.	Carpet			
	2 cm	2.4 (10 mm nominal size)		64
	2.5 cm	3.0 (10 mm nominal size)		64
	4.0 cm	4.8 (12 mm nominal size)		64
3.	Seal Coat			
a)	Dry area (Premixed sand seal coat)		0.6	68
b)	Wet area (Liquid seal coat with chips)		0.9	98

14.15.2 Seal coat

In dry areas where rainfall is under 150cm per year a premix sand seal coat shall be applied immediately after laying the carpet. The binder shall be heated in boilers of suitable design, to the temperature appropriate to the grade of bitumen. The aggregates shall be dry and suitably heated to a temperature directed by Engineer before the same are placed in the mixer of suitable design. Mixing of binder with aggregates to the specified proportions shall be continued till the latter are thoroughly coated with binder. The mix shall be immediately transported from the mixing plant to the point of use and spread uniformly on the bituminous surface to be sealed. As soon as sufficient length has been covered with premix materials, the surface shall be rolled with 6 to 8 tonne power roller. Rolling shall be continued till the premix material completely seals the voids in the bituminous course and a smooth uniform surface is obtained.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 150 of 180
			REVISION : 0
			EDITION : 1

In wet areas where rainfall is above 150cm per year a liquid seal coat with chippings (not sand) shall be applied after laying the carpet. The binder shall be heated in boilers of suitable design, to the temperature appropriate to the grade of bitumen and spread on the surface preferably using mechanical sprayers. Immediately following the application of the binder, stone chippings in a perfectly dry condition shall be uniformly spread on the surface. Immediately after the application of the cover material, the entire surface shall be rolled with 8-10 tonne road roller.

14.15.3 Surface dressing

The surface shall be prepared in the same way as that for premix carpet work as per 14.15.1.1. Depression or pot holes, if any, shall be repaired as indicated.

After the surface has been prepared and is in perfectly dry condition, bitumen heated in the same manner as for premix carpet, shall be sprayed over the surface preferably using mechanical sprayers. It shall be ensured that there is even and uniform distribution of bitumen on the surface. Spraying shall be carried out parallel to the centre line of the road.


Immediately following the application of bitumen, stone chippings in a perfectly dry condition, shall be uniformly and evenly spread as specified in the item, over the entire sprayed surface. Spreading may be done preferably by means of mechanical gritter. Finally the entire surface shall be broomed to ensure perfect uniform spreading.

The final surface shall be checked by means of camber board etc. The spread surface shall be rolled with 6 to 8 tonne roller till there is sufficient boundage of chippings with bitumen. The finished surface shall be thrown open to traffic on the following day.

14.15.4 Premixed Bitumen Concrete

14.15.4.1 General

In this type of road carpet a mixture of sand and stone aggregate is used as aggregate producing a dense mixture. Seal coat is not necessary as the sand used in the mix works up to the surface and forms a seal by itself. The consolidated thickness of this type of treatment shall vary from 4cm to 7.5cm as specified.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 151 of 180
			REVISION : 0
			EDITION : 1

14.15.4.2 Surface Preparation

Same as in para 14.15.1.1 above.

14.15.4.3 Tack Coat

Same as in para 14.15.1.2 above.

14.15.4.4 Preparation of Mix, Laying & Consolidation


Para 14.15.1.3 shall generally apply except that the mixing shall be done in two stages. The stone aggregate of the the correct specified size and in the proportion shown in the table above shall be fed into the mixer to which 2/3rd of the total specified quantity of bitumen heated to the appropriate temperature shall be added. When the stone metal is well coated, the sand in the specified proportion and the balance 1/3rd quantity of total bitumen shall be fed into the mixer. Mixing shall be continued until a homogeneous mix is produced and all particles are uniformly coated with bitumen.

The premix shall be emptied on to wheel barrows or stretchers and carried to the site of work. It shall then be spread uniformly on the road surface with rakes or drag spreaders immediately after applying the tack coat to a thickness sufficient to achieve after consolidation the specified thickness. When the premix has been laid for a length of 15-20m it shall be rolled. Rolling shall commence from edges and proceed towards the centre.

The roller wheels shall be moistened continuously so as to prevent metal chips sticking to it. After preliminary rolling, all honeycombs, any high spot or depression which become apparent shall be corrected by addition or removal of premix materials. Camber and grade shall be checked at every stage to ensure correctness and any defect found shall be rectified.

14.15.4.5 Materials

Quantity of materials required per 100 sqm of road surface shall be as given in the table below unless otherwise specified.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 152 of 180
			REVISION : 0
			EDITION : 1

BINDER


Sl. No.	Thickness of consolidated bitumen concrete surfacing	Tack coat (kg)	Hot Bitumen (cut back)/ Paving Bitumen 80 / 100 grade	
			Bitumen concrete	
			Stone aggregate (kg / cum)	Sand (kg / cum)
1.	4 cm, 5 cm, 6 cm & 7.5 cm	75	560	128

Aggregate

Sl.	Thickness of compacted bitumen concrete surfacing		Stone aggregate (cum / 100 sqm)	Coarse sand (cum / 100 Sq.m)
1.	4 cm	3.8	(12mm nominal size)	1.90
2.	5cm	4.8	(20mm nominal size)	2.40
3.	6cm	5.8	(60% 40mm nominal size) (40% 25mm nominal size)	2.90
4.	7.5 cm	7.3	(60% 50mm nominal size) (40% 40mm nominal size)	3.65

The nominal size of Coarse Aggregate herein shall mean as defined below:

Sl. No.	Nominal size of coarse aggregate	Designation of IS sieve through which the aggregate shall wholly pass	Designation of IS sieve through which the aggregate shall be retained
i)	40 mm	50 mm	25 mm
ii)	25 mm	40 mm	20 mm

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 153 of 180
			REVISION : 0
			EDITION : 1

iii)	20 mm	25 mm	12.5 mm
iv)	12 mm	20 mm	10 mm
v)	10 mm	12.5 mm	6.3 mm
vi)	6 mm	10 mm	2.36 mm

14.15.5 Surface evenness

The finished surface of premix carpet and bituminous concrete shall be tested with a straight edge 4.5 m long and any irregularity greater than 6mm shall be corrected.

14.16 Berms

Shoulders and berms shall be prepared as shown on the drawings. Work on making berms shall not lag more than 100 metres behind the water bound macadam consolidation. Suitable drains shall be cut on the berms so that the water bound macadam surface is kept drained till bituminous macadam is laid.


14.17 Kerbs

Kerbs shall be laid and set in place before completing the bituminous or concrete wearing surface as well as the wearing surface of footpath. Setting shall be done in mortar where so specified with Schedule of Items. They shall be laid and set in such a way as to obtain straight lines in the finished work, the top surface matching with the finished surface of footpath.

Where the road edge forms a curve, the kerbs shall follow such curve. Gaps shall be left as shown in drawings or as may be required to provide for drainage.

14.18 Bridges and Culverts

Bridges and culverts shall be constructed according to the specifications of Indian Roads Congress. Relevant chapters of earthwork, concrete, masonry etc., of these series shall apply.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 154 of 180
			REVISION : 0
			EDITION : 1

14.19 Boulder Pitching

Wherever specified, boulder pitching shall be provided at the inlet and outlet of pipe culverts, or for embankments of bridges. The subgrade shall first be dressed to level or slight slope as indicated. The transverse slope of the pitching shall be made strictly in accordance with the drawings or as directed by the Engineer.

14.20 Scarifying & Dismantling

Where a new carriage-way abuts or includes an existing carriage-way and the Engineer so directs, the surface of the latter shall be scarified, adjusted and reshaped to conform with the existing and new camber or crossfall. Materials from the existing road shall be used or disposed off as directed by the Engineer.


Where dismantling of the existing road has been specified, the various layers of the road viz., bituminous macadam, water-bound macadam and soling shall be scarified separately. Scarifying can be done either by hand picks, or by means of scarifiers fixed to the roller. When a roller is used for scarifying, crushing of the metal shall be avoided by moving the metal clear of roller wheels after the scarifier has passed over it. The loosened material shall then be combed by means of rakes to bring out most of the larger stone. If necessary, the larger stones thus collected shall be screened to separate fine particles if any.

The remaining metal shall then be removed and screened to recover reusable metal. Different grades of metal shall be stacked separately and measured.

14.21 Diversions

Where the construction of the road or culvert or bridge is in progress, the road shall be closed to traffic and a suitable diversion shall be provided for traffic by the Contractor, as directed by the Engineer.

The road shall be closed by the erection of barriers and suitable sign boards at both ends which shall be provided with lights at night. Both during night and during day, one man shall be posted at each barrier to suitably divert the traffic and to keep the light burning during the night.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 155 of 180
			REVISION : 0
			EDITION : 1

15.0 WATERPROOFING TO ROOFS & WATERPROOFING PAINTS

15.1 Scope

This chapter deals with different types of waterproofing on roof.

15.2 Material

The materials shall conform to Part-I.

15.3 General Workmanship


The waterproofing to roofs being specialised works the Contractor shall get these done by specialised firms/agencies.

15.4 Painting with Hot Bitumen

The surface to be painted shall be thoroughly dried and then cleaned, with wire brushes and cotton or gunny cloth, of all loose materials and scales. The surface shall further be cleaned with a piece of cloth lightly soaked in kerosene oil. Bitumen shall be brought to the site in its original container and this shall not be removed from site till the painting job is completed. Before applying the main coatings of hot bitumen paints, one coat of bituminous primer shall be applied. The number of coats of hot bitumen shall either two coats or as specified in the Schedule of Items. The bitumen of approved quality (either of grade 80/100 or 30/40) or as specified shall be applied to the surface after heating it to the manufacturer's specifications. Care shall be taken to see that no blank patches are left and the quality of bitumen to be spread shall be as specified and shall be to the satisfaction of the Engineer.

15.5 Painting with Bitumen Emulsion

Before applying, the surface shall be cleaned thoroughly. Generally two coats of Bitumen Emulsion are provided over a coat of emulsion primer. Since the painting is with emulsion, the surface need not be made dry.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 156 of 180
			REVISION : 0
			EDITION : 1

15.6 Waterproofing of Roof

15.6.1 With bitumen felt

Prior to laying the insulation, roof gradient shall be checked. If necessary, the roof shall be re-graded by screed to ensure everywhere a run off gradient of not less than 1 in 120. The screed shall consist of one part cement and four parts medium to coarse sand by volume. The screed shall be cured for 7 days. The surface shall then be cleaned of all foreign matter by wire brushing and dusting.

Waterproofing unless specified otherwise in drawings shall be the "heavy treatment type" with primer coat as described in IS : 1346-1991. The method of laying roofing treatment, surface finishing with pea gravels, special mode of treatment for drain outlets, projecting pipes, parapet walls, expansion joints, gutters, timber roofs etc., shall conform to IS : 1346-1991. The number of layers of felts shall be as specified in the drawing or Schedule of Items. The bonding bituminous material shall be of grade 30/40 or as specified and the minimum quantity of hot bitumen to be applied, shall be 1.2 kg/m². Unless specified otherwise, the bituminous felts shall be hessian bases of Type-3 Grade-2. Pea gravel finish may be substituted by a coat of bituminous aluminium paint, where so specified in the Schedule of Items.


The cement mortar used for filling the chases shall be of mix 1:4 and the cement concrete for fillets shall be of the same grade as the roof slab.

Where special surface finish with precast concrete or clay tiles is specified, it shall be in accordance with the relevant chapter of this series.

15.6.2 With bitumen mastic

The work shall be carried out generally in accordance with IS : 4365-1967 "Code of Practice for Application of Bitumen Mastic for Waterproofing of Roofs" or according to the manufacturer's specifications. The work shall be carried out by a firm of specialists in the trade.

The type of underlay or primer, thickness of application, surface finish etc., shall be as shown on drawing or described in the Schedule of Items. Bitumen melting shall be done in a mechanical mixer by gradu-

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 157 of 180
			REVISION : 0
			EDITION : 1

ally heating to about 200 degree 'C'. Coarse aggregate where required shall be added to the hot bitumen and stirred.

Each coat shall be spread evenly and uniformly by means of a float to the required thickness. Timber gauges shall be used to regulate the thickness. Particular care shall be taken to tuck the mastic into grooves on vertical surfaces, at joints, around pipes or other projections and at junction of adjoining bays.

15.6.3 Waterproofing of RCC roof with Lime concrete and Pressed clay titles.

Lime concrete shall consist of broken brick aggregates and lime. Proportion of brickbat coba shall be 2.5 parts of brick jelly to one part of lime. The brick jelly shall be hard, well burnt and of size varying from 12mm to 25mm.


The lime concrete is then laid over roof to slope to give specified thickness and in slope of 1 in 80 or as shown on the drawing for proper roof drainage as per roof drainage plan. The lime concrete is then to be beaten in the manner approved by the Engineer for 48 hours or as directed with hand beaters.

If the surface during the process of compaction becomes so uneven that water lodges in pools, the surface shall be pricked up, and fresh concrete

spread and consolidated as necessary to obtain an even surface.

The concrete shall then be cured by sprinkling water and allowed to harden for a period of not less than six days before laying the roof finish.

Roof shall be finally finished with one coarse of machine pressed clay titles 20 mm thick laid over a 12mm thick of 1:3 mix cement mortar mixed with 5% crude oil by weight of cement mixed in mortar. The pressed clay tiles shall be immersed in water for two hours before being used. The side joints of the tiles shall be more than 60 mm thick set full in mortar. Before the work dries up completely, the tile joints shall be raked out and pointed with cement mortar 1:3 mixed with crude oil which shall be 5% by mass of cement. The joints shall be well rubbed over with thin bar trowel and excess of mortar scrapped off until the surface of the pointing attains a black polish and becomes hard. As

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 158 of 180
			REVISION : 0
			EDITION : 1

the work proceeds, it shall be kept thoroughly wetted until the mortar has set firm and hard. Watering shall be continued for three weeks after construction.

Lime concrete and tiles shall be taken up the parapet walls to a height of 150 mm or as shown in the drawing.

The specification of pressed clay tiles shall be as given in IS:2690-1975 (Part-I). The specification of crude oil shall be as per IS:2119-1980.

The areas around drain pipes shall be properly finished with provision of adequate slope.

The contractor shall give guarantee for any/all types of waterproofing for a period of 7 years against bad of faulty material and construction and shall rectify the same at his own cost during the guaranteed period.

15.7 Waterproofing for Basement

15.7.1 The specification covers the requirements of waterproofing of basements, tunnels, ducts, pits, bunkers, etc.

The material used shall be bitumen felt type-3 of grade-2 conforming to IS : 1322-1982, together with the specified bonding material and primer.


Waterproofing shall be provided on the outside of walls and top of the floors and shall be carried 150 mm above ground level.

The number of layers of bitumen felt to be used for walls and floor unless otherwise shown in the drawing shall be :

- i) For depths upto five metres below ground : 2 layers.
- ii) For depths beyond five metres : 3 layers.

The method of laying the bitumen felts and workmanship shall in general conform to IS : 1609-1991.

Waterproofing work shall be taken in hand only when the sub-soil water level is at its lowest, the site shall be kept dry by adequate

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 159 of 180
			REVISION : 0
			EDITION : 1

arrangements for pumping out water till the work has been completed. For this purpose drains shall be formed along the edges of the excavation but beyond the building line, with suitable collecting sumps. In case of large excavation areas where it is necessary to dewater under the floor, additional land drains shall be formed across the excavation, to adequately drain the area. Adequate arrangements shall be made to prevent the sides of excavation from slipping while the work is in progress.


The base concrete of mud-mat shall be rendered smooth by a 20 mm thick sand-cement plaster (6:1). Any sharp corner over which the waterproofing course is to be laid shall be eased out by means of cement mortar fillets 7.5 cm in radius.

The surface must be dry before the next operation is carried out. Blown bitumen conforming to IS : 702-1988 shall be applied hot over the prepared surface at the rate of 1.5 kg/m² for the first layer and for every other subsequent layer(s). The laying of felt over the bitumen so applied shall always commence on the floor, and shall be carried to the walls only after treatment of the floor is complete. The minimum overlapping of joints at sides and ends of felts shall be 10 cm. Joints for subsequent layers of felt shall be staggered. All joints shall be completely sealed by blow lamp.

A protective flooring of either flat bricks in cement mortar 1:3 or 6 cm thick cement concrete type M15B or a coat of cement sand plaster (1:3) 4 cm thick shall be constructed over the waterproofing treatment to prevent damage to the latter during subsequent construction of the structural floor.

The walls shall be treated in a similar way, the bitumen felts joining at the base with the projecting felt laid over the mud-mat. The wall surface shall be made smooth, where necessary with a coat of cement plaster 1:5, the felts shall be laid as for the floor ensuring that the surface to be treated is dry and then a protective brick wall, half-brick nominal thickness shall be built in cement mortar 1:6 over the projecting mud-mat, the space between the wall and felt being grouted with cement slurry. Sufficient care shall be taken to ensure a perfect bond between the waterproofing on the floor and that on the walls.

The treatment on the wall shall be carried 150 mm above the surface of ground and tucked into a groove 6.5 cm. wide and 7.5 cm deep, the chase being filled with cement mortar (1:4).

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 160 of 180
			REVISION : 0
			EDITION : 1

Where waterproofing is done to the roof of an underground structure, such as a tunnel, it shall be done in a similar way. The structural concrete shall be rendered smooth, hot bitumen and bitumen felts applied in the same way as for the floor and walls, and over this shall be laid a protective layer of cement concrete grade M10C, 7.5 cm thick.

15.7.2 With epoxy based emulsion

Over the mud-mat a 20 mm plaster is to be provided to make the surface even.

On the plastered surface of the mud-mat, three coats of epoxy based leakproof emulsion shall be applied with reasonable gap between each coat in order to permit sufficient drying time.

Precaution should be taken that during the process of rod binding if any damages happens it should be immediately rectified by making patch painting on the affected portion only and as such a complete vigilance is to be kept to rectify the defect.


After the rod binding is over the concreting should be done with high polymer based, chloride and sulphide free cement waterproofing additive/admixtures @ 2% by weight of cement all through the floor area and all through the vertically raised walls of four sides which shall remain underground upto a depth of 8 metre and above from ground level.

After the concreting and immediately after de-shuttering cleaning of the concrete surface on the external faces of the walls are to be done and then three coats of epoxy based leakproof emulsion shall be applied with a reasonable gap between the each coat before back filling. If the back filling is with hard material again a protective layer of plaster shall also be applied on the external faces of walls in order to avoid damages on the painted surface.

If the back filling is with soft sandy or alluvial soil there is no necessity for protective layer of plastering as mentioned above.

Epoxy based paint can be applied on the wet surface hence there shall be no stoppage of the normal progress of the project works.

15.8 Surface Application

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 161 of 180
			REVISION : 0
			EDITION : 1

Waterproofing done by surface application of bitumen based or epoxy based material shall conform strictly to the recommendations of the manufacturer. The work shall be carried out by a firm of specialists in the trade.

15.9 Guarantee

For the waterproofing on the roof as well as for underground basements the Contractor shall give guarantee in writing for the period of 7 to 10 years as specified in the Schedule of Item. For such guarantee the Contractor shall get guarantee from the manufacturer/specialised firms and forward the same to the Engineer. However, the Contractor shall be fully responsible for the serviceability of the waterproofing treatment throughout the guarantee period and any leakage during that guarantee period shall be stopped by the Contractor at no cost to the Owner and without disturbing working facility of the Owner.

15.10 Water proofing course with Fibre glass R.P. tissue

15.10.1 Scope


This section covers the furnishing of all labour, equipment and performing all operations necessary to complete to provide water proofing course of Fibre glass R.P. tissue all in accordance with the drawing and these specifications.

15.10.2 Terminology

For the purpose of these specifications the following definitions detailed hereinafter shall apply.

15.10.3 Preparation of surfaces

Surface to receive waterproofing shall be dry, free from dirt, loose particles and foreign materials. Projections which might puncture the membrane shall be removed and voids and crevices shall be filled in prior to the start of work.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 162 of 180
			REVISION : 0
			EDITION : 1


Adequate covering shall be provided during this work to avoid splashing or staining of the adjacent work and surfaces. Any work or surface splashed or stained shall be thoroughly cleaned to the satisfaction of the Engineer. Joints in the tissue felt in the different layers shall be staggered.

15.10.4 In built-up roofing

Application

- i) Suitable slope shall be provided in the roof as per manufacturers specifications. Heat insulation may also be provided if necessary.
- ii) Prime the plastered surface primer at the rate of 0.4 Kg/sqm. This should properly impregnate the surface and should be left till the time it is touch-dry.
- iii) Apply first coat of hot bitumen @ 1.8 Kg/sqm.
- iv) Embed first layer of fibre glass RP tissue. Overlaps shall be 100mm between the layers in either direction.
- v) Apply second coat of hot bitumen @ 1.8 Kg/sqm.
- vi) Embed second layer of fibre glass RP tissue after the surface of the first layer has become dry.
- vii) Apply third coat of hot bitumen @ 1.8 Kg/sqm.
- viii) Embed third layer of fibre glass RP tissue.
- ix) Apply fourth coat of hot bitumen @ 1.8 Kg/sqm.
- x) Finish with gravel grit @ 0.006 cum per sqm.

Guarantee

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 163 of 180
			REVISION : 0
			EDITION : 1

A written guarantee for the water tightness shall be taken for a minimum period of 10 years.

15.10.5 Specification

Water proofing medium

- i) By impregnation into the fibre glass reinforcement membrane forms a monolithic mass.
- ii) Prevents the penetration of water/moisture.
- iii) Acts as a top dressing.

Layer

A single thickness of fibre glass tissue impregnated with bituminous compound.

Multiple layer

2 or more layers of fibre glass tissue laid consecutively with overlapping joints and impregnation with bitumen.


Bitumen/primer

A liquid bitumen of low viscosity which penetrates into a prepared surface upon application.

Half-brick masonry shall be of approved quality 50 class brick work in cement mortar 1:4 (1cement : 4 sand). Plaster should be in cement mortar 1:4 (1cement : 4 sand). Sand should be fine sand conforming to IS 383

Application

Suitable slope may be provided in lean concrete, if necessary. Over this, 12mm thick plaster with cement mortar 1:4 (1cement : 4 coarse sand) is to be laid.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 164 of 180
			REVISION : 0
			EDITION : 1

Prime the plastered surface with primer at the rate of 0.4 Kg/sqm. This should properly impregnate the surface & then should be left till the time it is touch dry.

Water proofing shall be as follows :-


- i) Apply first coat of hot bitumen @ 2.4 Kg/sqm.
- ii) Embed first layer of fibre glass RP tissue. Overlaps shall be 100mm between the layers in either direction.
- iii) Apply second coat of hot bitumen @ 2.4 Kg/sqm.
- iv) Embed second layer of fibre glass RP tissue after the surface of the first layer has become dry .
- v) Apply third coat of hot bitumen @ 2.4 Kg/sqm.
- vi) Embed third layer of fibre glass RP tissue after the surface of the second layer has become touch-dry.
- vii) Apply fourth coat of hot bitumen @ 2.4 Kg/sqm.
- viii) Embed fourth layer of fibre glass RP tissue after the surface of the third layer has become touch-dry.
- ix) Apply fifth coat of hot bitumen @ 2.4 Kg/sqm.
- x) A layer of 12mm thick fine sand is to be laid after completing the above operations. The layer of sand will not be applied on vertical walls.

The surface should be finished with half-brick masonry in cement mortar 1:4 (1cement : 4 coarse sand).

Guarantee

A written guarantee for the water tightness shall be taken for a minimum period of 10 years.

General

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 165 of 180
			REVISION : 0
			EDITION : 1

The work will be carried out by specialists in the trade. Workers shall be provided with gum boots and hand gloves. There shall be no air pockets. Corners shall be treated flush without any air pockets or voids.

Measurement

The unit will include supply of materials, transport, preparation of surface, application of water proofing treatment, plastering, masonry work etc., as specified herein. The measurement of the item will be in square metres nearest to the second decimal of the concrete surface which is to be damp-proofed.

15.11 Water proofing course with P.V.C sheets/ membranes

15.11.1 Jointing


The adjacent lengths of the P.V.C sheets shall be jointed by giving an overlap of 25mm, one over another by sealing with the approved adhesive. A minimum width of the sheet, as specified in the item, shall be used without any joint. Jointing of the sheets, to the extent possible and practicable, shall be done at the site workshop.

15.11.2 Laying

- i) Horizontal areas: The base concrete shall be rendered smooth by cement sand plaster 1:6 mix of 20mm thick unless otherwise specified. It shall be ensured that there are no sharp crivices, projections etc which may puncture and damage the sheet. P.V.C sheets shall then be evenly laid over the smooth rendered surface while it is green.

After laying of sheets a protective cover shall be laid over it. This cover may be of 1:6 cement sand mortar bed of thickness 20mm and above, flat brick/tile soling over cement sand mortar bed, any other suitable layer or thermal insulation cover as specified in the item. However care is to be taken that sheets do not get damaged while laying the protective cover. The horizontal layer of P.V.C sheets shall be carried over to a minimum of 150mm height and tucked in to the connecting vertical walls as in the case of roof parapets, if there is no provision of continuous laying of the sheets in the adjacent vertical surface.

- ii) Vertical surfaces

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 166 of 180
			REVISION : 0
			EDITION : 1

On vertical concrete surfaces the P.V.C sheets shall be fixed along with the form work with the knobs projecting toward concrete. The sheets shall be clamped on the top of the form work to keep it in position. Concrete is then poured and knobs are locked in it. After the forms have been stripped off, all the tie bolt holes, cuts and other damages are sealed with additional patches of sheets as per manufacturer's specification.

In case good quality of soil, completely free from foreign materials like stone piece, hard lumps and rubbish etc, is available, it can be used directly as a back fill. Otherwise a half brick wall or any other measure as specified shall be provided as a protection barrier over the projecting base of the concrete/mud mat. The top edge of the sheet shall be tucked into a chase to be subsequently sealed with cement sand mortar of 1:4 mix.

In case of sheets being laid both on horizontal and adjacent vertical surfaces, the horizontal sheets shall be carried on the vertical portion as one monolithic layer.

15.11.3 Agency

The execution work including jointing, laying and testing etc. shall be done by a specialised agency duly approved by the Engineer.

15.11.4 Testing


After laying is complete, the sheets shall be tested by an Electronic Pin hole detector for pin holes, cuts and other damages etc. All such portions shall be patched suitably with additional sheets as directed and again test checked.

15.11.5 Expansion joints

All Expansion Joints etc of dimensions as specified, shall be filled up by Polymer Sealant of pourable grade as per manufacturer's specification on the P.V.C sheets locked in the joint.

15.11.6 Guarantee

The contractor shall guarantee the water tightness and leak proofing of the structure for a period of ten years after certified completion and

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 167 of 180
			REVISION : 0
			EDITION : 1

handing over of the jobs by furnishing a free maintenance guarantee as per prescribed format and as specified.

15.12 Waterproofing with Non-Shrink Polymeric Waterproof Grouting Compound

15.12.1 Work Included

The Contractor shall furnish materials, labour, plant, equipment and tools to complete the work as specified and/or as shown in drawings.

15.12.2 Materials

Cement

Ordinary portland cement shall conform to IS : 269-1989 and portland blast furnace cement shall conform to IS : 455-1989.

Aggregates

All aggregates shall conform to IS : 383-1970 Fine aggregates shall be approved river or pit sand.

Cement waterproofing compound

All cement waterproofing compound shall conform to IS : 2645-1975 and shall be of approved quality.


Solvent less resin

High build polymeric surfacing which forms a thick resilient and flexible membrane on concrete with high resistance to oil and water.

Nozzle

15 mm dia threaded G.I. pipes of suitable length plugged at both ends.

Super plasticiser

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 168 of 180
			REVISION : 0
			EDITION : 1

High range water reducing admixture and integral cement waterproofer for concrete. Super plasticiser shall conform to ASTM C-194 Type F, IS: 9103-1979 & IS:2645-1975.

15.12.3 Waterproofing of underground structures

Waterproofing shall be carried out as per the approved manufacturer's specification and as stated below:

15.12.3.1 Raft


The sub-base (PCC) of the underground structure shall be cleaned of all dirt and kept dry by continuous pumping of water. 20 mm thick plaster with cement-sand mortar (1:3) mixed with approved cement waterproofing compound as per manufacturer's specification shall be laid on top of the sub-base. The plaster shall be finished smooth with a steel trowel.

The plastered surface shall then be painted with two (2) coats of approved solvent less resin to form a thick resilient and flexible resinous membrane over the plastered surface.

Threaded nozzles of 15 mm dia and of suitable length shall be placed and fixed in a grid pattern of maximum 1.5 m centre to centre over the whole raft, prior to casting of RCC raft. similar nozzles will also be placed along the construction joint, if any, at regular intervals not exceeding 1.5 m c/c. Adequate precaution shall be taken to keep the nozzles plugged at both ends to prevent them from getting clogged by concrete. Similar nozzles shall also be post fixed at critical points, if required. Approved super plasticiser-cum-cement waterproofer shall be added to the concrete which shall be at least M20 grade as defined by IS : 456-1978 and the water cement ratio of the concrete shall not exceed 0.45. Adequate precaution shall be taken to keep the nozzles vertical while concreting.

Approved non-shrink polymeric waterproof grouting compound mixed with cement slurry shall be injected through the nozzles under pressure by pump as per the instructions of the manufacturer. When the injection operation is over the nozzles shall be sealed with a sealing compound as per manufacturer's specification and instruction.

15.12.3.2 Vertical wall

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 169 of 180
			REVISION : 0
			EDITION : 1

15 mm dia threaded nozzle of suitable lengths shall be placed and fixed in a grid pattern of maximum 1.5 m centre to centre over the entire surface prior to concreting of the vertical wall. Similar nozzle are to be also fixed at construction joints, if any, y, at regular intervals not exceeding 1.5 m c/c. Adequate precaution shall be taken to keep the nozzles plugged at both the ends to avoid clogging of the nozzles by concrete. Similar nozzles shall also be post fixed at critical points, if required.

The concrete for the vertical wall shall be at least M20 grade as defined by IS:456-1978 having a maximum water cement ratio of 0.45. Approved super plasticiser-cum-cement waterproofer shall be added to the concrete as per the manufacturer's specification. Adequate precaution shall be taken to keep the nozzles horizontal during concreting. The exterior surface of the concrete shall be plastered with 12 mm thick cement sand mortar (1:3) mixed with approved cement waterproofing compound conforming to manufacturer's specification. The plastered surface shall then be finished smooth with a neat coat of cement slurry and painted with two coats of approved solventless resin to form a thick resilient and flexible resinous membrane over the plastered surface. Approved non-shrink polymeric waterproof grouting compound mixed with cement slurry shall be injected through the nozzles under pressure by pump as per the manufacturer's specification and shall be sealed with a sealing compound as per manufacturer's specification and instruction.


16.0 MISCELLANEOUS

16.1 False ceiling

16.1.1 Scope

This chapter deals with the specification for various types of false ceiling as listed below :

- Wooden ceiling (solid wood) and decorative ply.
- Ceiling with insulating Building Board/Particle Boards etc.,
- A.C. Sheet and ply wood ceiling.
- Plaster of Paris (Gypsum Anhydrous) ceiling over wooden frame.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 170 of 180
			REVISION : 0
			EDITION : 1

e) Plaster of paris (Gypsum Anhydrous) Tiles ceiling.

f) Wooden cover, fillets, beading for ceiling.

16.1.2 General

16.1.2.1 Materials

All materials shall be in accordance with the general specifications of materials, Part-I, Schedule of items and as shown in drawings.

Special finishing materials as specified in schedule of item shall be procured from the specified source and got fixed by employing skilled worker in the trade under direct supervision of the manufacturer.

16.1.3 Openings for installation of light fittings

Openings in the ceiling for installation of A/C grills, light fittings shall be provided as per drawings.

16.1.4 Recess for pelmet

Recess for the installation of pelmets shall be provided where shown in drawings along the windows/ doors.

16.1.5 Grills


Grills made of wooden, M.S., Aluminium, PVC or any other material as necessary shall be provided as indicated in the drawing.

16.1.6 Frame work

The type of frame to receive the ceiling material may be of wood, aluminium or M.S. as specified in the schedule of item and as mentioned in the drawing.

16.1.7 Wooden framing for false ceiling

Unless otherwise specified in schedule of items the wooden frame work shall be of following description :

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 171 of 180
			REVISION : 0
			EDITION : 1

The frame work for false ceiling shall be of approved quality teak wood scantlings, the runners shall be 75 x 50 mm size and shall be spaced at 1200 mm c/c and the battens shall be 50 x 50 mm size spaced at 600 mm c/c (approx) forming a grid of 600 x 600 mm or any other grid suitable for fixing the false ceiling material and its size. The runner and battens shall be joined by halving joint using counter sunk 6 mm bolt with washer of required length with soffit of runner and batten in perfect level. The heading joints between runners shall be made with lap joints using 2 nos. 6 mm dia counter sunk bolts with washer. Heading lap joints between battens shall be made with suitable size screws. The wall ends of the runner shall be embedded in the wall (50 mm deep) and shall be grouted with 1:2:4 cement concrete. The soffit of framework shall be made perfectly horizontal. The teak wood frames shall be treated with 2 coats of wood preservations treatment before fixing the tiles/boards as the case may be.


The main runners of frames shall be suspended by M.S. flat 40 x 3 mm /12mm dia M.S. round/T.S. hangers placed at 1200 mm c/c (approx), the top end of the hangers shall be hocked to R.C.C. reinforcement of slab or fixed to M.S. flat cleats installed in slab for the purpose or hooked to purlins of the trusses. The hangers may be twisted or ends of M.S. round/T.S. hanger flattened to allow for fixing the same with T.W. frame or M.S. cleats with bolts of suitable size.

For teak wood framings of shaped ceilings the spacings of frames and hangers levels of false ceiling etc., shall be required to obtain the shapes/drops and profile of the ceiling and to the requirement of ceiling material. The frames shall be locally adjusted to create openings of required sizes for installation of light fittings, grills of air conditioning system.

16.1.8 Metal framing

16.1.8.1 Galvanised pressed steel framing system

Galvanised pressed steel framing system for false ceiling shall be procured from reputed manufacturer and installed by specialist agencies under technical guidance of the manufacturer and strictly as per their specifications. Unless specified otherwise these shall consist of G.I. rectangular pipes at 900 mm c/c suspended by M.S. hanger fixed to R.C.C. slab with M.S. cleats and cross channels fixed to rectangular pipes at 450 mm c/c as per "Galvolock" system of M/s

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 172 of 180
			REVISION : 0
			EDITION : 1

Eastern Interior Pvt Limited or equivalent. Ceiling materials shall be fixed to cross channels as per specifications of the manufacturer.

Framing shall be adjusted to provide openings for the light fittings and air-conditioning grills but these shall be supported independently and not on the framing.

16.1.8.2 Aluminium grid ceiling framing system

Framing for Aluminium grid false ceiling system shall be of reputed manufacturer Bestlok, Eezilock or equivalent. It shall consist of aluminium main tee and cross tee's suspended by adjustable hangers fixed to R.C.C. floor with cleats. The grid may be 600 x 600 mm, 1200 x 600 mm or as per drawings. Ceiling materials, shall be fixed to frames strictly as per manufacturers specification.

16.1.9 Fixing of Ceiling


16.1.9.1 Wooden ceiling with planks

These shall be of class of wood and thickness as specified in Schedule of items. Unless specified otherwise the width of the ceiling board shall be 100 mm to 150 mm and shall be planed true on the exposed surface. The maximum length of the finished board shall be 1800 mm. The boards/strips shall be joined with tongue and groove joints and heading joints in adjacent board of the same strip shall be square butt type neatly finished. These joints shall be staggered in alternate strip or line. The boards shall be fixed to T.W. battens by headless brass pins. Moulding beads at junctions with walls and other locations as per drawings shall be provided. Necessary opening for installation of light fittings and A/C grill shall be provided and junctions if required shall be finished with moulded beads.

The false ceiling shall finally be checked for line and level, sand papered and polished with colourless polish to achieve matt satin natural finish.

16.1.9.2 Decorative ply ceiling

These shall be with decorative selected group matched ply of Teak Ply, white cedar ply or any other approved class of veneer ply in strips, square or rectangular panel matching the ply of wall panelling, if any, in the same room and of thickness as per schedule of item and drawings.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 173 of 180
			REVISION : 0
			EDITION : 1

The strip ply, square/rectangular panels shall be fixed to T.W. framework with panel pins. Moulded beads of same wood as that of ply of matching shade shall be provided at junctions with walls and as specified in drawings.

Where specific pattern of grains and shade is required the ply cut into shapes as per design may be pasted on a backing ply with adhesive and such made panels shall be fixed to framing.

The ceiling shall be checked for line, and levels and exposed surfaces shall be sand papered and finally polished with colourless polish to achieve matt satin natural finish.

16.1.9.3 Ceiling with insulation board/particle boards

Insulation boards shall be of approved manufacturer, shade, design and thickness as specified in schedule of items and drawings. These may be plain, textured, perforated with natural finish or with white finished surface.

The boards shall be cut to suit the panel sizes of ceiling with special tools and by skilled workmen strictly as per manufacturers specifications. The board shall be fixed to T.W. frames with brass screws or as per manufacturers recommendation and in case of metal frames as per recommendations of the manufacturer of the ceiling system. The joints where exposed shall be of uniform thickness (3 mm to 6 mm) and pattern as shown in drawings.

The ceiling shall be checked for line and level and exposed surfaces prepared appropriately to receive the paint as specified in schedule of item and drawing.


16.2. Wooden partitions

16.2.1 Scope

All materials for the wooden partitions shall be of respective class as specified in the part (I) and as mentioned in schedule of items.

16.2.1.2 Frame work

Unless otherwise specified in the schedule of items, framing for partitions shall be made of approved quality teak wood scantlings of

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 174 of 180
			REVISION : 0
			EDITION : 1

sizes as mentioned in schedule of items and drawing. The spacing of frames shall not exceed 1200 mm c/c in both direction. The joints of the frame shall be made as per standard joinery practice using standard adhesive as described in wood work chapter. The faces of the frames to receive ply/wooden board shall be true to line, level and plumb. The frames shall be firmly secured to walls, ceilings, floors by making chases and grouting the frames in 1:2:4 cement concrete or fixing the frames with metal clamps/flats screwed to above elements. The frame shall be treated with 2 coats of wood preservative. Where the panelling material is of decorative ply of 3.5 mm to 4 mm thickness, commercial ply of 6 mm thickness shall be fixed to the frame work for backing purpose. Where sunk (coffered) panels are to be made, combination of single and double layers ply shall be used for backing to achieve level difference for sunk panels.

16.2.3 Boarding/facing for partition

a) Wooden plank/board

These shall be of class of wood and thickness as specified in the schedule of item and drawings. These shall be fixed to backing wooden frame work with counter sunk brass screws in pattern and designs, with grooves, joints, beads, fillets, cover moulds as shown in drawings. The exposed surfaces shall be sand papered and polished as specified.


b) Decorative ply wood facing

These shall be with decorative teak wood/rose ply/white cedar 3.5 to 4 mm thickness of selected pieces with matching colour, texture and grains and shall be fixed to the backing ply with panel pins in pattern, design, with uniform width of joints, beads, fillets, cover mould as shown in drawings. The exposed surfaces shall be lightly sand papered finished with colourless polish to achieve matt satin finish.

c) Jolly pan (laminated) board

Where specified Jolly pan boards shall be fixed to teak wood frame work strictly as per manufacturer's specification. The boards after fixing shall be cleaned of all adhesives etc.

d) Formica facing

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 175 of 180
			REVISION : 0
			EDITION : 1

Formica facing shall be fixed to the backing ply with standard adhesive as described for panelling works.

16.3 Expansion and Isolation Joints

16.3.1 General

Expansion and isolation joints in concrete structures shall be provided at specific places as per details indicated on the drawings. The materials and types of joints shall be as specified hereinafter. In case of liquid retaining structures, additional precautions shall be taken to prevent leakage of liquids as may be specified on the drawings or as directed by the Engineer. All materials are to be procured from reliable manufacturers and must have the approval of the Engineer. Where it is the responsibility of the Contractor to supply the material, the Engineer may demand test certificates for the materials and/or instruct the Contractor to get them tested in an approved-laboratory free of cost to the Owner. Joints shall be formed true to line, level, shape, dimension and quality as per drawings and specifications. Prior approval, for the method of forming the joints, should be obtained from the Engineer before starting the work.


16.3.2 Bitumen impregnated board

Bitumen impregnated fibre board of approved manufacturer as per IS: 1838 (Part 1)-1983 may be used as fillers for expansion joints. It must be durable and waterproof. It shall be compressible and possess a high degree of rebound. The dimensions of the board should be equal to that of the joint being formed. At the exposed end, the joint shall be sealed with approved sealing compound to a depth of at least 25 mm after application of an approved primer. The sealing compound and the primer shall be applied as specified by the manufacturer.

16.3.3 Joint sealing strips

16.3.3.1 General

Joint sealing strips may be provided at the construction, expansion and isolation joints as a continuous diaphragm to contain the filler material and/or to exclude passage of water. The sealing strips will be either metallic like G.I., Aluminium or Copper, or Non-metallic like rubber or P.V.C.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 176 of 180
			REVISION : 0
			EDITION : 1

Sealing strips will not have any longitudinal joint and will be procured and installed in largest practicable lengths having a minimum number of transverse joints. The jointing procedure shall be as per the manufacturer's recommendations, revised if necessary, by the Engineer. If desired by the Engineer, joints in rubber seals may have to be vulcanised.

16.3.3.2 Metal sealing strips

Metal sealing strips shall be either G.I., Aluminium or Copper and formed straight, U-shaped, Z-shaped or any other shape and of thickness as indicated in the drawing and schedule of items and/or as instructed by the Engineer.

The transverse joints will be gas welded using brass rods and approved flux. In case it is found that the joints cannot be made leak proof, longer lap lengths and different method of brazing which will render it leak proof, will be adopted by the Contractor without any additional cost to the Owner. The edges shall be neatly crimped and bent to ensure proper bond with the concrete.

a) G.I. Strips

G.I. strips shall be minimum 1.5 mm thick and 150 mm in width unless specified otherwise. The Strips shall be strong, durable, without any rust or crease. At the joints, the overlapping should be for a minimum length of 50mm


b) Aluminium strips

Aluminium strips shall be minimum 18 SWG thick and 300 mm wide unless specified otherwise and shall conform to IS : 737-1986. A minimum lap of 50 mm length is required at the joints.

c) Copper strips

The copper strips shall be minimum 18 SWG in thickness and 300 mm width.

It should be cleaned thoroughly before use so as to expose fresh surface, without any reduction in gauge. A minimum lap of 50 mm in length is required at the joints.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 177 of 180
			REVISION : 0
			EDITION : 1

16.3.3.3 Non-metallic sealing strips

These will be normally in Rubber or PVC Rubber or PVC joint seals can be of shape having any combination of the following features :

- Plain
- Central bulb
- Dumb-bell or flattened ends
- Ribbed and corrugated wings
- V-shaped

Transverse joints will be allowed only under unavoidable circumstances and with the specific approval of the Engineer. The actual size and shape shall be as shown in drawings/Schedule of Items and or as directed by the Engineer.

The method of forming these joints, laps etc., shall be as specified by the Manufacturer and/or as approved by the Engineer taking particular care to match the central bulbs and the edges accurately.

a) Rubber sealing strips

The minimum thickness of rubber sealing strips shall be 3 mm and the minimum width 100 mm. The material will be natural rubber and be resistant to corrosion, abrasion and attacks from the acids, alkalies and chemicals normally encountered in service. The physical properties will be generally as follows :

Specific Gravity : 1.1 to 1.15


Shore Hardness : 65A to 75A

Tensile Strength : 25 - 30 N/mm²

Maximum Safe Continuous
Temperature : 75 Degree 'C'

Ultimate Elongation : Not less than 350%

b) P.V.C. sealing strips

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 178 of 180
			REVISION : 0
			EDITION : 1

The minimum thickness of P.V.C sealing strips will be 3 mm and the minimum width 100 mm. The material should be of good quality Polyvinyl Chloride highly resistant to tearing, abrasion and corrosion as well as to chemicals likely to come in contact with during use. The physical properties will generally be as follows :

Specific Gravity : 1.3 to 1.35

Shore Hardness : 60A to 80A

Tensile Strength : 10 - 15 N/mm²

Maximum Safe Continuous Temperature : 70 Degree 'C'

Ultimate Elongation : Not less than 275%

16.3.4 Bitumen compound

When directed, the gap in expansion joints shall be thoroughly cleaned and bitumen compound laid as per manufacturer's specifications. The compound to be used shall be of approved manufacture and shall conform to the requirements of IS: 1834-1984.

16.4 Barbed Wire Fencing

16.4.1 Materials

16.4.1.1 Galvanised barbed wire


Barbed wire shall be properly galvanised and shall be obtained from the approved manufacturer as specified in detail in Part-1.

16.4.1.2 Other materials

The specifications of materials, for angle iron posts, concrete works, plasters, if any, and for other works, shall conform to the requirements as specified in Part-I.

16.4.2 Workmanship

The work shall comprise of the following :

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 179 of 180
			REVISION : 0
			EDITION : 1

- a) Excavation in ground of required dimensions with all sides vertical in any type of soil including soft rock and removing the soil and dressing it neatly.
- b) Filling the holes in full with cement concrete 1:3:6 mix, well packed, after erecting the posts in correct line, level and plumb. In case of any post coming at local depression, the hole may not be of full depth but the depth of concrete will always be made 60 cm raising it above ground level with necessary shuttering.
- c) Where the angle iron posts are specified in the item these shall be 50 mm x 75 mm x 6 mm unless mentioned otherwise. 10 mm dia holes with saw cuts for inserting the wires shall be made as per the spacings of barbed wire shown in drawing or as directed by the Engineer. The foot of the post shall be provided with base plate for anchorage. The spacing shall be 2.5 m or as per drawing. After inserting the wire into holes the socket is to be pressed back.
- d) Straining bolts are to be provided 15 m apart from each row of wire for maintaining proper tension in the wire and without any sag or looseness.
- e) Posts are to be painted as directed by the Engineer.

16.5 Chain link fencing


16.5.1 Scope

The work under this specification covers the supply and fixing of galvanised steel chain link fencing with galvanised steel posts chain link fabric.

16.5.2 Material

Galvanised steel chain link fabric and galvanised steel pipe posts shall be obtained from the approved manufacturer as specified in detail in Part - I .

16.5.3 Workmanship

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 180 of 180
			REVISION : 0
			EDITION : 1

The GI pipe posts shall be embedded in plain cement concrete not leaner than 1:4:8 foundations. The height of posts above top of foundations and spacing of post shall not be more than 3 m. The chain link fabric shall be fixed to the fencing posts with the help of stretcher galvanised bars (25 x 6 flats) which will be bolted to the lugs welded to the posts. The stretcher bars shall be provided in the lapping of fabric also.

16.6 Concertina Coil fencing

The spacing of posts and strut shall be 3.0m apart centre to centre, unless otherwise specified or as per Engineer-in-charge to suit the dimension of the area to be fenced. Every 15 th last but one end posts and corner posts shall be strutted on both sides and end posts on one side only.


Fixing of posts and struts shall be as specified in clause 4.21.8 Part II of specification.

Concertina coil fencing shall be fixed on angle iron shaped with 9 horizontal reinforced barbed tape (RBT) stud tied with GI staples and GI clips to retain horizontal including necessary bolts or GI barbed wire tied to angle iron all complete as per direction of Engineer-in-charge with reinforced barbed tape.




SPECIFICATION FOR CIVIL WORKS

PART – III NORMS OF CEMENT CONSUMPTION

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 1 of 1
			REVISION : 0
			EDITION : 1

CONTENTS

1. MASONRY WORK
2. PLAIN/REINFORCED CONCRETE WORK
3. FINISHING WORK
4. FLOORING WORK
5. MISCELLANEOUS ITEMS
6. WATER SUPPLY/DRAINAGE & SANITARY WORKSS

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 1 of 14
			REVISION : 0
			EDITION : 1

GENERAL


For calculating the requirements of cement in various items of work the following standards will be adopted. Over the above theoretical quantity of cement, additional allowance upto plus or minus 3% shall also be allowed as certified by the engineer.

For items not covered in this standard, CPWD standards shall be followed or calculated as per uses/requirement in absence of standard norms. Cement required for enabling work and cement required for testing purposes will be taken into account for consumption purpose. However, in no case such quantity should exceed 5% of the total cement used in the work or as certified by the engineer based on actual observation whichever is less.

Sl.No.	Description of Item	Cement Requirement
--------	---------------------	--------------------

MASONRY WORK

- | | | | |
|----|----------------------------|--------|----------------------------------|
| 1. | Random rubble masonry with | CM 1:4 | 1.255 quintals per cum |
| 2. | Random rubble masonry with | CM 1:6 | 0.825 quintal per cum |
| 3. | Coursed rubble masonry in | CM 1:6 | 0.75 quintal per cum |
| 4. | Brick work in | CM 1:4 | 0.950 quintal per cum of BW |
| 5. | Brick work in | CM 1:6 | 0.625 quintal per cum of BW |
| 6. | Half brick work in | CM 1:3 | 1.43 quintals per 10 sqm of area |
| 7. | Half brick work in | CM 1:4 | 1.06 quintals per 10 sqm of area |
| 8. | 75mm thick brick in | CM 1:4 | 0.65 quintal per 10 sqm of area |
| 9. | 75mm thick brick in | CM 1:3 | 0.81 quintal per 10 sqm of area |

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 2 of 14
			REVISION : 0
			EDITION : 1


10. Projected brick bands,
Drip course etc. in CM 1:6
finished with 12mm thick
cement plaster 0.165 quintal per 10 RM
11. Half brick thick,
Honey combed brick work in CM 1:4 0.064 quintals per sqm

PLAIN/REINFORCED CONCRETE

- RCC/PCC of nominal mix 1:5:10
complete (excluding finishing with CP) 1.30 quintals per cum of concrete
- RCC/PCC of nominal mix 1:4:8
complete (excluding finishing with CP) 1.70 quintals per cum of concrete
- RCC/PCC of nominal mix 1:3:6
complete (excluding finishing with CP) 2.23 quintals per cum of concrete
- RCC/PCC of nominal mix 1:2:4
complete (excluding finishing with CP) 3.18 quintals per cum of concrete

Controlled Concrete - Plain and Reinforced


- | | | | |
|----|----------------|--|--|
| 5. | Concrete grade | (i) M -5A
(ii) M -5B
(iii) M -7.5A
(iv) M -7.5B | To be mutually agreed
based on
mix design to be
prepared by contractor &
approved by the
Engineer |
| 6. | Concrete grade | (i) M -10A
(ii) M -10B
(iii) M -10C | |
| 7. | Concrete grade | (i) M -15B
(ii) M -15C
(iii) M -15D | |

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 3 of 14
			REVISION : 0
			EDITION : 1

8.	Concrete grade	(i) M -20B (ii) M -20C (iii) M -20D	plus wastage and all incidentals as decided.
9.	Concrete grade	(i) M -25B (ii) M -25C (iii) M -25D	
10.	Concrete grade	(i) M -30C (ii) M -30D	
11.	Applying cement slurry on RCC slab for receiving cement concrete flooring.		2.75 kg/sqm

FINISHING


1.	6mm thick C.P. 1:4	0.280 quintal per	10 sqm area
2.	10mm thick C.P. 1:5	0.370 quintal per	10 sqm area
3.	10mm thick C.P. 1:4	0.430 quintal per	10 sqm area
4.	10mm thick C.P. 1:6	0.300 quintal per	10 sqm area
5.	12mm thick C.P. 1:3	0.734 quintal per	10 sqm area
6.	12mm thick C.P. 1:4	0.547 quintal per	10 sqm area
7.	12mm thick C.P. 1:6	0.360 quintal per	10 sqm area
8.	15mm thick C.P. 1:4	0.655 quintal per	10 sqm area
9.	15mm thick C.P. 1:6	0.440 quintal per	10 sqm area
10.	20mm thick C.P. 1:4	0.850 quintal per	10 sqm area
11.	20mm thick C.P. 1:6	0.560 quintal per	10 sqm area
12.	12mm thick bearing plaster in CM 1:4 with neat cement finish	0.590 quintal per	10 sqm area

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 4 of 14
			REVISION : 0
			EDITION : 1


13.	Neat cement punning	0.200 quintal per	10 sqm area
14.	Flush or ruled or cut or weather pointing on brick work with CM 1:3	0.155 quintal per	10 sqm area
15	Flush or ruled or cut out or weather pointing on brick work with CM 1:2	0.200 quintal per	10 sqm area
16.	Raised and cut pointing on brick work with cement mortar 1:3	0.235 quintal per	10 sqm area
17.	Flush or ruled pointing on brick flooring with cement mortar 1:4	0.075 quintal per	10 sqm area
18.	Flush or ruled pointing on brick flooring with cement mortar 1:6	0.050 quintal per	10 sqm area

FLOORING


1.	Brick on edge flooring in cement mortar 1:4	1.100 quintal per	10 sqm area
2.	Brick on edge flooring in cement mortar 1:6	0.800 quintal per	10 sqm area
3.	25mm thick (IPS) cement concrete flooring 1:2:4 (1 cement : 2 sand : 4 graded stone chips 12mm nominal size) finished with a floating coat of neat cement.	1.020 quintal per	10 sqm area
4.	40mm thick (IPS) cement concrete flooring 1:2:4 with 20mm and down stone chips finished with a floating coat of neat cement.	1.500 quintal per	10 sqm area
5.	25mm thick (IPS) flooring with base coat 19mm thick 1:2:4 using stone		

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 5 of 14
			REVISION : 0
			EDITION : 1


- chips 10mm nominal size and 6mm topping coat 1:1 (1 cement : 1 stone chips 3mm size) with a floating coat of neat cement. 1.370 quintal per 10 sqm area
6. 40mm thick (IPS) flooring with base coat 30mm thick 1:2:4 using stone chips 10mm nominal size and 10mm topping coat 1:1 (1 cement : 1 stone chips 3 to 6mm size) with a floating coat of neat cement. 2.320 quintal per 10 sqm area
- 25mm thick cast-in-situ grey terrazzo flooring, under layer 19mm thick cement concrete 1:2:4 with 10mm nominal size chips and 6mm thick topping laid in cement marble powder mix 3:1 (3 cement : 1 marble powder) by weight in proportion of 4:7 (4 cement marble powder mix : 7 marble chips) by volume. 1.370 quintal per 10 sqm area
8. 40mm thick cast-in-situ grey terrazzo flooring, under layer 30mm thick cement concrete 1:2:4 with 10mm nominal size chips and 10mm thick topping laid in cement marble powder mix 3:1 (3 cement : 1 marble powder) by weight in proportion of 4:7 (4 cement marble powder mix : 7 marble chips) by volume. 1.575 quintal per 10 sqm area
9. 40mm thick cast-in-situ terrazzo flooring, under layer 31mm thick cement concrete 1:2:4 with 10mm nominal size chips and top layer 9mm thick with marble chips of size 4 to 7mm nominal size laid in cement

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 6 of 14
			REVISION : 0
			EDITION : 1

- marble powder mix 3:1 (3 cement : 1 marble powder) by weight in proportion of 4:7 (4 cement marble powder mix : 7 marble chips) by volume.
- a) Dark or light shade pigment with grey cement 1.583 quintal per 10 sqm area
- b) Light shade pigment or without any (grey cement) pigment with white cement 1.010 quintal per (grey cement) 0.580 quintal per (white cement) 10 sqm area
- c) Medium shade pigment with 50% grey cement and 50% white cement 1.295 quintal per (grey cement) 0.290 quintal per (white cement) 10 sqm area
10. 40mm thick cast-in-situ terrazzo flooring, under layer 28mm thick cement concrete 1:2:4 with 10mm nominal size chips and top layer 12mm thick with marble chips of size 7 to 12mm nominal size laid in cement marble powder mix 3:1 (3 cement : 1 marble powder) by weight in proportion of 2:3 (2 cement marble powder mix : 3 marble chips) by volume.
- a) Dark or light shade pigment with grey cement 1.705 quintal per 10 sqm area
- b) Light shade pigment or without any (grey cement) pigment with white cement 0.895 quintal per (grey cement) 0.810 quintal per (white cement) 10 sqm area
- c) Medium shade pigment with 50% grey cement and 50% white cement 1.300 quintal per (grey cement) 10 sqm area


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 7 of 14
			REVISION : 0
			EDITION : 1

		0.405 quintal per (white cement)	10 sqm area
d)	White cement without any pigment	0.895 quintal per (grey cement)	10 sqm area
		0.810 quintal per (white cement)	10 sqm area
11.	Terrazzo cast-in-situ skirting and dado, top layer 6mm thick marble chips laid in cement marble powder mix 3:1 (3 cement : 1 marble powder) by weight in proportion of 4:7 (4 cement marble : 7 marble chips) by volume.		
(A)	18mm thick with under layer 12mm thick cement plaster 1:3		
a)	Dark or light shade pigment with grey cement	1.490 quintal per	10 sqm area
b)	Light shade pigment or without any pigment with white cement.	1.090 quintal per (grey cement)	10 sqm area
		0.400 quintal per (white cement)	10 sqm area
c)	Medium shade pigment with 50% grey cement and 50% white cement	1.290 quintal per (grey cement)	10 sqm area
		0.200 quintal per (white cement)	10 sqm area
(B)	21mm thick, with under layer 15mm thick cement plaster 1:3		
a)	Dark or light shade pigment with grey cement	1.640 quintal per	10 sqm area
b)	Light shade pigment or without any pigment with white cement.	1.230 quintal per (grey cement)	10 sqm area
		0.400 quintal per	10 sqm area


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 8 of 14
			REVISION : 0
			EDITION : 1

(white cement)

- | | | | |
|-----|--|---|----------------------------|
| c) | Medium shade pigment with 50% grey cement and 50% white cement | 1.430 quintal per (grey cement)
0.200 quintal per (white cement) | 10 sqm area
10 sqm area |
| 12. | Precast terrazzo tiles 20mm thick with marble chips of sizes upto 6mm laid in 25mm thick bed of lime mortar, jointed with neat cement slurry mixed with pigment | | |
| a) | Dark shades using grey cement | 0.88 quintal per | 10 sqm area |
| b) | Light shade using white cement. | 0.44 quintal per (grey cement)
0.44 quintal per (white cement) | 10 sqm area
10 sqm area |
| c) | Medium shade using 50% grey cement and 50% white cement | 0.66 quintal per (grey cement)
0.22 quintal per (white cement) | 10 sqm area
10 sqm area |
| 13. | Precast terrazzo tiles 20mm thick with marble chips of sizes upto 6mm in skirting or on walls, laid on 12mm thick cement plaster 1:3 jointed with neat cement slurry | | |
| a) | Dark shades using grey cement | 1.395 quintal per | 10 sqm area |
| b) | Light shade using white cement. | 1.175 quintal per (grey cement)
0.22 quintal per (white cement) | 10 sqm area
10 sqm area |
| c) | Medium shade using 50% grey cement | 1.285 quintal per | 10 sqm area |

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 9 of 14
			REVISION : 0
			EDITION : 1


	and 50% white cement	(grey cement) 0.11 quintal per (white cement)	10 sqm area
14.	White glazed tiles 5, 6 or 7 mm thick in flooring, skirting and dado on 12 mm thick cement plaster 1 : 3 in base and joined with white cement, slurry etc.	0.942 quintal per (grey cement) 0.25 quintal per (white cement)	10 sqm area 10 sqm area
15.	Marble stone slab flooring over 20mm thick base of lime mortar 1:1:1 (1 lime : 1 surkhi : 1 sand) and jointed with white cement slurry etc.		
	a) 20 mm thick / 30 mm thick / 40 mm thick	0.075 quintal per (white cement)	10 sqm area
16.	Marble stone slab flooring over 20mm thick base of cement mortar 1:4 & jointed with white cement slurry etc.		
	a) 20 mm thick	1.275 quintal per (grey cement) 0.075 quintal per (white cement)	10 sqm area 10 sqm area
	b) 30 mm thick	1.290 quintal per (grey cement) 0.075 quintal per (white cement)	10 sqm area 10 sqm area
	c) 40 mm thick	1.310 quintal per (grey cement) 0.075 quintal per (white cement)	10 sqm area 10 sqm area
17.	Marble tiles 18 to 24 mm thick in risers	1.16 quintal per	10 sqm area

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 10 of 14
			REVISION : 0
			EDITION : 1

	of steps, skirting, dado, walls and pillars laid on 12mm thick cement mortar 1:3 (1 cement : 3 sand) and jointed with white cement slurry	(grey cement) 0.075 quintal per (white cement)	10 sqm area
18.	Extra for each additional thickness of 5 mm granolithic layer of 1:2:4 for flooring	0.016 quintal per	10 sqm of area
19	12mm thick cement plaster skirting, dado risers of steps and edges of ground sink with CM 1:3 finished with a floating coat of neat cement.	0.800 quintal per	10 sqm of area
20	15mm thick cement plaster skirting, dado risers of steps and edges of ground sink with CM 1:3 finished with a floating coat of neat cement.	0.995 quintal per	10 sqm of area
21.	19mm thick cement plaster skirting and dado with 12mm thick backing with CM 1:3 and 7mm topping 1:1 (1 cement : 1 stone chips 3mm size) finished with a floating coat of neat cement.	1.35 quintal per	10 sqm of area
22.	25mm thick cement plaster skirting and dado with 18mm thick backing with CM 1:3 and 7mm topping 1:1 (1 cement : 1 stone chips 3mm size) finished with a floating coat of neat cement.	1.85 quintal per	10 sqm of area


MISCELLANEOUS

1.	Marble work for wall lining (Veneer work) 1.8 to 2.4 cm thick in CM 1:3 including pointing with white cement mortar 1:2 (1 white cement : 2 marble	0.715 quintal per (grey cement) 0.170 quintal per (white cement)	10 sqm of area 10 sqm of area
----	--	---	----------------------------------


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 11 of 14
			REVISION : 0
			EDITION : 1

dust)

- | | | | |
|----|---|---|----------------------------------|
| 2. | Marble work for wall lining (Veneer work) 4 cm thick in CM 1:3 including pointing with white cement mortar 1:2 (1 white cement : 2 marble dust) | 1.020 quintal per (grey cement)
0.170 quintal per (white cement) | 10 sqm of area
10 sqm of area |
| 3. | Grading roof for water proofing treatment with :- | | |
| a) | CC 1:2:4 (1 cement : 2 coarse sand : 4 stone aggregate 20mm nominal size) | 3.2 quintal per | cum of Concrete |
| b) | CM 1:3 | 5.1 quintal per | cum of mortar |
| c) | CM 1:4 | 3.8 quintal per | cum of mortar |
| 4. | Providing and fixing MS fan clamps of standard shape and size in existing RCC slab including cutting chase and making good. | 0.016 quintal | each |
| 5. | Making plinth protection 50mm thick of CC 1:3:6 (1 cement : 3 sand : 6 graded stone aggregate 20mm nominal size) over 75mm bed of dry brick ballast 40mm nominal size well rammed and consolidated and grouted with fine sand including finishing the top smooth. | 1.1 quintal per | 10 sqm of area |
| 6. | Grouting with | | |
| a) | CM 1:2 | 7.18 quintal per | cum |
| b) | CM 1:3 | 5.40 quintal per | cum |


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 12 of 14
			REVISION : 0
			EDITION : 1

7.	DPC 25mm thick (1:2:4)	0.81 quintal per	10 sqm of area
8.	Making plinth protection with bricks on edge in CM 1:6 over 7.5cm bed of dry brick aggregate 40mm nominal size rammed, consolidated and grouted with fine sand and top of bricks pointed with CM 1:2.	0.86 quintal per	10 sqm of area
9.	Providing and fixing 25mm dia GI pipe outlet in CM 1:3 including cutting and making good the walls.	0.05 quintal per	10 RM
10.	Providing and fixing 40mm dia GI pipe outlet in CM 1:3 including cutting and making good the walls.	0.075 quintal per	10 RM
11.	Providing chases 75mm wide 50mm deep in walls for conduit pipe and filling the same with CC 1:3:6	0.075 quintal per	10 RM
12.	Fixing steel windows with 1:2:4 concrete blocks	0.40 quintal per	10 sqm of area
13.	Cement-sand mortar :		
a)	1:1(1cement :1sand)	10.2 quintals per	cum
b)	1:2(1cement : 2sand)	6.8 quintals per	cum
c)	1:3(1cement : 3sand)	5.1 quintals per	cum
d)	1:4(1cement : 4sand)	3.8 quintals per	cum
e)	1:5(1cement : 5sand)	3.1 quintals per	cum
f)	1:6(1cement : 6sand)	2.5 quintals per	cum

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 13 of 14
			REVISION : 0
			EDITION : 1

DRAINAGE/SANITARY & WATER SUPPLY INSTALLATIONS

- | | | | |
|-----|---|-------------------|----------------|
| 1. | 100mm dia AC rain water pipe
l/c fittings with CM 1:2 | 0.725 quintal per | 100 RM of pipe |
| 2. | 150mm dia AC rain water pipe
l/c fittings with CM 1:2 | 0.82 quintal per | 100 RM of pipe |
| 3. | Fixing IWC pan with traps, pair of
footrests, and flushing cistern
complete | 0.125 quintal | each |
| 4. | Fixing EWC pan with trap and flushing
cistern complete | 0.01 quintal | each |
| 5. | Fixing wash basin and kitchen sink | 0.025 quintal | l each |
| 6. | Fixing urinal cistern including pipes | 0.025 quintal | each |
| 7. | Fixing & finishing floor trap | 0.015 quintal | each |
| 8. | Fixing HCl pipes and specials, 100mm
dia and 75mm dia including making
good the walls | 0.135 quintal per | 10 RM of pipe |
| 9. | Fixing GI pipes of all dia with clamps
(for inside work only) | 0.015 quintal per | 10 RM of pipe |
| 10. | Jointing glazed stoneware pipe with
CM 1:1 | | |
| | a) 100 mm dia | 2.17 quintals per | 10 RM of pipe |
| | b) 150 mm dia | 3.23 quintals per | 10 RM of pipe |


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 14 of 14
			REVISION : 0
			EDITION : 1

11. Laying cement concrete 1:5:10 all round SW pipe including bed concrete as per standard design
 - a) 100mm dia SW pipe 19.24 quintals per 100 RM of pipe
 - b) 150mm dia SW pipe 23.53 quintals per 100 RM of pipe
12. Gully chamber as per specification. 0.385 quintal each
13. Stopcock chamber as per specification 0.185 quintal each
14. Inspection chambers as per specification
 - a) 600x600x600mm deep 1.43 quintals each
 - b) 750x600x600mm deep 1.435 quintals each
 - c) 900x900x600mm deep 1.885 quintals each
15. Extra depth of inspection chambers as per specification
 - a) 600x600mm 0.805 quintal per RM of depth
 - b) 750x600mm 1.295 quintal per RM of depth
 - c) 900x900mm 1.460 quintal per RM of depth
 - d) 1200x900mm 1.835 quintal per RM of depth



SPECIFICATION FOR CIVIL WORKS

PART – IV DIMENSIONAL TOLERANCE

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 1 of 10
			REVISION : 0
			EDITION : 1

GENERAL

The materials used in construction shall, besides conforming to the specifications and standards mentioned, be the best of the existing kinds obtainable. Where a particular 'Brand' or 'Make' of material is specified such 'Brand' or 'Make' of material alone shall be used.

A high standard of workmanship and accuracy shall be achieved in all sections and parts of the work. The workmanship shall be in accordance with the latest and the best civil engineering practice.

The Contractor shall ensure that all sections of the work are carried out with utmost care to achieve the dimensions shown in drawings or specifications. Where special and close tolerances are required in any particular section of work, these will be shown in the drawing and such tolerances shall be met. In the absence of such specific mention in drawings the following dimensional deviations may be tolerated, provided they do not impair the appearance or render the particular section of work unacceptable to the purpose for which it is intended. Tolerance for materials and workmanship not covered in this part as mentioned hereinafter will be in accordance with the relevant IS code.

Description	Permissible tolerance
--------------------	------------------------------


Building bricks, in length width and height	:	As per IS 1077 - 1992
---	---	-----------------------

Laterite stone, in length, width & height	:	Plus or minus 5 mm
---	---	--------------------

Natural building stone

a)	For stones required in ashlar masonry :	
	Length & Breadth	: Plus or minus 5mm
	Height	: Plus or minus 3mm

b)	For stones required other than in ashlar masonry :	
	Length & Breadth	: Plus 5mm, minus 10mm
	Height	: Plus 5mm, minus 5mm

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 2 of 10
			REVISION : 0
			EDITION : 1

Description

Permissible tolerance

Concrete and reinforced concrete pipes :

Length : Plus or minus 1% of standard length

Internal diameter, upto 300 mm : Plus 3 mm Minus 1.5 mm

Cast iron spigot & socket pipes and fittings :

Length of fittings : Plus or minus 10mm

Length of pipe : Plus or minus 20mm

Thickness : minus 1 mm

Internal dia of socket : Plus or minus 3 mm

Depth of socket : Plus or minus 10mm

External dia, upto 75 mm : Plus or minus 3mm

100 mm : Plus or minus 3.5mm


150 mm : Plus or minus 4mm

Stoneware pipes, in length

upto 75 cm : Plus or minus 10mm

Upto 90 cm : Plus or minus 15mm

In thickness of barrel and socket not exceeding 450mm : Plus or minus 2mm

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 3 of 10
			REVISION : 0
			EDITION : 1


Description

Permissible tolerance

In thickness of barrel and socket between 500 to 600mm	:	Plus or minus 3mm
Glazed tiles, length of all 4 sides	:	Plus or minus 0.8mm
Individual dimensions and thickness	:	Plus or minus 0.5 mm
Metal doors, windows and ventilators - In overall dimension	:	Plus or minus 1.5 mm
Wooden doors, windows, ventilators Overall dimension of door, window, ventilators	:	Plus or minus 3 mm
All components of shutter except glazing bar		
Width	:	Plus or minus 3 mm
Thickness	:	Plus or minus 1 mm
Glazing bar, width & thickness	:	Plus or minus 1 mm

Mild steel tubes, tubulars and other wrought steel fittings

a)	Thickness		
i)	butt welded light tubes	:	Plus not limited minus 8%
	medium and heavy tubes	:	plus not limited minus 10%
ii)	seamless tubes	:	plus not limited minus 12.5%
b)	Weight		
i)	single tube (irrespective of the quantity)	:	+ 10% , - 8%

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 4 of 10
			REVISION : 0
			EDITION : 1


- ii) for quantity of less than 150m of one size : + 10% , - 8%
- iii) for quantity of 150m and over of one size : + 4% , - 4%

Earth work

Finished level of site levelling in hard rock : Plus or minus 50mm

Finished level of site levelling except for hard rock : Plus or minus 100 mm

Level of pits, trenches foundations : Plus or minus 50mm

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 5 of 10
			REVISION : 0
			EDITION : 1

Concrete & Reinforced concrete

Footings, plan dimension : Plus 50 mm Minus 12 mm

Eccentricity : 0.02 times the dimension of footing in the direction limited to 50 mm

Thickness : Plus or minus 0.05 times the specified thickness

Foundations

Deviation of planes and lines of their intersection from vertical or inclination along full height : Plus or minus 20 mm

Deviation of horizontal plane from horizontal line

for 1 m of the plane in any direction : Plus or minus 5mm

for the whole plane : Plus or minus 20mm

Sizes of cross section : Plus or minus 8mm


Surfaces of inserts to support loads : Plus or minus 5mm

Length of elements : Plus or minus 20 mm

Equipment foundations :

Top level of bolt : Plus 20mm


Top level of foundation before grouting : Minus 20mm

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 6 of 10
			REVISION : 0
			EDITION : 1

Axes of anchor bolts in plan	:	Plus or minus 5mm
Axis of foundation in either direction	:	Plus or minus 10mm
Deviation in vertical line along height	:	Plus or minus 10mm
Sizes of pits in plan	:	Plus or minus 20 mm
Sizes of steps in plan	:	minus 20mm
Levels of steps, benches and pits	:	minus 20mm
Axes of inserts in plan	:	Plus or minus 10 mm
Basic dimensions in plan	:	Plus or minus 10mm
Deviation of horizontal plan from horizontal line for 1 m of plane in any direction	:	Plus or minus 5mm
for the whole plane	:	Plus or minus 20mm
Local deviations of top surface when checked with a 2 m long straight edge	:	Plus or minus 8mm

Buildings :

Surfaces when checked with a 2 m long straight edge	:	Plus or minus 8mm
Sizes of cross section	:	Plus 8mm Minus 0 mm
Length of elements	:	Plus or minus 20mm
Deviation from horizontal plane, for whole building	:	Plus or minus 10mm
Plumb in verticality	:	1 in 1000 of height

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 7 of 10
			REVISION : 0
			EDITION : 1


for columns supporting floor beams	:	Plus or minus 10mm
for framed columns linked with crane girders and beams	:	Plus or minus 10mm
Reinforced concrete walls	:	Length : Plus or minus 20mm
Flatness of surface when checked with a 2 m long straight edge	:	Plus or minus 8mm
Level of top surface to support assembled elements	:	Plus or minus 5mm
Deviation in planes and lines of intersection from vertical	:	Plus or minus 15mm
Size of cross section	:	Plus or minus 8mm

Placing of reinforcement :

Length of bar upto 75 cm long (Other than straight bars)	:	Plus 3 mm Minus 5 mm
75 - 150 cm long	:	Plus 5 mm Minus 10 mm
150 - 250 cm long	:	Plus 6 mm Minus 15 mm
250 cm long and above	:	Plus 7 mm Minus 25 mm
Straight bars, all lengths	:	Plus or minus 25 mm
Spacing of bars	:	Plus or minus 5 mm

Anchor bolts :

Shift in location in plan	:	Plus or minus 5 mm
---------------------------	---	--------------------

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 8 of 10
			REVISION : 0
			EDITION : 1

Same, when bolts are located outside of structural columns : Plus or minus 10mm

Top level : Plus 20 mm

Threaded length : Plus 30 mm

For Walls

For Pillars

Masonry

Width : Plus or minus 10 mm Plus or minus 10 mm

Shift in axes : Plus or minus 10 mm --- ---


Deviation in row from horizontal line for every 10m length : Plus or minus 15 mm --- ---

Flatness of surface when checked with a 2 m long straight edge : Plus or minus 10 mm Plus or minus 5 mm

Deviation in lines separating storeys Deviation of surface from vertical and and at angles and corners : Plus or minus 15 mm Plus or minus 15 mm

for 1 storey : Plus or minus 10 mm Plus or minus 10 mm

for whole building : Plus or minus 30 mm Plus or minus 30 mm

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 9 of 10
			REVISION : 0
			EDITION : 1

Dimensions of openings for
doors, windows etc : Plus 15 mm
Minus 0 mm

Flooring, skirting, dado and
plastering :

Insitu concrete floor : 4 mm

Concrete tile and mosaic, in
any 3 m length : 3 mm

in large open area : 15 mm

wall tiling - surface should not
vary from general plane by
more than 1 in 200. Marble and
such superior work, in any 2 m
length : 1.5 mm

in any row : 3 mm


Plastered surfaces, flatness
when checked with a 2 m long
straight edge : 3 mm

Vertical surfaces, upto 1 storey : 5 mm

Over full heights : 10 mm

Metallic Inserts on assembled
components length and width : Plus or minus 3
mm

Road work

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 10 of 10
			REVISION : 0
			EDITION : 1


The levels of the sub-grade and different pavement courses should not vary from those calculated with reference to the longitudinal and cross-sections of the road as shown on the drawing beyond the tolerance given below :-

Sub-grade	:	plus or minus 25mm
Sub-base	:	plus or minus 20mm
Base	:	plus or minus 15mm
Wearing course	:	plus or minus 6mm




SPECIFICATION FOR CIVIL WORKS

PART – V METHOD OF MEASUREMENT

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 1 of 1
			REVISION : 0
			EDITION : 1

CONTENTS

1.0	GENERAL
2.0	EARTHWORK
3.0	ANTI - TERMITE TREATMENT
4.0	CONCRETE (PLAIN & REINFORCED)
5.0	MASONRY
6.0	PLASTERING
7.0	WHITE WASHING, COLOUR WASHING & PAINTING
8.0	FLOORING, PAVING & FACING WORKS
9.0	WOODWORK
10.0	METAL DOORS, WINDOWS & VENTILATORS
11.0	GLAZING
12.0	WATER SUPPLY, DRAINAGE, SEWERAGE & SANITATION
13.0	WATER PROOFING, DAMP PROOFING
14.0	CEILING AND LINING
15.0	ROAD WORK

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 1 of 16
			REVISION : 0
			EDITION : 1

1.0 GENERAL

- 1.1 The method of measurement of the various items of work shall be in accordance with IS : 1200 (Part 1 to 28) - 1971 to 1993 unless otherwise mentioned in this part or in the schedule of items or in preamble or in the specification.
- 1.2 If there is any contradiction in meaning between any portion of this part and that of IS :1200 (Part 1 to 28) - 1971 to 1993, the stipulation of this part shall prevail.
- 1.3 The descriptions and explanations given herein have as much forces as though they are incorporated into the description of the items themselves in the schedule of items.


2.0 EARTH WORK & SAND FILLING

2.1 General

- 2.1.1 Each dimension upto 25 m shall be measured to nearest 0.01 m and to nearest 0.1 m for dimensions over 25 m. Areas shall be worked out to the nearest 0.01 m² and cubical contents to the nearest 0.01 m³.
- 2.1.2 Shoring and strutting shall not be measured separately unless otherwise specified.
- 2.1.3 Dewatering for earth work and sand filling work shall not be measured separately unless otherwise specified.
- 2.1.4 For classification of soils, relevant clauses of Technical specification (workmanship and other requirements) is to be followed.

2.2 Requirements for particular works

2.2.1 Site levelling

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 2 of 16
			REVISION : 0
			EDITION : 1

2.2.1.1 For site levelling levels shall be taken jointly before start & after completion of work and the quantity computed based on the levels. Measurements shall be made only for excavation and no separate measurement for filling shall be made except where earth, borrowed from elsewhere for site levelling work, will be measured separately only for that borrowed portion of earth.

2.2.1.2 In cases where it is not possible or convenient to take measurements from excavated cuts or borrow pits, excavation shall be worked out from filling based on the levels to be taken before and after completion of works. Deduction of 10 percent will be made for voids, however for consolidated fills done through heavy mechanical means, the deduction for voids shall be 5% in place of 10%.


2.2.1.3 In exceptional cases where the quantity is measured on the lorry measurement, loose stacks, boxes or any other similar method with the approval of the Engineer the deduction for voids shall be 20 per cent from the actual quantity.

2.2.2 Excavation

2.2.2.1 Before commencing excavation of foundations for buildings and structures, the initial ground levels shall be jointly recorded. The depth of excavation and the calculation of lift shall be based on this. Normally the initial ground level shall be considered as the level of the site as handed over to the contractor. In case excavation is planned and approved to be taken up subsequent to terracing, the terrace level shall be treated as initial ground level.

2.2.2.2 Excavation of foundations, trenches, basements, pits etc., shall be measured to the dimensions shown in the excavation plan, if any, or of the lowest concrete or masonry course, as the case may be and the actual depth. Working space and slopes shall not be measured.

2.2.2.3 Excavation of rock shall be measured from stacks of excavated rock with a deduction of 50 per cent for voids or measured in the solid based on levels.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 3 of 16
			REVISION : 0
			EDITION : 1

2.2.2.4 In case of following works, no measurement will be recorded for the excavation beyond drawing / specification.

- (a) In work which will be covered externally with damp proof covering.
- (b) In work which requires formwork.
- (c) In work which requires workmen to operate from the outside and for guniting and post tensioned concrete, ground beams etc.

However, if there is a specific provision otherwise in the item/specification/preamble, for authorised working, it shall be measured accordingly. This working space may be 60 cm. measured from the face of the structure at lowest level, unless otherwise mentioned.

2.2.2.5 Surface Dressing

Trimming of natural ground, excavated surface and filled up area to remove vegetation and/or small in equalities not exceeding 15 cm deep shall be described as surface dressing and measured in square metres unless otherwise specified in the schedule of items/ preamble.

2.2.2.6 Lead


The distance for removal shall be measured over the shortest practicable route and not necessarily the route actually taken.

The description of the item shall include loading and unloading.

For the purpose of the measurement of the lead, the area excavated shall be divided in suitable block and for each block the distance from the centre of the block to the centre of the placed earth pertaining to this block shall be taken as lead.

2.2.3 Back filling/filling

2.2.3.1 In foundations, trenches, basements, pits, etc. and in other like areas, the measurements shall be the theoretical volume of the filling computed from

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 4 of 16
			REVISION : 0
			EDITION : 1

drawings i.e. the volume measured under excavation minus the volume occupied by the structure and part filling if any, done otherwise.

- 2.2.3.2 In filling under floors the measurements shall be the theoretical volume as per drawings after deducting the part filling if any, done otherwise.
- 2.2.3.3 In embankments, the work shall commence only after recording jointly the initial ground levels and the measurements shall be made on the basis of finished cross section and initial ground levels. Where controlled compaction by mechanical compaction is done, 5% deduction for voids shall be made. In case controlled compaction by mechanical means is not done then deduction for voids shall be 10%.
- 2.2.3.4 Filling/Back filling shall not be measured separately for items of excavation, where filling/back-filling is a part of the composite item and as such is included in excavation item itself.

3.0 ANTI-TERMITE TREATMENT

Measurement shall be the plinth area of the ground floor of the building treated. Dimensions shall be measured to the nearest 0.01 m and area to nearest 0.01 m².


4.0 CONCRETE (PLAIN & REINFORCED)

4.1 Concrete

- 4.1.1 Dimensions shall be measured to nearest 0.01 m except for the thickness of slab, which will be to nearest 0.005 m. Areas shall be worked out to nearest 0.01 m² and cubic contents to nearest 0.01 m³.
- 4.1.2 The concrete shall be measured as per drawings except in the cases of approved variations which will be measured separately.

No deductions shall be made for the following :

- i) Ends of dissimilar materials such as beams, rafters, purlins etc., upto 500 cm² in cross section.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 5 of 16
			REVISION : 0
			EDITION : 1

- ii) Openings upto 0.1 m² in area (In calculating area of an opening, the thickness of any separate lintel or sill shall be included in the height. No extra labour for forming such opening or voids shall be measured).
- iii) Volume occupied by reinforcement or other embedments such as anchors, inserts, conduits or volume occupied by pipes, sheathing etc. not exceeding 100 sq. cm. each in cross sectional area or as specified.
- iv) Small voids not exceeding 40 cm² each in cross section.
- v) Moulds, drip moulding, chamfer, splay, beds, grooves and rebates upto 10 cm in width or 15 cm in girth.


4.1.3 Columns shall be measured from top of column base to underside of first floor slab and from top of floor to underside of floor slab above thereafter. Beams shall be measured from face to face of columns and will include haunches. Depth of beam shall be measured from bottom of slab and in the case of inverted beams from top of slab. Chajjas and other cantilevers shall be measured from the face of the projection. Where vertical fins are combined with chajja, the latter shall be measured clear between fins. In case chajja is not combined with lintel, beam or slab, it shall be measured inclusive of bearing.

4.2 REINFORCEMENTS

4.2.1 Norms for Steel Consumption

The requirement of mild and high strength deformed bars for various works like reinforcement, guard bars, fan hooks etc. shall be calculated as mentioned below :


- i) As per drawing including
 - (a) Authorised laps, bends, standard hooks and deviations etc.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 6 of 16
			REVISION : 0
			EDITION : 1

(b) Spacer bars, chairs, hangers, supports, spacer blocks dowels etc. are to be considered for wastage only and not to be measured for payment purpose.

- ii) Quantity upto 0.5% of (i) above towards unaccounted wastages, plus
- iii) Quantity upto 3% of (i) above towards cut pieces, which shall be pieces below 2m. length. These cut pieces shall not be taken back even though steel has been issued by the client/owner.

- 4.2.2 Reinforcements shall be measured in lengths to the nearest 0.01 m for various diameters of bar and converted into weight in tonnes to the nearest kg. on the basis of standard weights as per IS : 1786-1986. No allowance shall be made in the weight for rolling margin.
- 4.2.3 Authorised laps, standard hooks, bends shall be measured.
- 4.2.4 Sapacer bars, chairs, hangers, supports, spacer blocks and unauthorised laps etc. shall not be measured unless otherwise specified.
- 4.2.5 Dowels neither shown on the drawings nor instructed by the Engineer, but required for construction facilities shall not be measured for payment.
- 4.2.6 Modification of already embedded reinforcement, if required due to faulty fabrication or placement, shall not be measured for payment.
- 4.2.7 The measurements of reinforcements (including authorised laps, hooks, bends) shall be taken only from Bar bending lists or from the drawings except in the cases of approved variations which will be measured as per 4.2.2.
- 4.2.8 Wire netting and fabric reinforcement shall be described (including meshes and wire/strands) and measured in square metre, unless otherwise specified in the schedule of item. Authorised laps shall be measured. Raking or circular cutting and waste shall be included in the description of item.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 7 of 16
			REVISION : 0
			EDITION : 1

4.2.9 Hoop iron shall be fully described and measured in running metres unless otherwise specified in the schedule of item.

4.2.10 Binding wire for the reinforcement shall not be measured separately and shall be included in the item of reinforcement.

4.3 ADMIXTURE

Admixture will be measured separately as specified or on the basis of the requirement as approved by the Engineer.

4.4 FORMWORK

Each dimension shall be measured to the nearest 0.01 m and area to the nearest 0.01 sq.m.

4.4.1 Formwork shall be measured as the actual surface in contact with concrete and paid in sq.m. unless included in the rate for concrete in specific item of work.

4.4.2 All the measurements shall be computed from the drawings except in the cases of approved variations which will be measured separately.


4.4.3 Formwork shall not be measured separately for precast concrete work, grouting and damp proof course which shall be included in the concrete rates.

4.4.4 No measurement for formwork in construction joints shall be made.

4.4.5 Openings upto 0.1 sq.m. shall be neglected, as if non - existent, for the purpose of formwork measurement.

4.4.6 No extra measurement or payment shall be made for making the form work water proof or for supports, scaffolding, staging, centering, approaches etc.

4.4.7 No measurement shall be taken for the formwork in pockets, openings, chambers, chases etc., in concrete if the cross sectional area is less than or

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 8 of 16
			REVISION : 0
			EDITION : 1

equal to 0.1 sq.m. in each case. If the cross section area of any opening exceeds 0.1 sq.m. the actual area of the formwork shall be measured for payment.


4.5 EMBEDDED PARTS

- 4.5.1 These shall be measured on the basis of standard theoretical weight of the complete insert according to the drawing/direction.
- 4.5.2 Embedded steel, which are the integral parts of the embedment according to drawing and are required for anchoring the embedded parts in concrete shall be measured on the basis of the theoretical standard weight. In case of anchor bolts the theoretical weights of the nuts, lock nuts, check nuts and washers shall be added in the measurement for payment.
- 4.5.3 All bye-works such as jigs, fixtures, templates and other arrangements which are not integral parts of the embedded parts, but necessary to secure those (embedded parts) in position shall not be measured for payment.
- 4.5.4 Anti-corrosive paint over the exposed surfaces and protection of the anchor bolts with grease tc., shall not be measured for payment.
- 4.5.5 Modification works necessary to rectify the mistake of already placed embedded parts shall not be measured.

4.6 GROUTING

- 4.6.1 Grouting shall be measured in volume except in the cases of grouting by special cement compound or epoxy compound which will be measured by number.
- 4.6.2 Measurement shall be computed from the drawings except in the cases of approved variations which shall be measured separately and subsequently added to or deducted from.
- 4.6.3 Necessary formwork shall not be measured for payment.

4.7 DAMP PROOF COARSE

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 9 of 16
			REVISION : 0
			EDITION : 1

4.7.1 Measurement shall be in sq.m. stating thickness and computed from the drawings except in the cases of approved variations which will be measured separately.

4.7.2 Necessary formwork shall not be measured for payment.

5.0 MASONRY

5.1 Dimensions shall be measured to nearest 0.01 m, areas to nearest 0.01 m² and cubic contents to nearest 0.01 m³.


5.2 No deduction shall be made for :

- (i) Ends of dissimilar materials such as joints, beams, posts, girders, trusses, lintels, purlins etc., upto 0.1 m² in section.
- ii) Openings upto 0.1 m² in area.
- (iii) Wall plates, bed plates, bearing of slab etc., thickness not exceeding 10 cm. and bearing not extending over the full thickness of wall.
- (iv) Cement concrete blocks for holdfasts and the like.
- (v) Iron fixtures such as pipes etc. upto 300 mm. dia. and hold fasts for doors and windows.

5.3 Dressed stonework such as in sills, cornices , column caps, copings etc., shall be measured as the smallest rectangular block from which the finished stone can be worked.

5.4 Honeycomb openings shall not be deducted from the area of honeycomb brickwork.

5.5 Brickwork of full brick width or more shall be measured in cu.m. while of thickness of half brick or less shall be measured in sq.m., unless otherwise specified.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 10 of 16
			REVISION : 0
			EDITION : 1

- 5.6 Reinforcements for reinforced brick work shall be measured separately, unless otherwise specified and no deduction for reinforcement shall be made from brickwork.

6.0 PLASTERING & POINTING


- 6.1 All plastering and pointing shall be measured in sq.m. unless otherwise described. Dimensions shall be measured to nearest 0.01 m and areas to 0.1 sq.m.
- 6.2 Ceiling shall be measured between walls or partitions (dimensions before plastering) shall be taken. Measurement of wall plastering shall be taken between walls or partitions for length (dimension before plastering) and from top of floor or skirting to ceiling for height.
- 6.3 The methods of measurement including the deductions for openings etc., shall be according to the relevant part of IS : 1200 (Part 1 to 28) - 1971 to 1993.

7.0 WHITE WASHING, COLOUR WASHING, PAINTING & OTHER FINISHES.

The method of measurement shall be according to the relevant part of IS : 1200 (Part 13 & 15) - 1987.

8.0 FLOORING, PAVING & FACING WORKS

- 8.1 The work shall be measured as a complete finished item including necessary underbed, adhesives, dividing strips, joint sealing and necessary grinding, polishing and finishing where specified. The subgrade or the base course shall be measured separately against respective item unless otherwise specified.
- 8.2 All works shall be measured net, dimensions being measured to nearest 0.01 m and areas to nearest 0.01 sq.m. Any opening less than 0.1 sq.m. in area shall not be deducted nor any extra payment made for that.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 11 of 16
			REVISION : 0
			EDITION : 1

8.3 Building paper or water proofing by bituminous felts/mastic asphalt treatment, where specified to be laid below floor, shall be measured separately for payment unless otherwise specified.

8.4 Laps and seams in sheet finishing (linoleum, cork, PVC, rubber & like) shall be deemed to be included in the item itself even if not described explicitly and shall not be measured and paid separately.

9.0 WOODWORK

9.1 All work shall be measured net for finished dimensions as fixed, that is no extra measurement or allowance shall be made for shape, joints, wastage etc. subject to specific provision made in the IS : 1200 (Part 21) - 1973 and for dimensions supplied beyond those specified in the drawing.

9.2 Wooden frame

rough, finished and fixed shall be measured net for overall length nearest to 0.01 m, width and thickness to the nearest 2mm or as specified in the drawing and cubic contents calculated in cubic metres to the nearest three places of decimals.

Wooden shutters of all types


Length and width of the shutters shall be measured net as fixed to the nearest cm. in closed position covering the rebates of the frame but excluding the gap between the shutter and the floor and the area calculated in square metre upto two places of decimal.

Over lap of two leaves of shutter shall not be measured separately.

Hand rails

Hand rails of finished width and depth as specified in the item shall be measured in running metres upto two places of decimal.

9.3 Painting and polishing, unless otherwise described in the schedule of items, shall be measured separately for payment.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 12 of 16
			REVISION : 0
			EDITION : 1

9.4 Builder's hardware and fittings for doors windows and ventilators shall be measured separately, unless stated otherwise in the Schedule of Items. Hardware and fittings shall be measured according to IS : 1200 (Part-VII) - 1972.

9.5 Hold fasts for door, window and ventilator frames shall be measured separately.

9.6 Timber Partitions

This shall be measured in area calculated in sq. m. to the nearest two places of decimal.

9.7 Glazed shutters and glazed partitions (Wooden)

Glazed shutters/glazed partitions with wooden frames shall be measured as a single item in area calculated in sq.m. to the nearest two places of decimal. No separate measurement for glazing/glass panes shall be made.


9.8 Provision of making holes/opening/chases in masonry/ concrete flooring etc. for fixing and making good of the same shall not be measured separately for payment.

9.9 Bitumen painting or approved wood preservative of the timber surfaces in contact with masonry/concrete floor etc. shall not be measured for payment.

10.0 METAL DOORS, WINDOWS & VENTILATORS

10.1 Door, window and ventilator/louvers as fixed, shall be measured net as clear width between jambs and clear height between floor/sill and underside of lintel, but excluding the gap between door shutters and floor. Dimensions shall be calculated to the nearest 0.01 m., area calculated in sq.m. upto two places of decimal.

10.2 For MS collapsible shutter/gate, rolling shutter sliding folding door, length and breadth shall be measured to the nearest cm. for the clear area of

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 13 of 16
			REVISION : 0
			EDITION : 1

opening as per drawing in which they are installed and calculated in sq.m. to the nearest two places of decimal.

10.3 M.S. Rolling grills, doors of steel plate, sliding door louvered ventilators, gates, grills, as fixed, shall be measured and computed to weight from the size as per drawing unless otherwise specified.

10.4 Glazed doors, windows, louvers, partitions (both steel and aluminium) shall be measured in sq.m. to the nearest two places of decimal. No separate measurement for glazing/glass panes shall be made for payment.

11.0 GLAZING

11.1 Glazing shall not be separately measured for doors, windows and ventilators unless otherwise specified.


11.2 North light and roof glazing shall be paid as the area from outside to outside of glazing including frames, to the nearest 0.01 sq.m.

11.3 Glazing, where shown in the schedule of items as a separate item, shall be measured from edge to edge of glass as fixed.

12.0 WATER SUPPLY, DRAINAGE, SEWERAGE & SANITATIONS

12.1 All the pipelines buried under soil/masonry/floors/ concrete, laid over/underground/along masonry/along under floor shall be measured in metres along the centreline together with fittings/specials upto two places of decimal against respective schedule of items for different diameter (the diameter as specified shall mean nominal bore except PVC pipe) unless otherwise specified.

12.2 All necessary earth work in trenches for laying pipe lines including dewatering, levelling and trimming to the gradient, sand filling in the trenches before laying the pipe, back filling either by sand or by approved borrowed soil after laying the pipe lines including necessary compaction by spraying water and levelling/dressing the same shall not be measured separately for payment unless otherwise specified.


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 14 of 16
			REVISION : 0
			EDITION : 1

- 12.3 All required specials, i.e. bends tees, shoes cowls, plug, elbows, unions, caps, checkout and the like excluding valves shall not be measured separately for payment unless otherwise specified.
- 12.4 All fixing and supporting arrangement of the pipes like the supports, saddles, brackets, clamps, cleats, covering the pipes with concrete in case of pipes laid over ground, special arrangement for supporting the pipe like while coming out from the building to the trenches etc. shall not be measured separately for payment, unless otherwise specified.
- 12.5 All the arrangement in road crossing like cutting the road, diverting the road and drains, concealing the pipes with suitable approved measures, backfilling the area, covering and making good of the road with similar materials/design shall not be measured separately for payment, unless otherwise specified.
- 12.6 Septic tanks, inspection pits, manholes etc., shall be considered as a composite single item including excavation, dewatering, concrete, masonry, back filling, protection of other service lines and all the like works unless otherwise specified.
- 12.7 All the valves and all the bathroom/W.C./Kitchen fixtures like bib tap, stop cock, shower, all sanitary wares, towel rails, mirrors etc., shall be measured separately under respective item in the schedule, unless otherwise specified.

13.0 WATER PROOFING, DAMP PROOFING

13.1 Water proofing for roofs

- 13.1.1 Length and breadth shall be measured in metre upto two places of decimal and area calculated in sq.m. upto two places of decimal.
- 13.1.2 Measurement shall be made for the net covered area. No measurement shall be made for overlapping for end and side joints and for bends around/along the corners, ends and for special treatment around pipes, rain water gulleys, steel structure and the like etc. No deduction shall be made

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 15 of 16
			REVISION : 0
			EDITION : 1

in the measurement for the opening of area less than 0.1 m² each and no extra payment shall also be made for any special works made around such openings.

13.1.3 Water proofing treatment shall be considered as a single composite item including priming painting coat, water proofing felts, binding bituminous coats, top bituminous coat and pea size gravel or sand finishing etc.

13.1.4 For lime concrete terracing the consolidated thickness shall be considered for measurement.

13.2 For Water proofing treatment in basement

13.2.1 With bituminous felts

13.2.1.1 Length and breadth shall be measured in metre upto two places of decimal and area calculated in sq.m. up to two places of decimal.


13.2.1.2 Measurement shall be made for the net covered area. Measurement shall be made from the drawing, except in certain special cases where it is impossible to compute from drawing and the measurement shall be made as executed. No measurement shall be made for overlaps, special measures around projected pipes, sealing the bends/rounds and in other cases, necessary projection/ overlap for the connection between vertical and horizontal junction etc.

13.2.1.3 Water proofing treatment shall be considered as a single composite item, including priming painting coat, water proofing felts, binding bituminous coats and top bituminous coat etc.

13.3 Mastic Treatment

13.3.1 Length and breadth shall be measured in metres upto two places of decimal and area calculated in sq.m. up to two places of decimal.

13.3.2 Measurement shall be made for the net covered area. No deduction in measurement shall be made for opening of area upto 0.1 sq.m. each and no extra payment shall be made for any special treatment around such

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 16 of 16
			REVISION : 0
			EDITION : 1

openings. No measurement shall be made for extra payment for the special works necessary for junctions, corners, roundings, bends for the works around pipes and the like.

14.0 CEILING & LININGS

- 14.1 Dimensions shall be measured to the nearest 0.01 m., areas to be worked out to the nearest 0.01 sq.m.
- 14.2 Work formed to circular surfaces shall be measured separately unless otherwise specified.
- 14.3 All work unless otherwise described shall be measured as flat in sq.m.
- 14.4 No deduction in measurement shall be made for openings not exceeding 0.4 sq.m. and no extra measurement shall be made for forming such openings.


15.0 ROAD WORK

- 15.1 Dimensions shall be measured to nearest 0.01 m. Where the thickness is less than 20 cm., it shall be measured to nearest 0.005 m. Areas shall be worked out to nearest 0.01 sq.m. and cubic contents to the nearest 0.01 cu.m.
- 15.2 Where thickness is measured, it shall be the minimum thickness after compaction.
- 15.3 Cement concrete bases and roads shall be measured either in sq.m. or cu.m. as specified.
- 15.4 Unless otherwise specified, expansion and dummy joints shall be described and measured separately and given in running metres stating the thickness and depth of the joints.



SPECIFICATION FOR CIVIL WORKS

PART – VI SAFETY REQUIREMENTS FOR CONSTRUCTION WORKS

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 1 of 19
			REVISION : 0
			EDITION : 1

1.0 GENERAL


This specification deals with the subject matter of safety and protection to be observed in the Civil Construction. This shall be followed along with all related statutory requirements/obligation including Governmental byelaws, codes, ordinance of local or central authorities related to the construction work.

In case of complicated work like deep excavation, intricate shuttering and formwork, excavation in loose soil and below water table, stacking of excavated earth etc., work plan with necessary drawings and documents have to be prepared by the Contractor and got approved by the Engineer.

Necessary reference shall be made to the following Indian Standard Codes on safety requirements for various type of work :

Indian Standard

4081 - 1986	Blasting & Drilling.
5916 - 1970	Construction with Hot Bituminous Materials.
4130 - 1991	Demolition of Buildings.
3764 - 1992	Excavation Work
5121 - 1969	Piling & Other Deep Foundations.
4014 - (P-II) - 1967	Scaffolding, Steel Tubular.
3696 - (P-I & P-II)	Scaffolds and Ladders.
1987 to 1991	
6922 - 1973	Structures Subject to Underground Blasts.
4756 - 1978	Tunneling Work.
5499 - 1969	Underground Air-raid Shelters in Natural Soil.


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 2 of 19
			REVISION : 0
			EDITION : 1

- 4138 - 1977 Working in Compressed Air.
- 7293 - 1974 Working with Construction Machinery
- 8989 - 1978 Erection of Concrete Framed Structures.


2.0 **BLASTING**

- 2.1 Detonators and other explosive for blasting shall be taken to the blasting area in the original container or any separate non-metal container. This shall not be carried loose or mixed with other materials. Detonators and explosives must be kept separately.
- 2.2 No shot for blasting shall be fired except by persons licensed to do so.
- 2.3 Drilling shall not be resumed after a blast has been fired unless a thorough examination has been made to make sure that there is no unexploded charge.
- 2.4 Before firing a shot, sufficient warnings by means of whistling and/or otherwise shall be given to get men off the danger area. Blasting areas shall be cordoned off & red flags during day time and red lights during night time displayed prominently marking off the cordoned area.
- 2.5 All people except those who have actually to light the fuses must be removed to a safe distance of not less than 200 metres as a rule.
- 2.6 Wherever possible, blasting mats should be used.
- 2.7 Contractors doing blasting work must have licence and an approved magazine to store explosives.
- 2.8 Blasting operations shall be carried out during fixed hours of the day which shall be notified in writing.
- 2.9 Provisions in explosives Rules 1940 as amended from time to time, Indian Explosives Act 1844 (IV of 1884), and others shall be strictly followed.

3.0 **EXCAVATIONS**

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 3 of 19
			REVISION : 0
			EDITION : 1


- 3.1 Sides of all excavations must be sloped to a safe angle, not steeper than the angle of repose of the particular soil. If it is not possible to give a proper slope, the sides of the excavation where there is a danger of fall or dislodgement of earth or any material, shall be securely supported by timber or other type of shoring.
- 3.2 No excavation or earth work below the foundation level of an adjoining building shall be taken up unless adequate steps are taken to prevent damage to the existing structure or fall of any part.
- 3.3 Every accessible part of an excavation, pit or opening in the ground into which there is a danger of persons falling shall be suitably fenced with a barrier upto a height of one metre suitably placed from the edge of the excavation as far as practicable.
- 3.4 No material or load shall be placed or stacked near the edge of the excavation or opening in the ground. The excavated material shall not be placed within 1.5 m of the trench or half of the depth of the trench whichever is more.
- 3.5 Cutting shall be done from top to bottom. No undercutting of sides of excavation shall be allowed.
- 3.6 All narrow trenches 1.2 m or more depth, shall at all times be supplied with atleast one ladder for each 30m in length or fraction thereof. Ladder shall be extended from bottom of the trench to atleast one metre above the surface of the ground. The side of the trenches which are 1.5 m or more in depth shall be stepped back to give suitable slope, or securely held by planking, strutting and bracing so as to avoid the danger of side collapse.
- 3.7 Materials shall not be dumped against existing walls or partition to a height that may endanger the stability of the walls.
- 3.8 While withdrawing piled materials like loose earth, crushed stone, sand, etc., from the stock piles, no over hanging shall be allowed to be formed in the existing dump.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 4 of 19
			REVISION : 0
			EDITION : 1

- 3.9 No material on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or public or any other agency at work.

4.0 DEMOLITION


- 4.1 On every demolition job, danger signs shall be conspicuously posted all round the structure and all doors, openings giving access to the structure shall be kept barricaded or marked except during the actual passage of workmen or equipment. However, provision shall be made for at least two independent exits for escape of workmen during any emergency.
- 4.2 During night, red lights shall be placed on or about all the barricades.
- 4.3 Where in any work of demolition it is imperative, because of danger existing to ensure that no unauthorised person shall enter the site of demolition outside working hours, a watchman should be employed. In addition to watching the site he shall also be responsible for maintaining all notices, lights and barricades.
- 4.4 All the necessary safety appliances as per IS ;4130 shall be issued to the workers and their use explained. It shall be ensured that the workers are using all the safety appliances while at work.
- 4.5 The removal of a member may weaken the side wall of an adjoining structure and to prevent possible damage, these walls shall be supported until such time as permanent protection is provided. In case any danger is anticipated to the adjoining structure the same shall be got vacated to avoid any danger to human life.
- 4.6 The power on all electrical service lines shall be shut off and all such lines cut or disconnected at or outside the property line, before the demolition work is started. Prior to cutting of such lines the necessary approval shall be obtained from the electrical authorities concerned. The only exception will be any power line required for demolition work itself.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 5 of 19
			REVISION : 0
			EDITION : 1


- 4.7 All gas, water, steam and other service lines shall be shut off and capped or otherwise controlled at or outside the building line, before demolition work is started.
- 4.8 All the mains and meters of the building shall be removed or protected from damage.
- 4.9 If a structure to be demolished has been partially wrecked by fire, explosion or other catastrophe, the walls and damaged roofs shall be shored or braced suitably.
- 4.10 Walkways and passage ways shall be provided for the use of the workman who shall be instructed to use them and all such walkways and passageways shall be kept adequately lighted, free from debris and other materials.
- 4.11 All nails in any kind of lumber shall be withdrawn, hammered or bent over as soon as such lumber is removed from the structure being demolished, and placed in piles for future cleaning or burning.
- 4.12 All the roads and open area adjacent to the work site shall either be closed or suitably protected.
- 4.13 No electric cable or apparatus which is liable to be a source of danger or a cable or apparatus used by the operator shall remain electricity charged.
- 4.14 All practical steps shall be taken to prevent danger to persons employed from risk of fire or explosion or flooding. No floor, roof or other part of the building shall be so overloaded with debris or materials as to render it unsafe.

5.0 VEHICLE

- 5.1 No person shall board any vehicle or equipment when it is in motion.
- 5.2 Suitable blocks shall be placed against the wheels of a vehicle when it is used for tipping materials into excavation or a pit or over the edge of any embankment or earthwork to avoid the danger of its running over the edge.


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 6 of 19
			REVISION : 0
			EDITION : 1

- 5.3 All workers shall stand clear of the vehicle while it is dumping. If the material being dumped is very heavy or sticky, dump hooks shall be used or dumper shall be clamped to prevent any danger of its tripping.
- 5.4 Materials shall not be allowed to be loaded in a vehicle so as to project horizontally beyond the sides of the body of the vehicle. All materials projecting beyond the front or rear shall be indicated by a red flag in the day and with red light in the night.
- 5.5 Driver of the truck or any heavy vehicle shall not reverse it unless assisted by a signal man who shall have a clear view of the driver and the area beyond the truck during reversing operation.
- 5.6 Maximum speed of a heavy vehicle must not exceed 15 km. per hour.


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 7 of 19
			REVISION : 0
			EDITION : 1

6.0 SCAFFOLDING, GANGWAYS, LADDERS & SHUTTERING

- 6.1 For all work that cannot be done from the ground level or from part of any permanent structure or from other available means of support, soundly constructed scaffoldings of adequate strength shall be used as a safe means of access to places of work.
- 6.2 All scaffolding shall be securely supported or suspended and wherever necessary be properly braced to ensure stability.
- 6.3 Chains, ropes or other lifting materials used for the suspension of scaffoldings must be of adequate strength and shall be of tested quality.
- 6.4 All such chains and ropes used for the suspension of scaffoldings shall be properly fastened to safe anchorage points.
- 6.5 The platform of a suspended scaffolding shall be sufficiently wide. Suspended scaffolding shall have hand rail on 3 sides of about 1.0 m height.
- 6.6 All working platform and stages from which workers are liable to fall shall be of adequate width depending on the type of work done and closely boarded and planked.
- 6.7 Scaffolding or staging more than 3.5 m above the ground or floor, suspended from an overhead support or erected with stationary support shall have a guard rail properly attached, bolted, braced and otherwise secured atleast 1 m high above the floor or platform of such scaffolding or staging and extending along the entire length of the outside ends thereof with only such opening as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure. The platform shall also be provided with toe boards of atleast 150 mm high so placed as to prevent the fall of materials and tools from there.
- 6.8 All platforms or gangways, runways and the stairs shall be kept free from unnecessary obstructions, materials or junk.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 8 of 19
			REVISION : 0
			EDITION : 1

- 6.9 Working platforms, gangways & stairways shall be so constructed that they shall not sag unduly or unequally, and if the height of the platform or the gangway or the stairway is more than 3.5 m above ground level or floor level they shall be closely boarded, shall be of adequate width and shall be suitably fenced.
- 6.10 Every opening in the floor of a building or in a working platform shall be provided with suitable fencing or railing whose minimum height shall be 1 m to prevent the fall of persons or materials.
- 6.11 Every ladder shall be securely fixed at top and bottom. A ladder more than 5 m long shall have a prop.
- 6.12 All ladders used shall be of good construction, sound materials and adequate strength. Ladders with defective or missing rungs shall not be brought into use. The spacing of rungs shall not exceed 30 cms and these shall be recessed atleast 12 mm into rails.
- 6.13 All ladders or rungs used for vertical height of more than 10 m shall have an intermediate landing. All such intermediate landings shall be provided with guard rails to a height of atleast 1 m.
- 6.14 Every ladder shall be securely placed so that it cannot move either at the top or at the bottom and it shall rise to a height of atleast 1.2 m above the place of landing.
- 6.15 No portable single ladder shall be over 8 m in length.
- 6.16 Spacing between the side rails of the ladder shall not be less than 300 mm for ladders upto 3 m in length. For longer lengths, this shall be increased at 6 mm for each additional 0.3 m of length.
- 6.17 Metal ladders must not be used for electrical work or near electric circuit of equipments.
- 6.18 All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in safe condition and no scaffold, ladder or equipment shall be altered or removed while it is in use.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 9 of 19
			REVISION : 0
			EDITION : 1

6.19 Unfinished scaffolding which is under construction shall be prominently marked as unsafe and any access points shall be closed.

6.20 All Planking and Decking on walkways and scaffolds should be adequately supported at each end of the plank and intermediately if necessary. Planks should not be allowed to cantilever beyond the last support but should be overlapped if necessary on to the next plant.

6.21 Shuttering

The above remarks shall be applicable for this also. Shuttering, particularly for slabs, should be treated as a scaffold. Unfinished shuttering should be marked as dangerous similarly the finished formwork should be adequately supported, care being taken to avoid trap door effects.

7.0 MOBILE LIFTING APPLIANCES

7.1 No mobile lifting appliances shall used on a sloping surface unless adequate precautions are taken to ensure stability.

7.2 Adequate precautions shall be taken to see that jib of the mobile crane does not come in contact with overhead electric transmission line.


7.3 Only one person shall give signals to the operator of mobile lifting appliances.

7.4 Maximum load to be lifted by lifting appliances shall be marked in a position where it can be clearly seen by the crane driver and the operator.


7.5 No load shall be raised, lowered or suspended from a chain or rope having a knot in any of the part.

7.6 No chain which is joined to another chain by means of bolt and nut shall be used for raising, lowering or suspending any load.

7.7 All chains, ropes and lifting gears shall be carefully examined and tested by a competent Maintenance Engineer atleast once in every quarter.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 10 of 19
			REVISION : 0
			EDITION : 1

- 7.8 When the work is stopped or when the mobile lifting equipment is not in operation, the boom must be lowered to the horizontal position and tied securely in place to prevent accidental drop.
- 7.9 No person shall walk under a load which is swinging by a lifting equipment.
- Guide rope must be attached to the load to prevent its swinging.
- 7.10 The foot blocks of the crane before starting work shall be securely supported and firmly anchored to prevent its movement in any direction.
- 7.11 Use of Hoisting machines and tackle including their attachments, anchorage and supports shall conform to the following standards of condition.
- 7.11.1 These shall be of good mechanical construction, sound material and adequate strength and free from defect and shall be kept in good working order.
- 7.11.2 Every rope used in hoisting or lowering materials or as a means of suspension shall be of durable quality and adequate strength and free from patent defects.
- 7.11.3 Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 years shall be in charge of any hoisting machine or give signals to the operator.
- 7.11.4 In case of every hoisting machine and every chain ring hook shackle swivel and pulley block used in hoisting or lowering or as means of suspension the safe working load shall be ascertained by adequate means, every hoisting machine and all gears referred to above shall be plainly marked with the safe working load. In case of hoisting machine having a variable safe working loading, each safe working load of the conditions under which it is applicable shall be clearly indicated. No part of any machine or of any gear referred to above in this paragraph shall be loaded beyond the safe working load except for the purpose of testing. Mobile cranes shall have the working load and the radius of jib for the load marked on it.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 11 of 19
			REVISION : 0
			EDITION : 1

7.11.5 The top pulley for hoisting a load shall be opened monthly and the spindle inspected to see if any undue wear has taken place and for greasing.

7.11.6 In case of departmental machine, the safe working load shall be notified by the Engineer concerned. As regards contractor's machines the Contractor shall notify the safe working load of the machine to the Engineer whenever he brings any machinery to site of work and get it verified by the Engineer concerned.

7.12 Motors, gearing, transmission, electric wiring and other dangerous part of hoisting appliances shall be provided with efficient safeguards. Hoisting appliances shall be provided with such means as will reduce to the minimum, the risk of accidental descent of the load. Adequate precautions shall be taken to reduce to the minimum, risk of any part of a suspended load becoming accidentally displaced.

8.0 RIVETTING, WELDING & GAS CUTTING & STEEL ERECTION

8.1 Rivetting

8.1.1 Bolts covered with wet or slippery compounds shall not be used in fabricating structural work.


8.1.2 The rivet heater must keep the rivet heating equipment as near as possible to the place of work.

8.1.3 A pail of water shall always be kept ready for quenching fire when stopping rivetting work.

8.1.4 Hot rivet shall not be thrown across aisles and shaftways.


8.1.5 Metal buckets for catching hot rivets must have false wooden bottoms to prevent rivets from rebounding.

8.1.6 All rivets, bolts, nuts, and other tools must be kept in boxes and not left loose, (For any further safety measures relevant Indian Standards and safety specifications of structural section shall be referred to).

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 12 of 19
			REVISION : 0
			EDITION : 1

8.2 Welding & Gas Cutting

- 8.2.1 All cylinders must be used and stored in upright position only.
- 8.2.2 Cylinders must be stored away from open flames and other source of heat.
- 8.2.3 Oxygen cylinders must not be stored near other cylinders containing gas or oil, grease or other combustible materials.
- 8.2.4 While the cylinder is in use, the cylinder valve key or wrench must be placed on the valve spindle.
- 8.2.5 Before a cylinder is moved, the cylinder valve must be closed.
- 8.2.6 Gas cutting torches must be lighted by means of friction flames or similar other methods and not with matches.
- 8.2.7 When torches are being changed or welding stopped for some time valves for all cylinders must be closed.
- 8.2.8 The coloured lenses used for welding or gas cutting must be of proper shade for the work being done.
- 8.2.9 Suitable eye protection equipment such as goggles, hand shields etc., must be used by persons engaged in welding or gas cutting operations.
- 8.2.10 Before any heavy structural member is gas cut, make sure that it is cleared and supported by ropes, cables, chains or any other means to prevent its dropping or swinging.
- 8.2.11 Cylinder valves and connections are not to be lubricated. All oily or greasy substances must be kept away from cylinders.
- 8.2.12 Substantial and incombustible screen must be used below or near the welding operations, if there is a possibility of a spark falling on other workmen engaged in work closely.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 13 of 19
			REVISION : 0
			EDITION : 1

8.2.13 All air pipe lines and air hoses must be frequently inspected. Air hoses shall not be used for dusting or for cooling purposes.

8.3 Steel Erection

8.3.1 All persons shall stand clear when a crane is sorting or shifting steel girders or other structural materials.

8.3.2 No person shall stand, walk or work beneath any suspended load.

8.3.3 Guide rope must be used for guiding lifting loads.

8.3.4 When guiding a beam or fabricated structure or erection it shall be so held that the employees hands do not get jammed against other objects.

8.3.5 Safety belts equipped with suitable life lines must be used by persons working at heights and standing on structural members. Life line must be tied to an independent support. For any further safety measures, for Structural Steel Works, IS : 7205 - 1974 shall be referred to.


9.0 SAFETY APPLIANCES

9.1 Workers employed on mixing asphaltic materials, cement and lime mortars, shall be provided with protective footwear and protective goggles.


9.2 Those engaged in white washing and mixing or stacking of cement bags or any materials which is injurious to the eyes, shall be provided with protective goggles.

9.3 Those engaged in welding works shall be provided with welder's protective eye-shields.


9.4 Stone breakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 14 of 19
			REVISION : 0
			EDITION : 1

- 9.5 When workers are employed in sewers and manholes which are in use, the Contractor shall ensure that the manhole covers are opened and chambers are ventilated atleast for an hour before the workers are allowed to get into the manholes, and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident to the public.
- 9.6 The Contractor shall not employ men below the age of 18 and women on the work of painting with products containing lead in any form. Whenever men above the age of 18 are employed on the work of lead painting the following precautions shall be taken :
- 9.6.1 No paint containing lead or lead products shall be used except in the form of paste or ready made paint.
- 9.6.2 Suitable face mask should be supplied for use by them when paint is applied in the form of spray on a surface having lead paint dry rubbed and scraped.
- 9.6.3 Overalls shall be supplied by the Contractors to the workmen and adequate facilities shall be provided to enable the working painters to wash during the cessation of work.
- 9.7 The workers going into inspection chamber shall have gas masks, gum boots and rubber gloves while working inside. After coming out they shall have some disinfectant from the first aid box for proper washing
- 9.8 All necessary personnel safety equipment such as safety helmets, safety boots, safety belts, leather gloves for welders, clear glass safety goggles etc., as considered adequate by the engineer have to be kept available for the use of persons employed at the site of work and maintained in condition suitable for immediate use and Contractor shall take steps to ensure proper use of equipment by the workers.
- 9.9 All the persons entering the tunnel shall be provided with protective wear, such as helmets, steel toe safety shoe, gum boots or other suitable type of protective foot wear. In the case of steeply inclined tunnels and inshafts, safety belts shall also be provided.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 15 of 19
			REVISION : 0
			EDITION : 1

- 9.10 Sign boards 1 x 1.5 m in size with the following wording shall be erected at the access to these areas. "CONSTRUCTION AREA, HELMET REQUIRED BEYOND THIS POINT"
- 9.11 No loose garments or ragged clothing shall be worn by the personnel engaged in tunneling operation.
- 9.12 A telephone system shall provided to ensure a positive and quick method of communication between all control location inside tunnel and portal of the tunnels when longer than 500 m and for shafts when longer than 50 m
- 9.13 Irrespective of length and bends in the tunnel, arrangements shall be made for transmitting of warning signals by any one of the following means.
- 9.13.1 By electrically operated bells, operated by battery/dry cells with the bell placed outside the tunnel and the position of the switch shifting with the progress of the tunneling work. The position of the operating switch although temporary shall be so chosen as to ensure proper accessibility and easy identification.
- 9.13.2 By the use of two field (magnet type) telephone.
- 9.13.3 Any other suitable arrangement like walkie-talkie.
- 9.14 Arrangement for rendering prompt and adequate first aid to the injured persons shall be maintained at every work site under the guidance of a medical officer-in-charge of the project. Depending upon the magnitude of the work the availability of an ambulance at a very short notice (at telephone call) shall be ensured.
- 9.15 First-aid arrangements commensurate with the degree of hazard and with the number of workers employed shall be maintained in a readily accessible place throughout the working hours. At least one experienced first-aid attendant with his distinguishing badge shall be available on each shift to take care of injured persons. Arrangements shall be made for calling the medical officer, when such a need may arise. It is recommended that foreman/assistant foreman/supervisor/ permanent workmen who are normally present at each working phase in each shift

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 16 of 19
			REVISION : 0
			EDITION : 1

are given adequate training on first-aid methods to avoid employment of a separate attendant.

9.16 Stretchers and other equipment necessary to remove injured persons shall be provided at every shift.

9.17 Where there are more than 50 persons working in a shift, effective artificial respiration arrangements shall be provided, with trained men capable of providing artificial respiration.

10.0 ELECTRICAL

10.1 Only authorised persons shall handle or otherwise interfere with electrical equipment. Any person detecting electrical apparatus being handled by an unauthorised person or equipment in unsafe condition must report the matter to the Engineer concerned.

10.2 No person shall work on any live electric conductor or apparatus and no person shall assist such person on such work, unless he is authorised in that behalf.

10.2.1 After isolating the equipment from the source of supply before the work begins, a sign 'DONT'T SWITCH ON' must be hung on or near the switch to avoid its being accidentally or inadvertently switched on when persons are working.


10.2.2 Take out the fuses and keep in safe custody.

10.2.3 The switch may be locked if locking arrangement exists.

10.2.4 Earth the equipment, before work, to discharge it and short the terminals as a precautionary measure against accidental switching ON.

10.2.5 After the work is finished take out Earthing and shorting link.

10.2.6 Remove all tools and materials from the site of work. Replace the fuses and unlock the switch.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 17 of 19
			REVISION : 0
			EDITION : 1

10.2.7 The switch shall only be put 'ON' by the person who switched it 'OFF' or by the person authorised by him in writing.

10.3 When working on live equipment use one hand only whenever possible, it is advisable to keep the other hand behind the back. Shocks from hand to hand are most dangerous.

10.4 All persons handling electrical gear in elevated position must use safety belts. Even a slight shock may cause loss of balance and fall.

10.5 No one shall attempt to extinguish a fire on or near a live electrical apparatus with water. Water is a good conductor of electricity. Use extinguishers wherever provided. Use sand and blankets etc., if available.

10.6 No person shall use any part of electrical equipment for storing or hanging clothes, umbrellas or other articles. Serious accidents occur from this practice.

10.7 For attending the work on O.H. lines or equipment use wooden ladders. Metallic ladders shall not be used.


10.8 Use insulated tools and ensure the insulation is in proper condition periodically at least once in three months. Use rubber gloves wherever possible.

10.9 As far as possible verbal instructions shall be avoided in case of pre-arranged shut-down of electrical apparatus.


10.10 When workers are employed for electrical installations which are already energised, insulating mats, wearing apparel such as gloves, sleeves and boots as may be necessary shall be provided. The workers shall not wear any rings, watches and carry keys or other materials which are good conductors of electricity.

11.0 MISCELLANEOUS

11.1 The Contractor shall provide necessary fencing and lights to protect the public from accident.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 18 of 19
			REVISION : 0
			EDITION : 1

- 11.2 Fire extinguishers adequate in number shall be kept by the Contractor at the site of works where there is risk of fire hazard.
- 11.3 Adequate washing facilities shall be provided near the place of work.
- 11.4 When the work is done near any place where there is risk of drowning, all necessary equipments shall be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provisions shall be made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.
- 11.5 These safety provisions shall be brought to the notice of all concerned by displaying on a Notice Board at a prominent place at the work spot. The persons responsible for compliance of the code shall be named therein by the Contractor.
- 11.6 To ensure effective enforcement of the rules and regulations relating to safety precautions, the arrangements made by the Contractor shall be open to inspection by the Engineer and Owner.
- 11.7 Notwithstanding the above clauses there is nothing in those to exempt the Contractor from the operations of any other Act or Rule in force in the Republic of India.
- 11.8 All storage, handling and use of flammable liquids shall be under the supervision of qualified persons. Flammable liquid shall not be stored inside the tunnel
- 11.9 All sources of ignition shall be prohibited in areas where flammable liquids are stored, handled and processed. Suitable warning and 'NO SMOKING' signs shall be posted in all such places. Receptacles containing flammable liquids shall be stacked in such a manner as to permit free passage of air between them.
- 11.10 All combustible materials shall be continuously removed from such areas where flammable liquids are stored, handled and processed. All spills of flammable liquids shall be cleared up immediately. Containers of flammable liquids shall be tightly capped.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 19 of 19
			REVISION : 0
			EDITION : 1

12.0 REPORTING OF ACCIDENT

All accidents, major or minor must be reported immediately. The Contractor, will provide first aid to the injured person immediately and the injured person shall report to the first aid station along with the 'INJURED ON WORK' form duly filled in quintuplicate and submit to the Medical Officer of the First Aid Station".

Serious Injury

In case of serious injury, the following procedure shall be adopted by the Contractor :

1. Provide First Aid at his own First Aid Station.
2. Take the injured person to the Hospital along with the "INJURED ON WORK" form duly filled in.
3. Reporting the accident to the Owner/Engineer by the Contractor.

Fatal Accident

Fatal accident must be reported immediately to the Engineer/Owner as well as to the Police.


Penalty

Failure to observe the Safety Rules will make the Contractor liable to penalty by way of suspension of work, fine and termination of contract.

SPECIFICATION FOR CIVIL WORKS

ANNEXURE- A


LIST OF IS & IRC CODES REFERRED

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 1 of 25
			REVISION : 0
			EDITION : 1


ANNEXURE - A

LIST OF IS & IRC CODES REFERRED

IS 383	:	Specification for coarse & fine aggregates from natural sources for concrete.
IS 2386 (Part 1 to 8)	:	Method of Test for aggregates for concrete
IS 456	:	Code of practice for plain and reinforced concrete.
IS 712	:	Specification for building limes.
IS 3182	:	Specification for broken brick (burnt clay) fine aggregate for use in lime mortar.
IS 269	:	Specification for 33 grade ordinary Portland Cement.
IS 455	:	Code of practice for Portland Slag Cement.
IS 1489	:	Specification for Portland Pozzolana Cement.
IS 8041	:	Specification for rapid hardening Portland Cement.
IS 8112	:	Specification for 43 grade ordinary Portland Cement.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 2 of 25
			REVISION : 0
			EDITION : 1

IS 12269	:	Specification for 53 grade ordinary Portland Cement.
IS 8043	:	Specification for Hydrophobic Portland Cement
IS 12330	:	Specification for Sulphate resisting Portland Cement.
IS 6452	:	Specification for high alumina cement for structural use.
IS 8042	:	Specification for White Portland Cement.
IS 3535	:	Methods of sampling Hydraulic Cement.
IS 4031 (Part 1 to 15)	:	Methods of test for Hydraulic Cement.
IS 4032	:	Method of Chemical Analysis of Hydraulic Cement.
IS 2645	:	Specification for Integral Cement Waterproofing Compounds.
IS 1599	:	Method of Bend Test.
IS 1608	:	Method of Tensile Testing of Steel Products.
IS 6925	:	Method of test for determination of Water Soluble Chlorides in concrete admixtures.
IS 432	:	Specification for mild steel and medium

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 3 of 25
			REVISION : 0
			EDITION : 1

tensile steel bars and hard drawn steel wire for concrete reinforcement.

IS 1786 : Specification for high strength deformed steel bars and wires for concrete reinforcement.

IS 1566 : Specification for hard drawn steel wire fabric for concrete reinforcement.

IS 280 : Mild steel wire for general engineering purposes.

IS 2062 : Structural steel (Standard Quality).

IS 1161 : Steel Tubes for Structural purposes.

IS 5624 : Foundation bolts.

IS 1363 - (Part 1 to 3) : Hexagon Head bolts, screws, nuts.


IS 2016 : Plain washers.

IS 3063 : Single coil rectangular section spring washers.


IS 1239 (Part 1&2) : Mild Steel Tubes and other wrought steel pipe fittings.

IS 1367 : Technical supply conditions for threaded steel fasteners.


IS 1030 : Carbon steel castings.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 4 of 25
			REVISION : 0
			EDITION : 1

IS 3480	:	Flexible steel conduit for electrical wiring.
IS 2667	:	Fittings for rigid steel conduits for electrical wiring.
IS 9537 (Part 3)	:	Conduit for electrical installations - Rigid Plain conduits of insulating materiel.
IS 6946	:	Flexible non-metallic conduits for electrical installations.
IS 3419	:	Fittings for rigid non-metallic conduits.
IS 5913	:	Methods of tests for Asbestos Cement Products.
IS 2098	:	Specification for asbestos cement building boards.
IS 2096	:	Specification for asbestos cement flat sheets.
IS 9537 (Part 2)	:	Conduit for electrical installations - Rigid steel conduits.
IS 2614	:	Method for sampling of fasteners.
IS 1592	:	Specification for asbestos cement pressure pipes.
IS 9627	:	Specification for asbestos cement pressure pipe (Light duty).


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 5 of 25
			REVISION : 0
			EDITION : 1

IS 6908	:	Specification for asbestos cement pipes and fittings for sewerage and drainage.
IS 1626 (Part 1 to 3)	:	Specification for asbestos cement building pipes & pipe fittings and roofing fittings
IS 459	:	Specification for unreinforced corrugated and semi corrugated asbestos cement sheets
IS 1077	:	Specification for common burnt clay building bricks.
IS 3495 (Part 1 to 4)	:	Method of Test for burnt clay building bricks.
IS 3620	:	Specification for laterite stone block for masonry.
IS 1121	:	Method of test for determination of strength properties of natural building stone.
IS 1124	:	Method of test for determination of water absorption Sp. Gr. etc. of building stones
IS 1125	:	Method of test for determination of weathering of natural building stones.
IS 1126	:	Method of test for determination of durability of building stone.
IS 1127	:	Recommendation for dimensions and

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 6 of 25
			REVISION : 0
			EDITION : 1


workmanship of natural building stones for masonry work.

IS 2185 (Part-1)	:	Specification for concrete masonry unit Hollow and solid concrete blocks.
IS 2116	:	Specification for sand for masonry mortar
IS 1542	:	Specification for sand for plaster.
IS 2185 (Part-2)	:	Specification for concrete masonry unit- Hollow and solid light weight concrete blocks.
IS 2185 (Part-3)	:	Specification for concrete masonry unit - Auto claved Cellular Aerated concrete blocks.
IS 6041	:	Code of practice for construction of Auto claved Cellular concrete block masonry.
IS 6441 (Part 1 to 9)	:	Method of Test for Auto claved Concrete Products.
IS 3068	:	Specification for broken brick (burnt clay) coarse aggregates for use in lime concrete.
IS 2114	:	Code of practice for laying in-situ terrazzo floor finish.
IS 460 (Part 1 to 3)	:	Specification for Test Sieves.
IS 1237	:	Specification for cement concrete flooring


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 7 of 25
			REVISION : 0
			EDITION : 1

tiles.

IS 777	:	Specification for glazed earthen ware wall tiles.
IS 1129	:	Recommendation for dressing of natural building stone.
IS 1130	:	Specification for Marble (blocks, slabs and tiles).
IS 809	:	Specification for rubber flooring materials for general purposes.
IS 3462	:	Specification for unbacked flexible PVC flooring.
IS 3461	:	Specification for PVC asbestos floor tiles
IS 2818	:	Indian Hessians.
IS 653	:	Linoleum sheets and tiles.
IS 5389	:	Code of practice for laying hard wood parquet and wood block flooring.
IS 210	:	Grey Iron Castings.
IS 2114	:	Code of practice for laying in-situ terrazzo finish.
IS 1198	:	Code of practice for laying of linoleum flooring.


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 8 of 25
			REVISION : 0
			EDITION : 1

IS 1003 (Part-2)	:	Specification for timber panelled & glazed shutters, windows and ventilator shutters.
IS 1141	:	Code of practice for seasoning of timber.
IS 1003 (Part-1)	:	Specification for timber panelled & glazed shutters - Door shutters.
IS 287	:	Recommendation for maximum permissible moisture content of timber used for different purposes.
IS 2202 (Part-1)	:	Specification for wooden flush door shutters (Solid core type).
IS 2191 (Part-1&2)	:	Specification for wooden flush door shutters (cellular and hollow core type).
IS 3087	:	Specification for wood particle boards (Medium density) for general purposes.
IS 3478	:	Specification for high density wood particle boards.
IS 3097	:	Specification for veneered particle boards
IS 303	:	Specification for plywood for general purposes.
IS 1328	:	Specification for veneered decorative plywood.
IS 205	:	Specification for non-ferrous metal butt


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 9 of 25
			REVISION : 0
			EDITION : 1

hinges.


IS 1341	:	Specification for steel butt hinges.
IS 362	:	Specification for parliament hinges.
IS 453	:	Specification for double acting spring hinges.
IS 3818	:	Specification for continuous (Piano) hinges.
IS 206	:	Specification for Tee and Strap hinges.
IS 281	:	Specification for mild steel sliding door bolts for use with padlocks.
IS 1019	:	Specification for rim latches.
IS 2681	:	Specification for non-ferrous metal sliding door bolts for use with padlocks.
IS 204 (Part 1&2)	:	Specification for tower bolts - Ferrous and Non-ferrous metals.
IS 208	:	Specification for door handles.
IS 2209	:	Specification for mortice locks (vertical type).
IS 6607	:	Specification for rebated mortice locks (vertical type).
IS 1823	:	Specification for floor door stoppers.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 10 of 25
			REVISION : 0
			EDITION : 1

IS 1837	:	Specification for fan light pivots.
IS 207	:	Gate and shutter hooks and eyes.
IS 6343	:	Specification of door closers (pneumatically regulated) for light door weighing upto 40 Kg.
IS 8756	:	Specification for ball catches for use in wooden Almirah.
IS 6315	:	Specification for floor springs (hydraulically regulated) for heavy doors.
IS 7197	:	Specification for Double action floor spring (without oil check) for heavy doors
IS 364	:	Specification for fan light catch.
IS 3828	:	Specification for ventilator chains.
IS 363	:	Specification for hasp and staples.
IS 9899	:	Specification for hat, coat and wardrobe hooks.
IS 729	:	Specification for drawer locks, cup-board locks and box locks.
IS 3564	:	Specification for door closers (Hydraulically regulated).
IS 4351	:	Specification for steel door frames.


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 11 of 25
			REVISION : 0
			EDITION : 1

IS 419	:	Putty for use on window frames.
IS 5187	:	Specification for flush bolts.
IS 3847	:	Specification for mortice night latches.
IS 4621	:	Specification for indicating bolts.
IS 1038	:	Specification for steel doors, windows and ventilators.
IS 1977	:	Structural steel (ordinary quality).
IS 1361	:	Specification for steel windows for industrial buildings.
IS 7452	:	Hot rolled steel sections for doors, windows and ventilators.
IS 1948	:	Specification for aluminium doors, windows and ventilators.
IS 1148	:	Specification for hot rolled rivet bars for structural purposes.
IS 1949	:	Specification for aluminium windows for industrial buildings.
IS 204 (Part 1)	:	Specification for tower bolts-non-ferrous metal.
IS 733	:	Wrought aluminium and aluminium alloy bars, rods and sections (for general


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 12 of 25
			REVISION : 0
			EDITION : 1

engineering purposes).


IS 6248	:	Specification for metal rolling shutters and rolling grills.
IS 1081	:	Code of practice for fixing and glazing of metal doors, windows and ventilators.
IS 2339	:	Specification for Aluminium Paint for general purpose in dual containers.
IS 2835	:	Flat Transparent sheet glass.
IS 5437	:	Wired and figured glass.
IS 101 (Part 1 to 8)	:	Method of sampling and test for paints, varnishes and related products.
IS 2074	:	Ready mixed paint, air drying, red oxide zink chrome, priming.
IS 5410	:	Cement paint, colour as required.
IS 427	:	Distemper, dry, colour as required.
IS 428	:	Distemper, oil emulsion, colour as required.
IS 348	:	French polish.
IS 5411 (Part 1&2)	:	Plastic emulsion paint.
IS 702	:	Industrial Bitumen.
IS 73	:	Paving Bitumen.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 13 of 25
			REVISION : 0
			EDITION : 1


IS 217	:	Cut Back Bitumen.
IS 454	:	Specification for Digboi type cutback bitumen.
IS 5467	:	Specification for shellac Wax.
IS 3384	:	Specification for Bitumen primer for use in water proofing and damp proofing.
IS 290	:	Specification for Coal Tar Black Paint.
IS 341	:	Specification for Black Japan, Type A, B & C.
IS 1322	:	Specification for bitumen felts for water proofing and damp proofing.
IS 218	:	Specification for creosote oil for use as wood preservative.
IS 3037	:	Specification for Bitumen mastic for use in water proofing of roofs.
IS 1580	:	Specification for Bituminous compound for water proofing and caulking purposes.
IS 8542	:	Specification for polish for wooden furniture paste.
IS 9862	:	Ready mixed paint, brushing etc.
IS 782	:	Specification for caulking lead.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 14 of 25
			REVISION : 0
			EDITION : 1


IS 405 (Part 1&2)	:	Lead sheet and strips.
IS 5134	:	Bitumen impregnated paper.
IS 2849	:	Specification for non load bearing gypsum partition blocks.
IS 8591	:	Specification for floor polish paste.
IS 2095	:	Specification for gypsum plaster boards.
IS 77	:	Specification for linseed oil, boiled for paints.
IS 533	:	Gum Spirit of turpentine (oil of Turpentine).
IS 1504	:	Bees Wax.
IS 3536	:	Ready mixed paint, brushing, wood primer pink.
IS 8273	:	Specification for gypsum plaster for use in the manufacture of fibrous plaster board.
IS 5871	:	Specification for bitumen mastic for tanking and damp proofing.
IS 651	:	Specification for salt glazed stoneware pipe and fittings.
IS 1729	:	Sand cast iron spigot and socket soil pipe.
IS 771 (Part 1 to 7)	:	Specification for glazed fire clay appliances.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 15 of 25
			REVISION : 0
			EDITION : 1

IS 1230	:	Cast iron rain water pipes and fittings.
IS 774	:	Flushing cisterns for water closets and urinals.
IS 2548 (Part 1&2)	:	Specification for plastic seats and cover for water closet.
IS 1726	:	Specification for cast iron manhole cover and frames.
IS 1239 (Part 1&2)	:	Mild steel Tubes and fittings.
IS 4984	:	Specification for high density polyethylene pipes for potable water supplies: Sewerage and industrial effluents.
IS 2556 (Part 1 to 15)	:	Specification for vitreous sanitary appliances (vitreous china).
IS 7328	:	High density polyethylene materials.
IS 4985	:	Specification for unplasticised PVC pipes for potable water supplies.
IS 3076	:	Specification for low density polyethylene pipe for potable water supplies.
IS 9762	:	Specification for polyethylene floats for ball valve.


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 16 of 25
			REVISION : 0
			EDITION : 1

IS 3395	:	Code of practice for fire safety of industrial buildings.
IS 7834 (Part 1 to 8)	:	Specification for injection moulded PVC fittings with solvent cement joint for water supplies.
IS 8008 (Part 1 to 7)	:	Specification for injection moulded HDPE fittings for potable water supplies.
IS 8360 (Part 1 to 3)	:	Specification for fabricated high density polyethylene fittings for potable water.
IS 784	:	Specification for prestressed concrete pipe.
IS 1703	:	Specification for copper alloy float valves (horizontal plunger type) for water supply fittings.
IS 12234	:	Specification for plastic equilibrium float valve for cold water services.
IS 778	:	Specification for copper alloy gate, globe and check valves for water works purposes.
IS 1536	:	Centrifugally cast (spun) iron pressure pipes.
IS 1537	:	Vertically cast iron pressure pipes for water, gas and sewage.
IS 1538 (Part 1 to 23)	:	Sand cast iron spigot and socket soil, waste


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 17 of 25
			REVISION : 0
			EDITION : 1

and ventilating pipes, fittings and accessories.

IS 3589	:	Electrically welded steel pipes for water, gas and sewage.
IS 781	:	Specification for cast copper alloy screw down bib taps and stop valves for water services.
IS 1239 (Part 1&2)	:	Mild steel tubes and fittings.
IS 779	:	Specification for water meters.
IS 1795	:	Specification for pillar taps for water supply purposes.
IS 1363 (Part 1 to 3)	:	Dimensions for screw thread run-outs and undercuts.
IS 2016	:	Plain washers.
IS 638	:	Sheet rubber jointing and rubber insertion jointing.
IS 4127	:	Code of practice for laying of glazed stoneware pipes.
IS 458	:	Specification for precast concrete pipes.
IRC 19	:	Standard specification and code of practice for water Bound macadam.


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 18 of 25
			REVISION : 0
			EDITION : 1

IRC 29	:	Tentative specification for 4 cm Asphaltic concrete surface course.
IRC 15	:	Standard specification and code of practice for construction of concrete roads.
IS 6313	:	Code of practice for antitermite measures in building.
IS 1054	:	Dieldrin emulsifiable concentrates.
IS 1308	:	Aldrin dusting powders.
IS 6439	:	Hepta chlor emulsifiable concentrates.
IS 2632	:	Crotonaldehyde.
IS 1791	:	Specification for batch type concrete mixers.
IS 10262	:	Recommended guidelines for concrete mix design.
IS 7861 (Part 1)	:	Code of practice for extreme weather concreting - Recommended practice for hot weather concreting.
IS 1199	:	Methods of sampling and analysis for concrete.
IS 516	:	Method of test for strength of concrete.
IS 7861 (Part 2)	:	Code of practice for extreme weather

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 19 of 25
			REVISION : 0
			EDITION : 1


concreting. Recommended practice for cold weather concreting.

IS 2502	:	Code of practice for bending and fixing of bars for concrete reinforcement.
IS 2751	:	Recommended practice for welding of mild steel plain and deformed bars for reinforced construction.
IS 800	:	Code of practice for general construction in steel and deformed bars.
IS 816	:	Code of practice for use of metal arc welding.
IS 814	:	Covered electrodes for manual metal arc.
IS 3370 (Part 1&2)	:	Code of practice for concrete structures for the storage of liquids.
IS 2911 (Part 1 to 4)	:	Code of practice for design and construction of pile foundations.
IS 1343	:	Code of practice for prestressed concrete.
IS 1785 (Part 1&2)	:	Specification for plane hard drawn steel wires for prestressed concrete.
IS 2250	:	Code of practice for preparation and use of masonry mortars.
IS 1635:	:	Code of practice for field slaking of building


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 20 of 25
			REVISION : 0
			EDITION : 1

lime.


IS 2212	:	Code of practice for brick work.
IS 1597 (Part 1&2)	:	Code of practice for construction of stone masonry.
IS 4101 (Part 1 to 3)	:	Code of practice for external facing and veneer.
IS 737	:	Wrought aluminium and aluminium alloys, sheet and strips (for general engineering purposes).
IS 2572	:	Code of practice for construction of hollow connect block masonry.
IS 1661	:	Code of practice for application of cement finishes.
IS 5766	:	Code of practice for laying of burnt clay brick flooring.
IS 5491	:	Code of practice for laying of in-situ granolithic concrete flooring topping.
IS 3316	:	Specification for structural granite.
IS 1196	:	Code of practice for laying bitumen mastic flooring.
IS 1195	:	Specification for bitumen mastic for flooring.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 21 of 25
			REVISION : 0
			EDITION : 1

IS 3462	:	Specification for unbacked flexible PVC flooring.
IS 1198	:	Code of practice for laying fixing and maintenance of linoleum floor.
IS 848	:	Specification for synthetic resin adhesive for plywood.
IS 4457	:	Specification for ceramic unglazed vitreous acid resisting tiles.
IS 851	:	Specification for synthetic resin adhesive for construction work (non structural) for wood.
IS 2202 (Part 1&2)	:	Specification for wooden flush door shutters.
IS 102	:	Ready mixed paint.
IS 1081	:	Code of practice for fixing and glazing of metal doors.
IS 6248	:	Specification for metal rolling shutters and rolling grills.
IS 1868	:	Anodic coatings on aluminium and its alloys.
IS 2065	:	Code of practice for water supply in buildings.


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 22 of 25
			REVISION : 0
			EDITION : 1

IS 2064	:	Code of practice for selection, installation and maintenance of sanitary appliances.
IS 7634 (Part 1 to 3)	:	Code of practice for plastic pipes.
IS 1742	:	Code of practice for building drainage.
IS 5330	:	Criteria for design of anchor blocks for penstocks with expansion joints.
IS 3114	:	Code of practice for laying of cast iron pipes.
IS 783	:	Code of practice for laying of concrete pipes.
IRC-SP11	:	Hand book of quality control for construction of roads and run-ways.
IRC-63	:	Tentative guidelines for use of low grade aggregates and soil aggregate mixtures in road pavement construction.
IRC-60	:	Tentative guidelines for use of Lime Fly Ash Concrete as pavement base or sub-base.
IRC-74	:	Tentative guidelines for use of Lean Cement Concrete and lean concrete Fly Ash Concrete as pavement base or sub-base.
IS 6509	:	Code of practice for installation of joints in


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 23 of 25
			REVISION : 0
			EDITION : 1

concrete pavement.

IS 1838 (Part 1)	:	Specification for performed filler for expansion joint in concrete pavements and structures.
IRC-43	:	Recommended practice for Tools, Equipment and appliances for concrete pavement construction.
IRC-15	:	Standard specifications and code of practice for construction of concrete road.
IS 3036	:	Code of practice for laying lime concrete for a water proofed roof finish.
IS 1346	:	Code of practice for water proofing of roofs with bitumen felts.
IS 1609	:	Code of practice for laying damp proofing treatment using bitumen felt.
IS 4365	:	Code of practice for application of bitumen mastic for waterproofing of roofs.
IS 9103	:	Specification for admixtures for concrete.
IS 2645	:	Specification for integral cement water proofing compounds.
IS 1834	:	Specification for hot applied sealing compound for joint in concrete.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 24 of 25
			REVISION : 0
			EDITION : 1

IS 278	:	Specification for Galvanized barbed wire for fencing.
IS 2721	:	Specification for Galvanized steel chain link fabric.
IS 280	:	Specification for Mild steel wire.
IS 4826	:	Specification for hot dipped galvanized coating on round steel wires.
IS 1200 (Part 1 to 28)	:	Method of measurement of building and Civil Engineering Works.
IS 4081	:	Safety code for blasting.
IS 5916	:	Specification for cast iron gratings for drainage purposes.
IS 4130	:	Safety Code for demolition of building.
IS 3764	:	Safety code for excavation work.
IS 5121	:	Safety code for piling.
IS 4014 (Part 2)	:	Code of practice for steel tubular scaffolding.
IS 3696 (Part 1&2)	:	Safety code of scaffolds and ladders.
IS 6922	:	Criteria for safety and design of structures subject to underground blast.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	Civil Section		
TITLE	Civil Specification	DOCUMENT NO. BR/TS/061	Page 25 of 25
			REVISION : 0
			EDITION : 1


IS 5499	:	Code of practice for construction of underground raid shelter.
IS 4138	:	Safety code for working in compressed air.
IS 7293	:	Safety code for working with construction machinery.
IS 8989	:	Safety code for erection of concrete framed structures.
IS 4756	:	Safety code for Tunneling work.
IS 7205	:	Safety code for erection of structural steel works.


SPECIFICATION
FOR
ANTI BUOYANCY MEASURES
(CONCRETE WEIGHT COATING &
SADDLE WEIGHT)


SPECIFICATION NO. BR/TS/062





(CIVIL ENGINEERING SECTION)
BRIDGE AND ROOF CO.(I) LTD.


BRIDGE AND ROOF CO.(I) LTD.		CIVIL ENGINEERING SECTION NEW DELHI	STANDARD SPECIFICATION	
TITLE	ANTI BUOYANCY MEASURES	SPECIFICATION NO.		PAGE 1 OF 14
		BR/TS/062		REVISION 0
<u>CONTENTS</u>				
1. SCOPE				
2. REFERENCE DOCUMENTS				
3. MATERIALS				
4. COATING REQUIREMENTS				
5. APPLICATION METHOD				
6. EQUIPMENT				
7. MEASUREMENTS & LOGGING				
8. PROCEDURE QUALIFICATION				
9. APPLICATION OF REINFORCEMENT & CONCRETE COATING				
10. TOLERANCES				
11. WEIGHING				
12. INSPECTION & TESTS				
13. COATING OF FIELD WELDS				
14. REPAIRS				
15. MARKING				
16. UNLOADING, TRANSPORT, STORING & HAULING				
17. CONCRETE SADDLE WEIGHT				
PREPARED BY		CHECKED BY	APPROVED BY	

BRIDGE AND ROOF CO.(I) LTD.		CIVIL ENGINEERING SECTION NEW DELHI	STANDARD SPECIFICATION	
TITLE	ANTI BUOYANCY MEASURES	SPECIFICATION NO.	PAGE 2 OF 14	
	CONCRETE WEIGHT COATING	BR/TS/062	REVISION	
1.0	<u>SCOPE</u>			
	This specification covers requirements for the materials, workmanship, quality assurance and handling for anti buoyancy measures covering the external concrete weight coating of pipelines and concrete saddle weight installation.			
1.1	PART-A : EXTERNAL CONCRETE WEIGHT COATING			
1.2	This specification shall be read in conjunction with the conditions of all specifications and documents included in the CONTRACT between COMPANY and CONTRACTOR.			
1.3	CONTRACTOR shall, execute the work in conformity with all standard practices, specifications, drawing and direction by the COMPANY and provide all services, labour, supervision, all materials, excluding the materials indicated as COMPANY supplied materials in the CONTRACT, equipment, appliances etc. required in or about the execution of the work, whether of a temporary or permanent nature.			
1.4	All relevant specifications shall be referred to as per requirement, whether specifically mentioned or otherwise.			
2.0	<u>REFERENCE DOCUMENTS</u>			
2.1	Reference has been made in this specification to the following codes and standards :			
	a)	IS:8112	:	Indian Standard Specification for Ordinary Portland Cement.
	b)	IS:8112	:	Indian Standard Specification for high strength Ordinary Portland Cement.
	c)	IS:383	:	Indian Standard Specification for Coarse and Fine Aggregates from Natural Sources for Concrete.
	d)	IS:2386 (Parts-I to VIII)	:	Indian Standard Methods of Test for Aggregates for Concrete.
	e)	IS: 12330	:	Indian standard specification for sulphate resisting portland cement.

BRIDGE AND ROOF CO.(I) LTD.		CIVIL ENGINEERING SECTION NEW DELHI	STANDARD SPECIFICATION	
TITLE	ANTI BUOYANCY MEASURES		SPECIFICATION NO.	PAGE 3 OF 14
	CONCRETE WEIGHT COATING		BR/TS/062	REVISION
<div>f)IS:456:Indian standard code of practice for plain and reinforced concrete .</div> <div>g)IS:3370:Indian standard Code of practice for concrete structures for storage of liquids.</div> <div>h)IS:1566:Indian standard for Hard-drawn steel wire fabric for concrete reinforcement.</div> <div>i)IS:432 (Part II):Indian Standard for Mild steel and medium tensile steel bars and hard drawn steel wire for concrete Reinforcement.</div> <div>In case of conflict between the requirements of specification and that of the above referred codes standards, the requirements of this specification govern.</div>				
2.2	<div>For the purpose of this specification, the following definitions shall hold:</div> <div><div>-the words `Shall' and `Must' are mandatory;</div><div>-the words `Should', `May' and `Will' are non-mandatory advisory or recommended.</div><div>-3.0' and `Will' are non-mandatory advisory or recommended.</div></div>			
3.0	<div><u>MATERIALS</u></div> <div>The CONTRACTOR shall supply all the materials necessary for the performance of the work.</div> <div>Materials for concrete coating shall comply with following requirements. All materials supplied by the CONTRACTOR which in the opinion of COMPANY, do not comply with the appropriate specifications shall be rejected and immediately removed from site by CONTRACTOR at his expense.</div>			
3.1	<div>Cement</div> <div>Portland cement (conforming to IS:269), or High Strength Ordinary Portland Cement (conforming to IS:8112) shall be used. Cement which has hardened or partially set or has become lumpy shall not be used. Test certificates from the cement Manufacturer shall be supplied to the COMPANY for all cement delivered to site.</div>			

BRIDGE AND ROOF CO.(I) LTD.		CIVIL ENGINEERING SECTION NEW DELHI	STANDARD SPECIFICATION	
TITLE	ANTI BUOYANCY MEASURES		SPECIFICATION NO.	PAGE 4 OF 14
	CONCRETE WEIGHT COATING		BR/TS/062	REVISION
3.2	Aggregates			
3.2.1	Aggregate shall comply with the requirements of IS:383 and shall be tested in accordance with IS:2386.			
3.2.2	Fine Aggregates 'Fine Aggregates' shall mean any of the following, as defined in IS:383: i) Natural sand; ii) Crushed stone sand; iii) Crushed gravel sand. Sand shall be well-graded from fine to coarse in accordance with Table-4 of IS:383.			
3.2.3	Coarse Aggregates Use of coarse aggregates shall be subject to COMPANY approval.			
3.2.4	Aggregates shall be clean and free from injurious amount of salt, alkali, deterious substances or organic impurities.			
3.3	Water The water shall preferably be clean, fresh and shall be free from non-permissible amounts of oils, acids, salts, sugar, organic materials or other substances that may be deleterious to concrete or steel. It shall not contain chlorides, sulphates, and magnesium salts. Water from doubtful sources shall be tested by the CONTRACTOR at his expense and approved by COMPANY before use.			
3.4	Reinforcement Concrete coating shall be reinforced by a layer or layers of steel reinforcement according to the provisions described here.			
3.4.1	Reinforcement shall consist of welded steel wire fabric manufactured in flat sheets or in rolls (ribbon mesh) and shall conform to IS:1566-1995. Wires shall conform to IS:432, Part-II.			
3.4.2	Steel wires shall be galvanized at finished size. The diameter of the wire and spacing of wires (mesh dimensions) shall be selected according to the following criteria.			
3.4.2.1	Wire fabric manufactured in flat sheets shall be 50 x 100mm max. steel wire mesh, 13 gauge 2.5mm thickness.			

BRIDGE AND ROOF CO.(I) LTD.		CIVIL ENGINEERING SECTION NEW DELHI	STANDARD SPECIFICATION	
TITLE	ANTI BUOYANCY MEASURES	SPECIFICATION NO.		PAGE 5 OF 14
	CONCRETE WEIGHT COATING	BR/TS/062		REVISION
3.4.2.2	Wire fabric manufactured in rolls (ribbon mesh) shall be 25 x 50mm of 14 gauge(2mm thickness). The above dimensions will be applied unless otherwise specified by designs. As a rule wire fabric (sheets) shall be used when concrete coating is applied by casting method, while ribbon mesh (rolls) shall be used when concrete coating is applied by guniting method.			
4.0	<u>COATING REQUIREMENTS</u>			
	<p>Pipes shall be concrete coated to a thickness as specified in the drawings and documents supplied/ approved by the COMPANY. The concrete unit weight shall be minimum 2245 kg/m³ and the compressive strength shall not be less than 350 kg/cm² in 28 days and 235 kg/cm² in 7 days.</p> <p>CONTRACTOR shall be permitted to select any proportioning of materials to achieve the specified requirements of concrete density and weight by doing mix design and trial tests.</p>			
5.0	<u>APPLICATION METHOD</u>			
	<p>Concrete coating shall be applied either using casting or guniting method. Any alteration or modifications to the methods described in this specification shall be submitted to the COMPANY for approval. The application method shall however ensure the basic characteristics of concrete coating in compliance with the minimum requirements of this specification.</p> <p>CONTRACTOR shall submit to the COMPANY, prior to commencement of work, the procedure/ method of application for approval.</p> <p>Wherever practical, the total thickness of coating shall be applied in a single pass.</p>			
6.0	<u>EQUIPMENT</u>			
	<p>The equipment used for the concrete coating shall be capable of giving a reasonable degree of uniformity with respect to thickness, density and strength. The proportioning equipment and procedure shall be of the type to assure consistently proportioned materials by weight. Concrete shall be mixed in a mechanical mixer, which shall ensure thorough mixing of all materials. Any equipment that tends to separate the in gradients shall not be used.</p>			

BRIDGE AND ROOF CO.(I) LTD.		CIVIL ENGINEERING SECTION NEW DELHI	STANDARD SPECIFICATION	
TITLE	ANTI BUOYANCY MEASURES CONCRETE WEIGHT COATING	SPECIFICATION NO.		PAGE 6 OF 14
		BR/TS/062		REVISION

7.0 **MEASUREMENTS & RECORDS**

7.1 All measurements as mentioned below shall be taken during the work stages and clearly recorded in a proper log-book. A special log-book shall be used for recording tests and trial results. A log-book shall refer to pipe lengths having the same nominal diameter, and steel wall thickness.

7.2 The following shall be subject to measurement and recording for each pipe length.

a) Line Pipe

- 1) Field identification number
- 2) Mill serial number
- 3) Length
- 4) Weight
- 5) Average outside diameter

b) Concrete Coating


- 6) Batch identification number
- 7) Date of placing of concrete coating
- 8) Average concrete coating thickness
- 9) "Dry weight" of concrete coated pipe
- 10) "Unit dry weight" of concrete coated pipe
- 11) "Negative buoyancy" (unit) of concrete coated pipe


7.3 No concrete placing shall be allowed before items 1 through 5 listed at clause 7.2, have been recorded and approved by COMPANY.


8.0 **PROCEDURE QUALIFICATION**


Before commencement of the work, CONTRACTOR shall perform all tests, either in laboratory or in field and trials necessary to properly select type of mix which meets the requirements of section 4.0 of this specification.


8.1 The type of mix, i.e. the correct combination of the cement, aggregates and water which results in the desired properties of concrete shall be at first determined. For each mix the following shall be accurately checked and recorded:


BRIDGE AND ROOF CO.(I) LTD.		CIVIL ENGINEERING SECTION NEW DELHI	STANDARD SPECIFICATION									
TITLE	ANTI BUOYANCY MEASURES		SPECIFICATION NO.	PAGE 7 OF 14								
	CONCRETE WEIGHT COATING		BR/TS/062	REVISION								
<ul style="list-style-type: none">proportions and weights of the respective materials usedthe water/ cement ratio;the grading of the aggregates.												
8.2	Samples shall be prepared and tested in accordance with IS:456 to determine the dry specific gravity of the concrete.											
	Test for concrete specific gravity at intermediate time (7 days after coating) shall be performed.											
8.3	When the results of the above tests do not meet the requirements, the mix shall be modified and concrete samples tested until a proper mix has been determined.											
8.4	The mix so determined, shall then be used for sampling of concrete to be submitted to compressive strength tests as per IS:456.											
8.5	Frequency of sampling for tests for density and compressive strength of concrete shall be as follows :											
	<table><tr><th>`Quantity' of Concrete in the Work(m³)</th><th>Number of Samples</th></tr><tr><td>Upto 25</td><td>3</td></tr><tr><td>26 to 50</td><td>4</td></tr><tr><td>51 and above</td><td>4 plus one additional sample for each additional 50m³ or part thereof.</td></tr></table>				`Quantity' of Concrete in the Work(m ³)	Number of Samples	Upto 25	3	26 to 50	4	51 and above	4 plus one additional sample for each additional 50m ³ or part thereof.
`Quantity' of Concrete in the Work(m ³)	Number of Samples											
Upto 25	3											
26 to 50	4											
51 and above	4 plus one additional sample for each additional 50m ³ or part thereof.											
	`Quantity' means the volume of concrete to be used.											
9.0	<u>APPLICATIONS OF REINFORCEMENT AND CONCRETE COATING</u>											
9.1	Two test cubes each per day shall be obtained from batches and tested at the end of 7 days after coating, for compressive strength and specific gravity.											
9.2	The moisture content of the aggregates used shall be such as to maintain a satisfactory control on the water/ cement ratio of the concrete mix.											
	To maintain the water/ cement ratio constant at its correct, value, determination of moisture contents in both fine and coarse (if used) aggregates shall be made as frequently as possible.											


BRIDGE AND ROOF CO.(I) LTD.		CIVIL ENGINEERING SECTION NEW DELHI	STANDARD SPECIFICATION	
TITLE	ANTI BUOYANCY MEASURES		SPECIFICATION NO.	PAGE 8 OF 14
	CONCRETE WEIGHT COATING		BR/TS/062	REVISION
9.3	Pipe Length Preparation			
	Prior to placing of reinforcement, the protective coating of each pipe length shall be carefully inspected visually and by holiday detectors and, if damages are found, they shall be repaired before start of the work. Foreign materials, if any, shall be removed from the surface of the protective coating.			
9.4.	Reinforcement Application			
9.4.1	Reinforcement shall be placed around the pipe in such a way as to cover the whole pipe length or sections to be concrete coated. The reinforcement shall protrude a minimum 5 cm from the finished concrete coating.			
9.4.2	Reinforcement shall rest on PVC spacers forming a "Crown" whose number shall be such as to avoid any contact with the pipe's protective coating. Spacing between the two consecutive "crown" centers shall be 500 C/C and a minimum of 4 Nos. shall be provided at each `Crown` center.			
9.4.3	Splices and attachments shall be done by binding with steel wire having 1.5 mm diameter. Circular and longitudinal joints of wire fabric in sheets shall be lapped at least for one mesh. When wire fabric in rolls (ribbon mesh) is used, the spiral lap shall be one mesh while the spliced lap shall be three meshes.			
9.4.4	One layer of reinforcement steel shall be provided for concrete thickness less than 50mm and the same shall be embedded approximately midway in the concrete coating thickness. For concrete thickness 50mm and above two layers of reinforcing steel shall be provided. If application method requires more than one pass concrete, one reinforcement layer for each pass is to be applied independently from concrete coating thickness.			
9.5	Concrete Placing			
9.5.1	Concrete shall be placed within a maximum of 30 minutes from the time of mixing (adding water to mix) and shall be handled in such a way so as to prevent aggregate segregation and excessive moisture loss. Concrete containers shall continuously be kept clean and free from hardened or partially hardened concrete.			


BRIDGE AND ROOF CO.(I) LTD.		CIVIL ENGINEERING SECTION NEW DELHI	STANDARD SPECIFICATION	
TITLE	ANTI BUOYANCY MEASURES	SPECIFICATION NO.	PAGE 9 OF 14	
	CONCRETE WEIGHT COATING	BR/TS/062	REVISION	
9.5.2	If casting method is used, once reinforcement and mould have been applied around the pipe, concrete mixture shall be poured through an opening on the upper section of the same mould. Concrete shall not be deposited from a height greater than 1 metro. During pouring of concrete, vibrator sets applied inside of pipe or outside the mould shall vibrate the mix so as to obtain the best possible compactness.			
9.5.3	If guniting method is used, placement of concrete shall be upto the specified thickness in one continuous course, with allowance for splices of reinforcement and providing reinforcement in the right location.			
9.5.4	No casting shall be interrupted or passes shall be stopped for more than 30 minutes. Before placing fresh concrete against the joint, the contact surfaces shall be carefully cleaned and wetted to obtain a good bond between the fresh material and the previously placed material.			
9.5.5	Suitable means shall be provided to ensure that the temperature of the concrete, when placed, does not exceed 32°C.			
9.5.6	All pipes shall be kept clean and free from cement concrete and grout either inside or outside of the uncoated sections.			
9.5.7	Bevel protectors shall be kept in place throughout the coating application and after.			
9.5.8	The coating at each end of the pipe shall be beveled to a slope of approximately two-to-one (2:1). It shall terminate about 50mm short of the end of the corrosion coating applied on the pipe surface.			
9.6	Curing			
9.6.1	Immediately after concreting, the exposed surfaces of the concrete shall be protected during `setting' from the effects of sunshine, drying winds, rain, etc. and then after the initial set has taken place, the concrete coating shall be properly cured. The coated pipe sections shall be handled gently by suitable means to prevent undue distortion.			

BRIDGE AND ROOF CO.(I) LTD.		CIVIL ENGINEERING SECTION NEW DELHI	STANDARD SPECIFICATION	
TITLE	ANTI BUOYANCY MEASURES		SPECIFICATION NO.	PAGE 10 OF 14
	CONCRETE WEIGHT COATING		BR/TS/062	REVISION
9.6.2	<p>Curing shall be done by sprinkling water at regular intervals on gunny cloth wound around the concrete coated pipes.</p> <p>Alternatively, curing may be done by application of an approved curing membrane using sealing compounds and shall meet the basic requirements of IS:456 and shall generally be of very high quality of manufacture and approved make. The material shall be stored, prepared and applied in strict conformity with the instructions of the manufacturer. The ingredients of any such compound shall be non-toxic and non-inflammable and shall not react with any ingredient of the concrete, the reinforcement, the protective coating or pipe. The application of the curing compound shall take place immediately after the coating is completed and preferably before the pipe is removed from the concrete coating apparatus. The surface of the concrete shall be lightly sprayed with water before applying the curing compound. The membrane curing period shall not be less than 4 days, during which period the freshly coated pipes shall not be disturbed. The pipe surface shall be kept wet during daylight hours for seven days after application of the concrete coating. The concrete coating shall not be allowed to dehydrate.</p>			
9.6.3	<p>Before handling and hauling the concrete coated pipes, a check shall be made to make sure that the concrete coating is properly cured. Stacking and shipment of the coated pipes shall be initiated only after seven days provided that the concrete coating suffers no damage.</p>			
10.0	<u>TOLERANCES</u>			
10.1	<p>CONTRACTOR shall maintain a surface tolerance of 8mm maximum for the radial distance between high and low areas of the surfaces. The diameter of each coated pipe shall be obtained at three (3) or more points, spaced at equal intervals between the end points.</p>			
10.2	<p>The acceptance weight tolerance for any single pipe shall be limited to plus five (5) or minus two (2) percent of the calculated theoretical weight. The theoretical weight shall be calculated using total weight of the pipe with concrete and corrosion coating.</p>			
11.0	<u>WEIGHING</u>			
11.1	<p>The test specimen shall be selected at equal intervals during the course of production.</p>			

BRIDGE AND ROOF CO.(I) LTD.		CIVIL ENGINEERING SECTION NEW DELHI	STANDARD SPECIFICATION	
TITLE	ANTI BUOYANCY MEASURES		SPECIFICATION NO.	PAGE 11 OF 14
	CONCRETE WEIGHT COATING		BR/TS/062	REVISION
11.2	CONTRACTOR shall weigh each pipe when dry prior to shipment and 28 days after placing of concrete and mark the weight with paint on the inside of the pipe. The weight mark shall be followed with letters "DW" meaning Dry Weight.			
12.0	<u>INSPECTION AND TESTS</u>			
12.1	After curing, every length of concrete coated pipe shall be non-destructively tested by means such as "ringing" to determine if any suspected defects are present. In case this indicates faulty coating, cores shall be removed from coating and inspected. When defective coating appears from cores, the concrete coating shall be removed from the pipe lengths.			
12.2	Every length of concrete coated pipe shall be checked to verify insulation between steel reinforcement and pipe by means of a megger or equivalent device. To this purpose provisions should be made during placing of concrete such as to leave at-least a point of exposed steel reinforcement whenever the latter shall terminate inside of concrete coating.			
12.3	During the tests as per clause 12.2 above, and before transporting of concrete coated pipes, every pipe length shall be visually inspected to detect whether any damages and/ or defects are present. Possible damages and/ or defects with their allowable limits are described at following clause 13.0. Repairable concrete coatings shall be clearly marked while the non-repairable ones shall be removed from the pipe lengths.			
13.0	<u>THE COATING OF FIELD WELDS</u>			
13.1	The CONTRACTOR shall coat the uncoated pipe surface at field welds in accordance with methods approved by COMPANY. CONTRACTOR shall submit a detailed procedure for joint coating for COMPANY's approval.			
13.2	The reinforcement for the field welds shall be same as that for line pipe coating with the same number of layers and the same space between layers as for the existing coating. The edges of this meeting must be carefully secured with galvanized wire to the reinforcement extending from the existing coating.			
	The reinforcement shall not make direct or electrical contact with the pipe.			
	Synthetic resin spacer blocks may be used to keep the reinforcement free from the pipe coating as mentioned in cl. 9.4.2.			


BRIDGE AND ROOF CO.(I) LTD.		CIVIL ENGINEERING SECTION NEW DELHI	STANDARD SPECIFICATION	
TITLE	ANTI BUOYANCY MEASURES	SPECIFICATION NO.	PAGE 12 OF 14	
	CONCRETE WEIGHT COATING	BR/TS/062	REVISION	
<p>The moulds used for applying the concrete coating shall be supplied by the CONTRACTOR.</p>				
13.3	<p>The composition of the concrete shall be the same as that of the concrete coating of the pipe.</p> <p>When using moulds, the CONTRACTOR shall prevent air being trapped by applying mechanical vibrators or by striking the outside of the moulds with sticks.</p>			
13.4	<p>If the moulds remains around the pipe, e.g. in the case of submerged pipes floated into position, the CONTRACTOR shall take appropriate measures to prevent too much water entering the mould. This can be achieved by clamping strips of burlap between the ends of the mould and the existing concrete coating. After the mould has been filled with concrete the filling opening must also be closed off by clamping a strip on burlap under the sealing cover.</p>			
14.0	<p><u>REPAIRS</u></p> <p>The following are repairs that will be permitted to coating due to unavoidable damage in handling and in storage (This applies only to concrete that has set).</p>			
14.1	<p>Spalling due to compression or shearing caused by impact against other objects. Spalling is defined as damage which causes a loss in concrete of more than 25 percent of the total thickness of the coating at the point of damage.</p>			
14.2	<p>Damage due to spalling of a local area shall be repaired by removing loose concrete and exposing the reinforcing steel throughout the damaged area. Edges of the spalled area shall be undercut so as to provide a key lock for the repair material. A stiff mixture of cement, water and aggregate shall be trowelled into and through the reinforcement and built up until the surface is level with the coating around the repair. The pipe shall then be carefully laid with the repaired area at the top and shall be moist cured for a minimum of thirty six (36) hours before further handling.</p>			

BRIDGE AND ROOF CO.(I) LTD.		CIVIL ENGINEERING SECTION NEW DELHI	STANDARD SPECIFICATION	
TITLE	ANTI BUOYANCY MEASURES		SPECIFICATION NO.	PAGE 13 OF 14
	CONCRETE WEIGHT COATING		BR/TS/062	REVISION
14.3	Should the damaged area be more than 0.3m ² , coating shall be removed around the entire damaged area. A repair shall be made by satisfactorily restoring the reinforcement, forming the area with a metal form and pouring a complete replacement of materials similar to that from which the coating was made. The mixture shall be one (1) part of cement to three (3) parts of aggregate and the necessary water to produce a slump not to exceed 100mm. The resulting coating shall be equal in weight, density, uniformity, thickness, strength and characteristics to the originally applied coating. The pipe shall then be carefully laid in a position where it shall be moist cured for a minimum of 36 hours before further handling.			
15.0	<u>MARKING</u>			
15.1	Every concrete coated pipe length shall be clearly marked by a suitable type of paint (i.e. red and/ or white lead paint). Markings out of concrete coating shall be made inside of pipe close to bevel end, in such a way that the area involved by welding operations is not affected by paint.			
15.2	For each concrete coated pipe length, at one of the two ends, the field identification number and the date of concrete placing shall be marked, while the dry as well as the net weight along with number of days after coating shall be marked at the other end.			
16.0	<u>UNLOADING, TRANSPORT, STORING AND HAULING</u>			
16.1	Once the pipe sections have been taken on charge, the CONTRACTOR, complying with provisions of the CONTRACT, shall execute their transport together with other material, either supplied by him or by the COMPANY, from the site of receipt to the coating yard and after concrete coating completion and acceptance, to delivery point at laying field or storage areas as previously established providing each time the necessary storage.			
16.2	Materials other than pipes and which are susceptible of deteriorating or suffering from damages especially due to humidity or other adverse weather conditions, shall be suitably stored and protected.			
16.3	During loading, transport, unloading and hauling of inert aggregates, any contact and mixing with mud, earth, grease and any other foreign material shall be carefully avoided. Precautions shall be taken to prevent contamination, to maintain the cleanliness and against effects of hot or cold weather.			

BRIDGE AND ROOF CO.(I) LTD.		CIVIL ENGINEERING SECTION NEW DELHI	STANDARD SPECIFICATION	
TITLE	ANTI BUOYANCY MEASURES CONCRETE WEIGHT COATING CONCRETE SADDLE WEIGHT	SPECIFICATION NO.		PAGE 14 OF 14
		BR/TS/062		REVISION
16.4	During the operations of loading, unloading and stock-piling, the pipe sections shall be handled in such a way so as to avoid dents, cuts, cracks and other damages especially at beveled ends or damages to protective and/ or concrete coating.			
16.5	Stacks shall consist of a limited number of layers such that the pressure exercised by the pipes own weight does not cause damages to coating. Stacking with more number of layers shall be agreed upon with the COMPANY provided that each pipe section is separated by means of spacers suitably spaced so as to avoid stresses and compressed points of contact on the coated surfaces.			
17.0	PART-B : CONCRETE SADDLE WEIGHT			
17.1	This specification deals with the work of supply, precasting, and placement of concrete saddle weights of specified design and construction. Refer Standard Drawing No. MEC/05/ 11/STD/TERMINAL/006, Rev-1.			
17.2	This specification shall be read in conjunction with the conditions of all specifications and documents included in the CONTRACT between COMPANY and CONTRACTOR.			
17.3	CONTRACTOR shall, execute the work in conformity with all standard practices, specifications, drawing and direction by the COMPANY and provide all services, labour, supervision, all materials, excluding the materials indicated as COMPANY supplied materials in the CONTRACT, equipment, appliances etc. required in or about the execution of the work, whether of a temporary or permanent nature.			
17.4	All relevant specifications shall be referred to as per requirement, whether specifically mentioned or otherwise. Reference may generally be made to the cl. 2.0 REFERENCE DOCUMENTS (PART-A) of this document.			
17.5	For materials and workmanship the reference shall be made to respective items as per specification no. MEC/S/05/11/01.			

TECHNICAL SPECIFICATION FOR FABRICATION,
ERECTION AND PAINTING OF STEEL STRUCTURES,
GATES AND MISCELLANEOUS WORK

SPECIFICATION NO.: **BBR/TS/063**

BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES	BR/TS/063		Page 1 of 29

C O N T E N T S

1.	General	Page - 2
2.	Section – 1 Fabrication of steel structures	Page – 3
3.	Section – 2 Erection of steel structures	Page - 11
4.	Section - 3 Fabrication and erection of miscellaneous structures	Page - 16
5.	Section – 4 Painting of Steel Structures	Page - 20


LIST OF ANNEXURES

Annexure - A Permissible Deviation in pitch and gauge of holes or bolts of normal accuracy

Annexure – B Tolerance of assembled components of steel structures

Annexure – C Tolerance in erected steel structures


Annexure – D Material of Construction

BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES	BR/TS/063		Page 2 of 29

**TECHNICAL SPECIFICATION FOR FABRICATION, ERECTION AND PAINTING OF
STEEL STRUCTURES AND CHAIN LINK FENCING**

1.0 GENERAL

- 1.1 This specification shall apply to general steelwork, for CNG Distribution works. The structures shall include canopies, loading unloading platforms, hoarding, crossovers, ladders, Fencing and Fencing Gates, staircases, pipe supports, skid supports, , sheds, stockades/trestles, Boundary wall MS Gate etc.


BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES		BR/TS/063	Page 3 of 29

SECTION-1: FABRICATION OF STEEL STRUCTURES

2.0 SCOPE OF WORK

2.1 The scope of work under fabrication includes, but not limited to, the following:

- a) Preparation and supply of material indents, bolt lists, bought out items list, etc.
- b) Procurement and collection of all material from stockyards/stores, including loading, transportation, unloading and stacking and storing on skids or supports.
- c) Procurement and collection of all consumables like bolts, nuts, washers, electrodes, paints, shims, packs, etc., including allowance for spares and wastage.
- d) Preparation and submission of modification/rectification sketches, As-Built drawings, erection drawings, bill of materials, and shipping documents for approval of CLIENT.
- e) Cold straightening of section and plates, whenever they are bent and kinked.
- f) Fabrication of all steel structural components covered under tender drawings, design drawings and generally described under the scope of the project.
- g) Making arrangements for and conducting tests such as chemical analysis, physical and mechanical tests on raw materials where specified/as directed by CLIENT.
- h) Control Assembly of steel structural components at shop, wherever required.
- i) Preparation of steel structural surfaces for painting as provided in the specifications/drawings.
- j) Application for one primer coat of painting at shop, as specified in the design drawing/specifications.
- k) Loading, transportation from fabrication workshop to site of erection and unloading of all steel structural components/units/assemblies.
- l) Preparation of 'As-built' drawings.

BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES	BR/TS/063		Page 4 of 29

3.0 MATERIALS

3.1 Structural Steel

3.1.1 Structural steel and other related materials for construction shall conform to **Annexure-F**.

3.1.2 Due to non-availability of specified materials, suitable substitutions may be provided with the consent of CLIENT. Such substitution shall be incorporated in the "As-built" drawings.

3.1.3 All the items are to be cut as per requirements of the drawing. If joints are to be provided in any item in order to meet requirements of size and shape, cutting plan showing locations of joints shall be prepared for consideration of purchaser. Joints provided shall be incorporated in "As-built" drawings.

3.1.4 Rolling and cutting tolerances shall be as per IS:1852-1985.

3.1.5 Only tested materials shall be used unless use of untested materials for certain secondary structural members is permitted by CLIENT. If test certificate for the material is not available from the main producer, the following tests shall be carried out at the discretion of CLIENT:

- a) Chemical Composition
- b) Mechanical Properties
- c) Weldability test

3.2 Bolts and Nuts


3.2.1 Black hexagonal bolts, nuts and lock nuts shall conform to IS:1363-1992.

3.3 Electrodes

3.3.1 Electrodes shall conform to IS:814-1991.

4.0 STORING OF MATERIALS

4.1 Materials shall be stored and stacked properly ensuring that place is properly drained and is free from dirt. It shall be ensured that no damage is caused due to improper stacking.

BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES	BR/TS/063		Page 5 of 29

5.0 MATERIAL PREPARATION


- 5.1 Cut edges shall be finished smooth by grinding or machining wherever necessary. Sufficient allowance (3mm to 5mm) should be kept in the items incase machining is necessary.
- 5.2 Cutting may be effected by gas cutting, shearing, cropping or sawing.
- 5.3 Straightening and bending shall be done in cold condition as far as practicable.
- 5.4 If required, straightening and bending may be done by application of heat between 900°C and 1100°C. Cooling down of the heated item shall be done slowly.

6.0 DRILLING AND PUNCHING OF HOLES


- 6.1 Drilling and punching of holes for bolts shall be done as per clause no.11.2.4 of IS:800-1984, unless otherwise specified by CLIENT.
- 6.2 Drifting of holes for bolts during assembly shall not cause enlargement of holes beyond permissible limit or damage the metal.
- 6.3 Holes for bolted connection should match well to permit easy entry of bolts. Gross mismatch of holes shall be avoided.
- 6.4 Permissible deviation in holes for mild steel bolts of normal accuracy and high strength bolts are given in the **Annexure-A**.

7.0 ASSEMBLY FOR FABRICATION


- 7.1 Fabrication of all structural steelwork shall be in accordance with IS:800-1984 and in conformity with various clauses of this Specification, unless otherwise specified in the drawings.
- 7.2 Fabrication of structures shall preferably be taken up as per the sequence of erection.
- 7.3 All erection units shall bear reference drawing no. at a prominent location on the structures for easy identification at site.
- 7.4 Fabricated structures shall conform to tolerance as specified in this Specification and in IS:7215-1974. In case of contradiction, tolerance specified in this Specification shall prevail.

BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES	BR/TS/063		Page 6 of 29

- 7.5 All the components of structures shall be free from twist, bend, damage, etc.
- 7.6 Splice joints shall generally be of full strength butt weld and wherever possible, shall be located at zones of minimum or substantially lesser stress.
- 7.7 Splice joints of flange and web should preferably be staggered.
- 7.8 Where necessary, washers shall be tapered or otherwise suitably shaped to give the heads of nuts and bolts satisfactory bearing.
- 7.9 The threaded portion of each bolt shall project through the nut at least by one thread.
- 7.10 Tolerance of assembled components of structures are given in **Annexure-B**.
- 7.11 Permissible deviations from designed (true) geometrical form of the despatch elements shall be in accordance with IS:7215-1974.
- 8.0 WELDING**
- 8.1 The Contractor shall work out welding procedure for CLIENT's approval, considering the following factors:
- i) Specification and thickness of steel.
 - ii) Specification of electrode or/and base wire.
 - iii) Welding process (manual arc welding, submerged arc welding).
 - iv) Type of structures to be welded (thickness of components meeting at a joint).
 - v) Sequence of welding.
 - vi) Weather condition.
 - vii) Inspection procedure to be followed
 - viii) Design requirements of the joints.
- 8.2 All metal arc welding shall be carried out as per IS:9595-1980.
- 8.3 Electrode shall conform to Clause no. 3.3 of this Specification.
- 8.4 Electrodes shall be stored in a dry place. Electrodes whose coatings are damaged due to absorption of moisture or due any other reason shall not be used.
- 8.5 Recommendations of electrode manufacturer are to be strictly followed.

BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES		BR/TS/063	Page 7 of 29


- 8.6 Welding surface shall be smooth, uniform, free from fins, tears notches or any other defect which may adversely affect welding.
- 8.7 For multi-run weld deposit, the next run should be done only after thorough removal of slag and proper cleaning of surface.
- 8.8 Fillet weld shall have the correct profile with smooth transition into parent metal. Dressing of welds, if specified, shall be done by such method which does not cause grooving and other surface defects on the weld or on the parent metal.
- 8.9 Fillet welds shall not be stopped at corners but shall be returned round them.
- 8.10 Welding shall not be done under such weather conditions which might adversely affect the efficiency of the welding.
- 8.11 Ends of structural members and portions of gussets receiving welding at site shall be left unpainted.
- 8.12 Permissible deviation in assembly of weld joints shall be in accordance with **Annexure-C**.
- 9.0 INSPECTION & TESTING**
- 9.1 CLIENT/Inspector shall have free access at all times to those parts of Contractor's or his Sub-contractor's works which are concerned with the fabrication of steel works and shall be afforded all reasonable facilities at all stages of preparation, fabrication and trial assemblies for satisfying himself that the fabrication is being undertaken in accordance with the provisions of relevant specification.
- 9.2 All gauges and templates, tools, apparatus, labour and assistance for checking shall be supplied by the contractor free of charge. CLIENT/Inspector may, at his discretion, check the test results obtained at the Contractor's works, by independent test at the Government Test House or elsewhere, and should the material so tested be found to be unsatisfactory, the cost of such test shall be borne by the Contractor.
- 9.3 Contractor shall make all necessary arrangements for stage inspection by CLIENT/Inspector during the fabrication at shop and incorporate all on-the-spot instructions/ changes conveyed in writing to the Contractor.
- 9.4 Material improperly detailed or wrongly fabricated shall be reported to CLIENT/Inspector and shall be made good as directed. Minor misfits which can be remedied by moderate use of drift pins, and moderate amount of reaming and slight chipping may be corrected in that manner, if

BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES	BR/TS/063		Page 8 of 29

in the opinion CLIENT/Inspector, the strength or appearance of the structure will not be adversely affected. In the event CLIENT/Inspector directs otherwise, the items will be rejected and a completely new piece shall be fabricated. The cost of correcting errors shall be to the account of the Contractor.

9.5

- i) CLIENT/Inspector shall have the power:
 - a) To certify, before any structure is submitted for inspection, that the same is not in accordance with the contract, owing to the adoption of any unsatisfactory method of fabrication.
 - b) To reject any structure as not being in accordance with Specification and drawings.
 - c) To insist that no structure or parts of the structure once rejected is resubmitted for inspection/test, except in cases where CLIENT/ Inspector considers the defects as rectifiable.
- ii) If, on rejection of structure by CLIENT/Inspector, the Contractor fails to make satisfactory progress within the stipulated period, CLIENT/Inspector shall be at liberty to cancel the contract and fabricate or authorize the fabrication of the structures at any other place he chooses, at the risk and cost of the Contractor, without prejudice to any action being taken in addition to terms of General Conditions of Contract.
- iii) CLIENT/Inspector's decision regarding rejection shall be final and binding on the Contractor.
- iv) The Specifications prescribe various tests at specified intervals for ascertaining the quality of the work done. If the tests prove unsatisfactory, CLIENT/Inspector shall have liberty to order the Contractor to re-do the work, done in that period and/or to order such alterations and strengthening that may be necessary at the cost of the Contractor and the contractor shall be bound to carryout such orders failing which the rectification/redoing will be done by CLIENT through other agencies and the cost recovered from the Contractor.
- v) Notwithstanding any inspection at the workshop, CLIENT/Inspector shall have the liberty to reject, without being liable for compensation any fabricated members or materials brought to site that do not conform to specifications/drawings.
- vi) All rejected materials shall be removed from the site of fabrication by the Contractor at his own cost and within the time stipulated by CLIENT/Inspector.

BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES	BR/TS/063		Page 9 of 29

10.0 CONTROL IN WELDING

10.1 The extent of quality control in respect of welds for structural elements shall be as follows and shall be conducted by the contractor at his own cost:

- a) Visual Examination - All welds shall be 100% visually inspected to check the following:
 - i) Presence of undercuts
 - ii) Visually identifiable surface cracks in both welds and base metals
 - iii) Unfilled craters
 - iv) Improper weld profile and size
 - v) Excessive reinforcement in weld
 - vi) Surface porosity

Before inspection, the surface of weld metal shall be cleaned of all slag, spatter matter, scales etc. by using wire brush or chisel.

- b) Dye Penetration Test (DPT) - This shall be carried out for all important fillet welds and groove welds to check the following :
 - i) Surface cracks
 - ii) Surface porosity

Dye Penetration Test shall be carried out in accordance with American National Standard ASTM E165.


11.0 ACCEPTABLE LIMITS OF DEFECTS IN WELD

11.1 The limits of acceptability of defects detected during visual inspection and Dye Penetration Test shall be in accordance with clause 8.15.1 American National Standard ANSI/AWS D1.1-96.

12.0 RECTIFICATION OF DEFECTS IN WELDS

12.1 In case of detection of defects in welds , the rectification of the same shall be done as follows :

- i) All craters in the weld and breaks in the weld run shall be thoroughly filled with weld.

BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES		BR/TS/063	Page 10 of 29

- ii) Undercuts, beyond acceptable limits, shall be repaired with dressing so as to provide smooth transition of weld to parent metal.
- iii) Welds with cracks and also welds with incomplete penetration, porosity, slag inclusion etc. exceeding permissible limits shall be rectified by removing the length of weld at the location of such defects plus 10 mm from both ends of defective weld, and shall be re-welded. Defective weld shall be removed by chipping hammer, gouging torch or grinding wheel. Care shall be taken not to damage the adjacent material.


13.0 DESPATCH INSTRUCTIONS

Each despatchable structure shall bear mark no. along with reference drawing number at two prominent locations.

- 13.1 "As-built" drawings shall be prepared after fabrication is completed to indicate additions/alterations made during the process of fabrication. (Refer clause 3.1.2 & 3.1.3.)
- 13.2 Center lines of column flanges and both sides of web shall be punched, preferably at top and bottom to facilitate alignment after erection.

14.0 COMPLETION DOCUMENTS

- 14.1 On completion of work, the Contractor shall submit to CLIENT the following documents:
 - a) The technical documents according to which the work was carried out.
 - b) Copies of the "As built" drawings showing thereon all additions and alterations made during fabrication.
 - c) Manufacturer's test certificates
 - d) Certificates/documents on control checking
 - e) Test of welds
- 14.2 Inspection Certificates shall be issued to the contractor for the structures found acceptable in all respects by CLIENT/Inspector.


BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES	BR/TS/063	Page 11 of 29	

SECTION-2: ERECTION OF STEEL STRUCTURES

15.0 SCOPE OF WORK

In addition to provision of erection and transport equipment, the scope of work includes supply of tools and tackles, consumables, materials, labour and supervision and shall cover the following:

- a) Storing and stacking of all fabricated structural components/units/ assemblies at site storage yards till the time of erection.
- b) Transportation of structures from storage yard to site of erection, including multiple handling, if required.
- c) All minor rectification/modifications such as:
 - i) Removal of bends, kinks, twists etc. for parts damaged during transportation and handling.
 - ii) Reaming of holes which do not register or which are damaged, for use of next higher size bolt.
 - iii) Plug welding and re-drilling of holes which do not register and which cannot be reamed for use of next higher size bolt.
 - iv) Drilling of holes which are either not drilled at all or are drilled in incorrect position during fabrication.
- d) Fabrication of minor missing items as directed by CLIENT.
- e) Verification of the position of embedded anchor bolts and inserts w.r.t. line find levels, installed by others based on Geodetic Scheme/Bench mark/ Reference co -ordinates taken by the Contractor.
- f) Rectifying at site damaged portions of shop primer by cleaning and application touch-up paint.
- g) Erection of structures including making connections by bolts/welding as per drawing.
- h) Alignment of all structures true to line, level plumb and dimensions within specified limits of tolerance.

BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES	BR/TS/063	Page 12 of 29	

- i) Application at site after erection, required number of coats of primer and finishing paint as per specification and drawing.
- j) Rectification of structures as per instructions of the Engineer-Incharge.


16.0 STORING AND HANDLING

- 16.1 Storage of structures shall be preferably be done in such a manner that erection sequence is not affected.
- 16.2 While storing, care shall be taken so that structures do not come in direct contact with the earth surface and accumulated water.
- 16.3 Stacking of the structures shall be done in such a way that, erection marks are visible easily and handling does not become difficult. Wherever required, wooden sleepers/grillage may be used.
- 16.4 Handling and storage of materials shall be as per IS:7969-1975, to ensure safety.

17.0 ERECTION

17.1 General

- 17.1.1 Erection shall be carried out in accordance with IS:800-1984 and other relevant standards referred to therein.
- 17.1.2 For safe and accurate erection of structural steelwork, staging, temporary support, false work, etc. shall be erected as required.
- 17.1.3 The fabricated materials received at erection site shall be verified with respect of marking on the key plan/markings plan or shipping list.
- 17.1.4 Any material found damaged or defective shall be stacked separately and the damaged or defective portions shall be painted in distinct colour for identification and the same shall be brought to the notice of CLIENT.

BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES	BR/TS/063	Page 13 of 29	

17.2 Erection Drawings

17.2.1 The approved erection drawings and any approved arrangement drg, specification or instruction accompanying them shall be followed in erecting structures.

17.3 Erection of Structures

17.3.1 Erection work shall be taken up after receipt of clearance from CLIENT.

17.3.2 For safety requirements during erection, provisions in IS:7205-974, IS:7969-1975 and other relevant Indian standards shall be followed.

17.3.3 Erection shall be carried out with the help of maximum mechanization possible.

17.3.4 Prior to commencement of erection, all the erection equipment, tools, tackles, ropes, etc. shall be tested for their load carrying capacity. Such tests may be repeated at intermediate stages also if considered necessary and frequent visual inspection shall be done of all vulnerable areas and components to detect damages or distress in the erection equipment, if any.

17.3.5 Following shall be taken care of during erection, whenever necessary:

17.3.5.1 Erected members shall be held securely in place by bolts to take care of dead load, wind load and erection load.


17.3.5.2 All connections shall achieve free expansion and contraction of structures wherever provided.

17.3.5.3 No final bolting or welding of joints shall be done until the structure has been properly aligned.

17.3.5.4 Instrumental checking of correctness of initial setting out of structures and adjustment of alignment shall be carried out in sequence and at different stages as required. The final levelling and alignment shall be carried out immediately after completion of each section.

17.3.5.3 The Contractor shall design, manufacture, erect and provide falsework, staging temporary support etc. required for safe and accurate erection of structural steelwork and shall be fully responsible for the adequacy of the same.

17.3.5.4 The Contractor shall also provide facilities such as adequate temporary access ladders, gangways, tools & tackles, instruments, etc. to CLIENT/Inspector for his inspection at any stage during erection.

BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES	BR/TS/063		Page 14 of 29

17.4 Field Connections

17.4.1 Assembly by permanent bolts.

17.4.1.1 The numbers of washers on permanent bolts shall not be more than two (and not less than one) for the nuts and one for the bolt head.

17.4.1.2 Wooden rams or mallet shall be used in forcing members into position in order to protect the metal from injury or shock.

17.4.1.3 Where bolting is specified on the drawing, the bolts shall be tightened to the maximum limit. The threaded portion of the each bolt shall be project through the nut by at least one thread. Tapered washers shall be provided for all heads and nuts to achieve uniform bearing on sloping surface.

17.4.1.4 To prevent loosening of nuts, spring washers or lock nuts shall be provided as specified in the design/shop drawings.

17.4.1.5 All machine-fitted bolts shall be perfectly tight and the ends shall be checked to prevent nuts from becoming loose. No unfilled holes shall be left in any part of the structures.

17.4.2 Assembly by welding.

17.4.2.1 All field assembly by welding shall be executed in accordance with the requirements for shop fabrication. Where the steel has been delivered painted, the paint shall be removed before field welding for a distance of at least 50mm on either side of the joints to be welded.


17.4.2.2 All other requirements in welding shall be in accordance with clauses specified under Section-1 of this Specification

18.0 ACCEPTANCE STANDARD OF WELDING

18.1 Acceptance standard of welding shall be as specified in Section-1 of this Specification.

19.0 BEDDING AND GROUTING

19.1 Base plates shall be set to elevations shown on the drawings, supported aligned and levelled using steel wedges and shims or by other approved methods. Plates shall be levelled properly, positioned and the anchor bolts tightened.

BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES	BR/TS/063		Page 15 of 29

20.0 PAINTING AFTER ERECTION

- 20.1 The painting shall be as per painting specification (Section-4) of this Specification) and instruction given on drawings.
- 20.2 Site painting shall not be done in frosty or foggy weather or when humidity is such as to cause condensation on the surface to be painted.

21.0 ERECTION TOLERANCE


Maximum permissible tolerance in erected steel structures shall be as given in **Annexure-D**.

22.0 ACCEPTANCE OF WORK

- 22.1 Acceptance of erected steel structures shall be either after completion of erection of all the structures or in blocks.
- 22.2 Preliminary Acceptance will be done in the following cases:
- Any steelwork or part thereof embedded in concrete.
 - Steel structures which are to be covered in the process of carrying out further work.

23.0 DOCUMENTATION

- 23.1 The following documents shall be prepared at the time of acceptance of erected structures:
- Documents showing actual deviations made during execution of erection work and approval of competent authority.
 - Documents showing acceptance of embedded structures.
 - Certificate/documents on control checking and test of materials (if any) and weld.
 - Data and result of geodetic measurements obtained while checking the erection of the structures.
- 23.2 Copies of "As-Built" drawing showing thereon all additions and alternations which took place between approval of drawing and erection of structures.

BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES	BR/TS/063		Page 16 of 29

SECTION 3- FABRICATION AND ERECTION OF MISCELLANEOUS STRUCTURES

26.00 Roof and Side Cladding with Zincalume high tensile sheets. .

26.01 The scope of work shall cover:


- a. Preparation of drawings showing layout and size of sheets used, details of connections and flashing, Bill of Materials, etc.
- b. Procurement and supply sheets of all sizes, flashing and fittings like corner pieces, apron pieces, ridges, cutting and bending of sheets, wherever required, drilling of holes all as per Specification and Drawings.
- c. Procurement and supply of all fixtures and accessories such as self drilling, self tapping fasteners (galvanised with EPDM seals), washers, sealants, neoprene fillers etc.
- d. Procurement and supply of Rockwool insulation along with its fixing accessories such as cleats for fixing wire mesh, aluminium foil, metal/wire mesh etc(whenever applicable).
- e. Loading, transportation, unloading and delivery of sheeting with/without insulation material from place of procurement to erection site.
- e. Provision of all tools and tackles, equipment, labour supervision and services required for the satisfactory completion of the work specified herein and on the drawings.
- f. Erection in position of sheets and insulation where specified, for roofing, walling, louvers, erection of all flashing, fittings like ridges, valleys, gutters, corners, apron, etc. at all locations all work as per Drawings and Specifications.

26.02 **Fixing of sheets**

26.02.01 All fixing of the roof and side sheeting to purlins/insulations shall be by means of self drilling, self tapping screws.

26.02.02 Self Tapping screws shall be provided at all crest/valley at purlin locations for roof sheeting and at all valleys of the corrugations for side sheets.

26.02.03 All sheets shall be stitched together by self drilling/self tapping screws at spacing not more than 500mm.

BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES	BR/TS/063		Page 17 of 29

26.03 Laps

26.03.01 All roofing shall be provided with two corrugations side lap and 200mm end lap.

26.03.02 All side/gable end sheets shall be provided with single corrugation side lap and 100mm end lap.

26.03.03 Overhang of sheets on the roof and side cladding shall not exceed 300mm.

26.04 Erection

26.04.01 Erection is to be carried out with the lay of the side laps such that under the prevailing wind, rain is not driven into the lap. The sheets shall be laid so that side lap in any two consecutive rows is staggered.


26.04.02 Broken or otherwise damaged sheeting shall not be erected.

26.04.03 Cutting, framing and trimming of all openings required shall be carried out at site.

27.0 CHAIN LINK FENCING AND GATE


The scope of work shall cover:

- a) Procurement and supply mesh, line wire, stretcher bar, barbed wire (if shown in the drawings) and other accessories for chain link fencing and gate all as per specifications and drawings.
- b) Loading, transportation, unloading and delivery of material for fencing and gate from place of procurement to erection site.
- c) Provision of all tools, tackles, equipment, labour, supervision and services required for the satisfactory completion of the work specified herein and on the drawings.
- d) Erection in position of the fencing and gate at all locations, all work as per specification and drawings.

BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES		BR/TS/063	Page 18 of 29


27.1 Erection

- 27.1.1 The height of chain link fencing shall be 3.0/2.5m top of vertical post. Punch Tap Concertina coil is to be provided over chain link fencing.
- 27.1.2 Straining posts shall be provided at all ends and corners of fences, at changes in direction or acute variations in levels and at intervals not exceeding 66m on straight lengths of the fence. Intermediate posts shall be spaced at regular intervals not exceeding 1.5m.
- 27.1.3 Struts shall be fitted to all straining posts behind the chain link fabric in the direction of the fence.
- 27.1.4 There shall be four evenly spaced rows of line wire. The top wire shall be doubled, making five line wires in all. The bottom wire shall be close to the ground. Each line wire shall be strained lightly by means of eyebolt strainer at each straining point. The eyebolt strainer shall consist of bolt with welded eye. The bolt shall be sufficiently threaded and fitted with a nut and washer. Each line wire shall be secured to each of the intermediate posts by a wire stirrup passing through holes in the posts and secured to the line wire by three complete turns on each side of the post. Two-way eyebolt strainers shall have suitable ring nuts fitted after wires have been strained on one side.
- 27.1.5 The mesh shall be strained between each pair of straining posts and shall be secured to each straining post by means of a stretcher bar. One of the top line wires shall be threaded through the appropriate adjacent rows of mesh, care being taken that no meshes in the rows are by-passed by the line wire except where deviation is necessary at the straining posts. The second top line wire shall be strained in front of the fencing. The mesh shall be attached to top and bottom line wires by wire ties spaced 150mm apart and to other line wires by wire ties spaced 450mm apart. Bottom row of the mesh shall be threaded to the foundation concrete using staples spaced 500mm apart and set in concrete to a depth of 150mm. The top of concrete shall be 50mm above G.L. and 50mm below the fencing.

BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES	BR/TS/063		Page 19 of 29

27.2 Chain link fencing Gate

- 27.2.1 A gate of suitable width shall be provided in the direction of the chain link fabric. The mesh and barbed wire used for the fabrication of gate shall be identical in all respects to that of chain link fencing. The gate may be single leaf or double leaf depending on the width of the gate.
- 27.2.2 The gate frame shall be a pipe frame with stiffeners at mid-height and mid-width. The mesh shall be welded to the gate frame/stiffeners.
- 27.2.3 Each leaf of the gate shall be supported on a pivot in the foundation for the straining post and shall be laterally held at two points, one near the top of the straining post and second near the middle of the straining post. The free end of each leaf shall be provided with a tower bolt at the base of the frame. An aldrop shall be provided at the mid-height of the frame.

BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES	BR/TS/063		Page 20 of 29

SECTION-4: PAINTING OF STEEL STRUCTURES

25.0 SURFACE PREPARATION FOR PAINTING

25.1 General

The steel surface which is to be prepared shall be cleaned of dirt and grease and the heavier layers of rust shall be removed by grinding prior to actual surface preparation to a specified grade.

Surface preparation to be followed prior to painting shall be based on the requirement of a particular painting system as per Clause 27.0.

25.2 Mechanical Cleaning

Manual/ power tool cleaning shall be done as per grade St-2 or St-3, of Swedish Standard Institution SIS 055900.


- i) Grade St-2: Thorough scraping and wire- brushing, machine brushing, grinding etc. This grade of preparation shall remove loose mill scale, rust and foreign matter. Finally the surface is to be cleaned with a vacuum cleaner or with clean compressed air or with clean brush. After preparation, the surface should have a faint metallic sheen. The appearance shall correspond to the prints designated St-2.
- ii) Grade St-3: very thorough scraping and wire brushing, machine brushing, grinding etc. The surface preparation is same as for grade St-2 but to be done much more thoroughly. After preparing the surface, it should have a pronounced metallic sheen and correspond to the prints designated St-3.

25.3 If no grade of surface preparation is specified, Grade St-2 shall be followed.


26.0 PAINTS AND PAINTING

26.1 For use of specific painting system as mentioned in the Specification, the paint manufacturer's specification shall prevail.

26.2 General compatibility between primer and finishing paints shall be established through the paint manufacturer supplying the paints.

BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES	BR/TS/063		Page 21 of 29

- 26.3 Before buying the paint in bulk, it is recommended to obtain sample of paint and establish "Control Area of Painting". On control area surface preparation and painting shall be carried out in the presence of manufacturer of paint.
- 26.4 In order to ensure that the supplied paint meets the stipulation in design drawing/specification, if required, samples of paint shall be tested in laboratories to establish quality of paint with respect to viscosity, adhesion/bond of paint in steel surfaces, adhesion/simulated salt spray test, chemical analysis (percentage of solids by weight), normal wear resistance as encountered during handling & erection, resistance against exposure to acid fumes, etc.
- 26.5 Whole quantity of paint for a particular system of paint shall be obtained from the same manufacturer.
- 26.6 Thinners, wherever used, shall be as per recommendation of the paint manufacturer.
- 26.7 Areas which become inaccessible after assembly of structures shall be painted before assembly, after cleaning the surfaces as specified.
- 26.8 Wherever shop primer painting is scratched, abraded or damaged, the surfaces shall be thoroughly cleaned using emery paper and power driven wire brush wherever warranted, and touched up with corresponding primer. Touching up paint shall be matched and blended to eliminate conspicuous marks.
- 26.9 If more than 50% of the painted surface of an item requires repair, the entire item shall be mechanically cleaned and new primer coats shall be applied followed by finishing coats as per painting specification.
- All field-welded areas on shop painted item shall be mechanically cleaned (including the weld area proper, adjacent areas contaminated by weld spatter or fumes and areas where existing primer. intermediate / finishing paint is burnt). Subsequently, new primer and finishing coats of paint shall be applied as per painting specification.
- 26.10 Application of paint shall be by spraying or brushing as per IS:487-1985 and in uniform layers of 50% overlapping strokes. Painting shall not be done when the temperature is less than 5°C or relative humidity more than 85%, unless manufacturer's recommendations permit. Also painting shall not be done in frosty or foggy weather. During application, paint agitation must be provided wherever such agitation is recommended by the manufacturer.
- 26.11 Paint shall be applied at manufacturer's recommended rates. The number of coats shall be such that the minimum dry film thickness (DFT) specified is achieved. The dry film thickness

BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES	BR/TS/063		Page 22 of 29


of painted surfaces shall be checked with elcometer or measuring gauges to ensure application of specified DFT.

- 26.12 All structures shall receive appropriate number of primer and finishing coats in order to achieve overall DFT as per design drawings/specifications. First coat of primer paint shall be applied not later than 2-3 hours after preparation of surface, unless specified otherwise.
- 26.13 The finishing paint as specified shall be of approved colour and quality. The under coat shall have different tint to distinguish the same from the finishing coat.
- 26.14 Edges, corners, crevices, depressions, joints and welds shall receive special attention to ensure that they receive painting coats of the required thickness.
- 26.15 Parts of surfaces embedded in concrete shall be thoroughly cleaned of grease, rust, mill scale etc. and shall be given a protective coat of Portland cement slurry immediately after fabrication. No paint shall be applied on this part.
- 26.16 Zinc-rich primer paints, which have been exposed several months before finishing coat is applied, shall be washed down thoroughly to remove soluble zinc salt deposits. In similar circumstances, the surfaces of paint based on epoxy resin should be abraded or lightly blast cleaned to ensure adhesion of next coat.
- 26.17 Surfaces which cannot be painted but require protection shall be given a coat of rust inhibitive grease according to IS:958-1975 or equivalent international standard.

27.0 PAINTING SYSTEM

The recommended painting system for general service requirement of steel structures covering surface preparation, application of primer coats, intermediate coats (if necessary) and final coats to develop the required minimum dry film thickness on steel surface is indicated as below

- a. Surface preparation: St 2 according to Swedish Standard SIS055900.
- b. Primer paint: Two coats of redoxide zinc chromate in phenolic alkyd medium (DFT 25 μ /coat) of single pack type with 30-35% solids and covering capacity 12-13 m²/lit/coat.
- c. Finishing paint: Two coats of synthetic enamel in alkyd medium with superior quality water and weather resistant pigments (DFT 25 μ /coat) of single pack type with 30-40% solids and covering capacity 16-18 m²/lit/coat.


BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES	BR/TS/063		Page 23 of 29

28.0 MEASUREMENTS

28.1 Structural Steel

Structural steelwork will be measured by the metric tonne and as per IS:1200(Part-8)-1993 and IS:1200(Part-9)-1973 subject to provisions outlined below:

- The calculation of quantities shall be based on unit weights for structural sections as given in IS Handbooks. In the case of mild steel plates, the calculated weights shall be based on 78.5 kg/m²/centimeter thick plate. The payments will be made on the basis of weights of members as per drawings. However, any changes on the above weights during fabrication erection, payment shall be based on sketches approved by CLIENT.
- In the event the IS does not specify any mode of measurement for a particular item of work, the same shall be measured as per any other relevant international standard or as directed by CLIENT.
- The weight of all plates and sections shall be calculated from the approved drawing using the minimum overall square or rectangular dimensions and theoretical weight, no deduction being made for skew cuts, holes etc. In the case of plates, other than gussets, the actual dimensions shown on approved drawings will apply unless approved otherwise by the purchaser based on cutting diagram of mother plates.
- The weight of all welding runs, bolt, stanchion base packing, cuttings to waste and rolling margins, and coatings of paint, will be excluded from the measured weight and shall be deemed to have been allowed for in the rates for structural steelworks quoted by the Contractor.
- Temporary works and all other materials not included in the permanent works shall be excluded from any measurement for payment.
- Chain link fencing shall be measured in running meter basis, as specified and shown on the drawings.


BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES		BR/TS/063	Page 24 of 29

28.2 Sheets

- 28.2.1 sheets for roofing and side cladding shall be measured by lump sum or the square meter of net laid area, as specified and shown on the drawings or scope of work.
- 28.2.2 No allowance shall be made for wastage, cutouts, overlaps, etc., in the measurement.
- 28.2.3 The unit rate shall include all fasteners, flashing and fitting such as ridges corners, aprons and other accessories.
- 28.2.4 No deduction will be made for openings for area less than a single sheet. Also no extra payment will be made for making openings.

29.0 ACCEPTANCE OF WORKS


- 29.1 After completing the erection of a unit or portion thereof, the Contractor shall give a notice in writing stating that the job is complete in all respects and ready for preliminary acceptance. The job shall be jointly inspected visually by representatives of Contractor and CLIENT. All observed defects and omissions as per drawing and specification shall be noted down.
- 29.2 The Contractor shall make good all these defects, deficiencies and omissions and shall inform in advance CLIENT/Inspector for inspection. The Engineer-Incharge shall satisfy himself that all the defects, deficiencies and omissions noted down during preliminary acceptance have been rectified.

BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES		BR/TS/063	Page 25 of 29

Annexure-A

Permissible deviations in pitch and gauge of holes for bolts of normal accuracy


Sl. No.	Description	Hole Diameter (mm.)	Permissible deviations in spacing (mm.)	Permissible deviations in each group of holes	
				Carbon steel	Low alloy steel
a.	Deviation in hole diameter.	Upto 17	+1.0	No limits	
		Above 17	+1.5		
b.	Ovality (Difference between the biggest and the smallest diameters).	Upto 17	+1.0	No limits	
		Above 17	+1.5		
c.	Curves exceeding 1mm. and cracks on the hole edges.	-	-	Not permissible	
d.	Non-coincidence of holes in separate details of the assembled unit:				
	Upto 1mm.	-	-	Upto 50%	Upto 50%
	Above 1mm. upto 1.5mm.	-	-	Upto 10%	Upto 10%
e.	Slope of axis.	-	Upto 30% the thickness of unit.	No limits	No limits

BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES	BR/TS/063		Page 26 of 29

Annexure-B

Tolerance of Assembled Components of Structures


Sl. No.	Description of components in structures	Deviation (±) mm. for elements of structures						
		Upto 1m.	1m. to 5m.	5m. to 10m.	10m. to 15m.	15m. to 20m.	20m. to 25m.	Over 25m.
1.								
i.	Deviations from the dimensions assembled. Length and width of the details cut:							
a.	Manual gas cutting as per marking	3.0	3.5	4.0	4.5	5.0	-	-
b.	With shears or with saw as per marking.	2.0	2.5	3.0	3.5	4.0	-	-
c.	With shears or with a saw with a stop.	1.5	2.0	2.5	3.0	3.5	-	-
d.	Machine gas cutting.	2.0	2.5	3.0	3.5	4.0	-	-
ii.	Length and width of planed processed on edge planing machine.	1.0	1.5	2.0	2.5	3.0	-	-
2.								
i.	Distance between centers of the end holes:							
a.	Drilled according to marking.	2.0	2.5	3.0	3.5	4.0	-	-
b.	Drilled according to a gauge with bushing.	1.0	1.5	2.0	2.5	3.0	-	-
ii.	Distance between centers of adjacent holes:							
a.	Drilled according to marking or a gauge..	1.5	-	-	-	-	-	-
b.	Drilled according to a gauge with bushing.	0.5	-	-	-	-	-	-

BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES	BR/TS/063	Page 27 of 29	

Annexure-C

Tolerances in Erected Steel Structures


Sl. No.	Description	Tolerance
1.	Deviation of structure at foundation top level w.r.t. true axis	
a.	in longitudinal direction.	$\pm 5\text{mm.}$
b.	In lateral direction.	$\pm 5\text{mm.}$
2.	Deviation in the level of bearing surface of structures at foundation top w.r.t. true level.	$\pm 5\text{mm.}$
3.	Out of plumb of structure from true vertical axis and measured from structure top.	$\pm \frac{H}{1000}$ or $\pm 25\text{mm.}$ Whichever is less.
Note: 'H' above is the structure height in mm.		
Notes:		
1.	The tolerances do not apply to steel structures where deviations from true positions are intimately linked or directly influenced by technological processes. In such cases, tolerances on erected steel structures shall be as per recommendations of process technologists/equipment suppliers.	
2.	The observed or calculated values of deviations of steel structures from their true positions shall be rounded off in accordance with IS:2-1960 for comparison with permissible tolerances specified in this table. The number of significant places retained in the rounded off value shall be the same as that specified in this table.	

BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES		BR/TS/063	Page 28 of 29

Annexure-D

Material of construction (as applicable)

- 1.0 Unless otherwise specified in the drawing, all rolled sections and plates shall conform to Grade-A as per IS: 2062-1992.
- 2.0 Steel sheets shall conform to IS:1079-1988.
- 3.0 Steel tubes for structural purposes shall conform to IS: 1161-1979 (Grade YST-240).
- 4.0 Gutters and down comers shall be of copper bearing steel conforming to IS: 2062-1992.
- 5.0 Crane rails shall conform to IS: 3443-1980.
- 6.0 Roof Covering/ Sheetting: Canopy roof sheetting shall be of 0.6mm Zinalume/ galvalume colour coated sheets and shall have trapezoidal profile with 28-32 mm deep crest and 186-250 c/c profile width with minimum two ribs at centre for stiffening. The sheet shall be of minimum fy = 345 MPa and shall be coated with hot dip metallic Zinc aluminum alloy @ 150 gsm coating mass total on both sides.
- 7.0 Supply and Fixing of canopy false ceiling of 4 mm thick Aluminum composite panel in metallic colour of approved shades with skin thickness of 0.5 mm both side and back side finish shall be polyester coating including fixing by festering brackets of aluminum alloy/MS with Hot Dip Galvanized, using stainless steel screws, nuts, bolts, washer, cleats, weather silicone sealant, bracket rods, etc making cutting for fixing of light fitting shall be done as per the cutout required to fit the fixture ,the work shall be carried out as per manufacturers instruction and specification ,The items including cost of all material &labour component, All works shall be completed as per drawing and as directed by the Engineer-in-charge.
- 8.0 All black hexagonal bolts, nuts and lock nuts shall conform to IS: 1363-1984 and IS: 1364-1983 (for precision and semi-precision hexagonal bolts). Washers shall conform to IS: 1148-1982.

BRIDGE AND ROOF CO.(I) LTD.	STRUCTURAL SECTION, NEW DELHI.	STANDARD SPECIFICATION	
FABRICATION, ERECTION AND PAINTING OF STEEL STRUCTURES	BR/TS/063		Page 29 of 29


- 8.0 Covered electrodes for arc welding shall conform to IS: 814-1991. Coding of electrodes shall be as follows:
- ER 421 'C' x for mild steel of Grade A and Grade B as per IS: 2062-1992.
 - EB 542 'C' x H3X for:
mild steel of Grade B as per IS: 2062-1992 for dynamically loaded structures (arising out of crane, vibratory screen, equipment, etc.),
SAIL-MA micro alloyed steel 350 HYA/HYB and
when combined thickness (CT) for steel conforming to IS:2062-1992 exceeds 40mm.
- where 'C' is the value of current as recommended by the electrode manufacturer.
- 9.0 Material for chain link fencing shall conform to IS:2721-1979. Mesh for chain link fencing shall be of 3.15mm hot dip galvanized steel mesh wire, the diameter being measured over zinc coating. The diameter of mesh wire shall not vary from the specified diameter by more than 0.05mm. The material for mesh wire and line wire of chain link fencing shall conform to IS:280-1978. Stretcher bar for erection of mesh shall consist of mild steel flats 25mmx4.75mm. The stirrup wire for securing the line wires to the intermediate post shall be of 2.5mm mild steel wire. Hairpin staples for fastening the bottom line wire to the foundation concrete shall be of 6mmØ mild steel wire with ends of staples bent outwards for adequate anchorage. The cleats for eyebolts shall be of mild steel plate 10mm thick.
- 10.0 Material for barbed wire shall conform to IS:278-1978. Line wire for the barbed wire shall be made from two strands of galvanized steel wire of nominal dia 2.5mm twisted together. Barbs shall be made of point wire of galvanized steel of nominal dia 2.5mm in such a way that four points of the barbs are set and located or locked as far as possible at right angles to each other. Droppers for barbed wire shall be of mild steel flat 25mmx4.75mm with 38mmx4.85mm half round staples for fastening the barbed wire.

SPECIFICATION FOR TEMPORARY CATHODIC PROTECTION SYSTEM

SPECIFICATION NO.:- BR/TS/064




**(OIL & GAS)
BRIDGE AND ROOF CO.(I) LTD.**

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	TEMPORARY CATHODIC PROTECTION SYSTEM	DOCUMENT NO. BR/TS/064	Page 1 of 1
			REVISION : 0
			EDITION : 1

CONTENTS


<u>SL. NO.</u>	<u>DESCRIPTION</u>
1.0	SCOPE
2.0	CODES AND STANDARDS
3.0	CORROSION DATA
4.0	CATHODIC PROTECTION DESIGN PARAMETERS
5.0	CATHODIC PROTECTION DESIGN CRITERIA
6.0	SYSTEM DETAILS
7.0	INSTALLATION
8.0	CIVIL WORKS
9.0	TESTING AND INSPECTION AT WORKS
10.0	PACKING AND TRANSPORT
11.0	SYSTEM TESTING COMMISSIONING AND INTERFERENCE MITIGATION
12.0	SYSTEM MONITORING
13.0	DRAWINGS AND DOCUMENTS
14.0	INSTRUMENTS, TOOLS AND SPARES
15.0	INFORMATION REQUIRED WITH BID

PREPARED BY:	CHECKED & APPROVED BY:	ISSUE DATE :

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	TEMPORARY CATHODIC PROTECTION SYSTEM	DOCUMENT NO. BR/TS/064	Page 1 of 1
			REVISION : 0
			EDITION : 1

AMENDMENT STATUS

Sl. No.	Clause / Paragraph / Annexure / Exhibit / Drawing Amended	Page No.	Revision	Date	By (Name)	Verified (Name)

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	TEMPORARY CATHODIC PROTECTION SYSTEM	DOCUMENT NO. BR/TS/064	Page 1 of 21
			REVISION : 0
			EDITION : 1

1.0 SCOPE

- 1.1 This specification defines the requirements of design, engineering supply of materials, installation, testing and commissioning of temporary cathodic protection system of external surface of cross country underground pipeline/structure including supplementing of corrosion survey, investigation for interference/ interaction problems and mitigation of the same. Unless otherwise specified monitoring of the temporary cathodic protection system till the commissioning of permanent C.P. System shall be carried out by temporary C.P. contractor.


This specification defines the basic guidelines to develop a suitable temporary cathodic protection system for the structure required to be protected. All data required in this regard shall be taken into consideration to develop an acceptable design and for proper engineering of the system.

- 1.2 Compliance with these specifications and/ or approval of any of the contractor's documents shall in no case relieve the contractor of contractual obligations.
- 1.3 In case where temporary and permanent cathodic protection works are being executed by the same agency, activities of permanent CP system which are common to temporary CP system shall be completed as part of temporary CP system. In cases where temporary and permanent cathodic protection works are being executed by different agencies, the contractual scope of work shall be referred for further details.
- 1.4 All work to be performed and supplies to be effected as a part of contract shall require specific approval of owner or his authorised representative. Major activities requiring approval shall include but not be limited to the following :-
- Corrosion survey data interpretation report and design basis for CP system.
 - CP system design package
 - Purchase requisitions for major equipment and vendor approval
 - Detailed engineering package
 - Field testing and commissioning procedure
 - Procedures for interference testing and mitigation
 - CPL survey and system monitoring procedures

2.0 CODES AND STANDARDS

- 2.1 The system design, performance and materials to be supplied shall unless otherwise specified, conform to the requirements of latest relevant applicable standards of :-

- | | | | |
|-----|-------------------------|---|--|
| i) | NACE Standard SP-0169 | : | Standard Practice Control of External Corrosion on Underground or Submerged Metallic Piping Systems. |
| ii) | NACE Publication 10A190 | : | Measurement technique related to criteria for CP of Underground or Submerged Steel Piping System (as defined in NACE Standard RPO169-83) |
| ii) | NACE Standard SP-0177 | : | Standard Practice Mitigation of Alternating Current and Lightning Effects on Metallic |

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	TEMPORARY CATHODIC PROTECTION SYSTEM	DOCUMENT NO. BR/TS/064	Page 2 of 21
			REVISION : 0
			EDITION : 1

- iv) NACE Standard SP-0286 : Structures and Corrosion Control System. Standard Practice the electrical isolation of Cathodically Protected Pipelines.
- v) NACE Publication No. 54276 : Cathodic Protection Monitoring for Buried Pipelines
- vi) NACE Standard SP-0572 : Standard Practice for Design, Installation & Operation of Impressed Current Deep Ground beds
- vii) NACE Standard SP-200 : Standard Practise for Steel Cased Pipeline Crossings
- viii) NACE Standard SP-0104 : The Use of Coupons for Cathodic Protection Monitoring Applications
- ix) BS 7361 Part I : Code of Practice for Cathodic Protection for land and Marine applications
- x) VDE 0150 : Protection against Corrosion due to Stray Current from DC Installations.
- xi) IS : 7098 Part I : XLPE insulated cables.
- xii) IS: 8062 : Code of practice for cathodic protection of steel structures
- xiii) NACE TM 0497 : Measurement Techniques Related to Criteria for Cathodic Protection on Underground or Submerged Metallic Piping Systems


- Pbody book on control of pipeline corrosion

In case of conflicting requirements amongst any of the above standards the publication having most stringent requirement shall be governing.

2.2 The equipment shall also confirm to the provisions of Indian Electricity rules and other statutory regulations currently in force in the country.

2.3 In case of any contradiction between various referred standards / specifications / data sheet and statutory regulations the following order of priority shall govern:

- Statutory Regulations
- Schedule of rates & Scope of work/PJS
- Data Sheets
- Design Basis
- Job Specification/Scope of work
- This Specification
- Codes and Standards.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	TEMPORARY CATHODIC PROTECTION SYSTEM	DOCUMENT NO. BR/TS/064	Page 3 of 21
			REVISION : 0
			EDITION : 1

3.0 **CORROSION DATA**


- 3.1 The corrosion survey including soil resistivity data along ROW and other data required for CP design is attached with this document. However, verification of its veracity and adequacy shall be the entire responsibility of the contractor. In addition, contractor shall have to generate/ collect additional data as required for completeness of the job. Contractor shall also carry out soil resistivity survey at temporary anode ground bed locations for proper design of ground beds. Wenner's 4-pin method or approved equal shall be used for such measurements. Survey instruments shall have maximum AC and DC ground current rejection feature.

Care shall be taken to ensure that the resistivity observations are not influenced by the presence of foreign pipelines / structures, and earth currents in the vicinity of EHV / HV lines and installations using earth return in their power system etc.

3.2 **Additional data to be collected**

The following data shall be collected to generate design data for evaluation of interaction/ interference possibilities due to presence of other services in ROW/ in vicinity.

- i. Route and types of foreign service/pipeline in and around or crossing the right of way (including those existing and those which are likely to come up during contract execution or any abandoned pipelines).
- ii. Details of Existing Pipeline including diameter, wall thickness, pressure, pipeline coating against corrosion, soil cover used in case of pipelines.
- iii. Detail of the existing cathodic protection system protecting the services i.e. location, rating, type of protection, anode beds, test station locations and their connection schemes.
- iv. Graphical representation of existing structure/ pipe-to soil potential records. CP unit current/ voltage readings.
- v. Remedial measures existing on foreign pipeline/services to prevent interaction.
- vi. Possibility of integration/isolation of CP system, which may involve negotiations with owners of other services.
- vii. River crossing with detail of location/chainage, Name of river, Length of river.
- viii. Crossing and parallel running of electrified and non-electrified traction (along with information regarding operating voltage, type AC/DC etc.) as well as abandoned tracks near ROW having electrical continuity with the tracks in use.
- ix. Crossing and parallel running of any HT/AC/DC overhead line (existing/proposed) along with details of voltage, type AC/DC etc.
- x. Voltage rating, number of cores and sheathing details of under ground power cables, running in parallel or crossing ROW.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	TEMPORARY CATHODIC PROTECTION SYSTEM	DOCUMENT NO. BR/TS/064	Page 4 of 21
			REVISION : 0
			EDITION : 1

- xi. Information on existing and proposed DC/AC power sources and system having earth as return path, in the vicinity of the entire pipeline, route such as HV/DC sub stations, fabrication yards with electric welding etc.
- xii. Any masonry work for other concrete or non conductive constructions in the ROW which may block the CP current or cause interference to the pipeline.
- xiii. Any other relevant information that may be needed in designing and implementing proper protection scheme for the proposed pipeline.
Unless otherwise mentioned, Contractor shall conduct necessary potential gradient survey for any existing anode ground bed that may interfere with the CP system of the pipeline covered under this project.

3.3 Report

On completion of all field work a report incorporating all the results generated from surveys and details of additional data collected shall be furnished. The report shall also contain detailed interpretation of survey results and resistivity data enclosed, probable interference prone areas etc. to form design basis for the scheme of cathodic protection. This report shall be plotted on semi-log graph sheets.

4.0 CATHODIC PROTECTION DESIGN PARAMETERS


Unless otherwise specified in the project specifications, following parameters shall be used for design of temporary cathodic protection system.

Those parts of sacrificial anode cathodic protection system which will be integrated with permanent CP system shall be designed based on permanent CP parameters.

4.1 Protection current density

(i) Pipe lines having FBE Coatings

Pipeline surrounding Resistivity	Minimum Protection current density*
	Temporary CP ($\mu\text{A}/\text{m}^2$)
Normal Soil (10-100 Ohm-Mtr)	60
Marshy Area/ HDD (<10 Ohm-Mtr)	90
High Resistivity Area (more than 100 ohm-mtr. Resistivity)	40

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	TEMPORARY CATHODIC PROTECTION SYSTEM	DOCUMENT NO. BR/TS/064	Page 5 of 21
			REVISION : 0
			EDITION : 1

(ii) Pipe lines having polyethylene coatings

Pipeline surrounding Resistivity	Minimum Protection current density*
	Temporary CP ($\mu\text{A}/\text{m}^2$)
Normal Soil (10-100 Ohm-Mtr)	40
Marshy Area/ HDD (<10 Ohm-Mtr)	75
High Resistivity Area (more than 100 ohm-mtr. Resistivity)	25


Pipe to soil "ON" potential shall not be more negative than (-) 1.5V.

* Actual current density to be adopted shall be decided based upon soil and other environmental conditions, proximity of foreign pipelines and structures affecting interference. Where considered necessary for satisfactory protection of pipeline the current density shall be suitably increased by contractor.

- 4.2 Safety factor for current density : 1.3
- 4.3 Anode utilization factor : 0.88 for Centre Connected Mg Anodes
0.6 for End Connected Mg Anodes &
0.85 for Centre Connected Zn Anodes
0.5 for End Connected Zn Anodes
0.6 for Ribbon anodes
- 4.4 Pipeline natural potential : (-) 0.45 V
- 4.5 Unless otherwise specified in project specification the design life of temporary CP shall be as mentioned in Scope of work and that of permanent CP shall be 35 years.

5.0 CATHODIC PROTECTION DESIGN CRITERIA

- 5.1 Cathodic protection system shall be designed to meet the following criteria:
- The pipe-to-electrolyte potential measurement shall be (-) 0.95 V (ON) or more negative as measured between pipe surface and saturated Cu-CuSO₄, reference electrode containing electrolyte when cathodic protection is applied but on potential measurement shall not go more negative than (-)1.50 V (ON).
 - To prevent damage to the coating the limiting Pipe to Soil Potential should not be more negative than (-) 1200 mV to avoid the detrimental effect of Hydrogen production and/or a high Ph at material surroundings.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	TEMPORARY CATHODIC PROTECTION SYSTEM	DOCUMENT NO. BR/TS/064	Page 6 of 21
			REVISION : 0
			EDITION : 1

- c) The pipeline shall be considered protected when a minimum of (-) 300 millivolt potential shift has been achieved from the initial native potential to the CP 'ON' potential.
- d) In rare circumstances a minimum polarisation shift of (-) 100 millivolts shall indicate adequate levels of cathodic protection for the pipeline. The formation of decay of this polarisation shall be used in the criteria.

Discretion to use any of the criteria listed above shall solely rest with the Owner/ Owner's representative.

- 5.2 A positive potential swing of 50-100 mV shall be considered the criteria for presence of an interference situation requiring investigation and incorporation of mitigation measures by the CONTRACTOR during the TCP.

6.0 SYSTEM DETAILS

The system shall include the following major equipment/sub-systems unless otherwise specified:


- Sacrificial anodes and anode ground beds
- Test stations
- Surge diverter/grounding cell
- Polarisation cells
- Interconnecting cables
- Cable to pipe connections
- CP System at cased crossings
- Electrical resistance probes & Reader
- Polarisation Coupons

All equipment shall be new and supplied by approved reputed manufacturers. Equipment offered shall be field proven. Equipment requiring specialised maintenance or operation shall be avoided as far as possible and prototype equipment shall not be accepted. Make and construction of all material shall be subject to owner's approval.

The detailed specification of each system and equipment shall be furnished by the contractor. However, certain minimum requirements for the major equipment are highlighted in this document.


As far as possible equipment including test stations, anode lead junction boxes, etc., shall be located in safe area. All equipment located in hazardous areas shall be of flame proof type as per IS: 2148 or equivalent international standard for gas groups IIA & IIB and temp. Class T3. Indigenous equipment shall be certified by CMRI or any other recognized testing body and shall be approved by the concerned statutory authority. All flameproof equipment shall carry the BIS license marking as per the requirement of statutory authorities.

All imported equipment for hazardous area may be tested and certified by an independent certifying agency of country of equipment origin and shall be approved by the concerned statutory authority in India.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	TEMPORARY CATHODIC PROTECTION SYSTEM	DOCUMENT NO. BR/TS/064	Page 7 of 21
			REVISION : 0
			EDITION : 1

6.1 Anode Ground Beds

- 6.1.1 The pipeline shall be protected by prepacked zinc/ magnesium anodes.
- 6.1.2 Along ROW where soil resistivity predominantly remains low, ranges from 0-10 ohm. m and pH value is within 9, zinc anodes may be provided. Anodes of type I as per ASTM-B 418 standard shall be used for seawater, brackish water or saline electrolyte application and anode of type II as per ASTM-B 418 standard shall be used for fresh water, back fill and soil applications.
- 6.1.3 Along ROW where soil resistivity predominantly in the range of 10 ohm. m to 30 ohm. m low potential (1.55V) magnesium anodes may be provided.
- 6.1.4 At saline soil Ag/Agcl reference electrode should be used and not Zinc electrode.
- 6.1.5 Along ROW where soil resistivity is predominantly in the range of 30 ohm.m to 50 ohm.m high potential (1.75V) magnesium anodes may be provided.
- 6.1.6 At high resistivity area where resistivity is of the order of 50 ohm-m and above magnesium ribbon anodes may be provided.
- 6.1.7 Where magnesium anodes are used for protection of polyethylene coated pipelines, the anodes shall be preferably of low potential (1.55 V) type.
- 6.1.8 Anodes shall be installed along the pipeline at suitable intervals as per pipeline protection voltage attenuation calculations and ground bed resistance/ current output of anode installations. Minimum one anode installation shall be provided for every 1 (one) km of the pipeline. At high resistivity area the magnesium ribbon anodes shall be installed all along the pipeline by the side of the pipeline in the pipeline trench.
- 6.1.9 Each electrically continuous section of pipeline shall preferably be protected totally by one type (material) of anodes to avoid inter-anode circulation currents.
- 6.1.10 The anodes shall be installed at sufficient depth to reach moist soil and shall be separated from the pipe line by at least 5m and 2m for magnesium and zinc anodes respectively. The magnesium ribbon anode shall be separated from the pipeline by at least ½ meter. The anode connections to pipeline shall be routed through test stations.
- 6.1.11 For sacrificial anode ground bed which shall be integrated with permanent CP System the leads of all the anodes shall be brought up to the test station and shall be terminated individually.
- 6.1.12 The number of anodes at each ground bed shall be sufficient for providing the specified pipe protection current density taking into consideration the ground bed resistance, pipe coating resistance, cable resistance, etc. Contractor shall prepare a table for number of anodes required at different soil resistivities to produce the specified protection current. Any deficiency in the protection system if noticed during commissioning or during monitoring shall be corrected by the CP contractor by suitably augmenting the system with additional anodes without any cost / schedule implications.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	TEMPORARY CATHODIC PROTECTION SYSTEM	DOCUMENT NO. BR/TS/064	Page 8 of 21
			REVISION : 0
			EDITION : 1

6.1.13 For the portion of the pipeline for which for CP system has been specified based on the permanent CP system parameters, the contractor shall ascertain the requirement of the cathodic protection current density indicated in Cl. No. 4.1 above. Where specified in the project specification / datasheet the requisite current density test /survey shall be conducted by the contractor to establish the adequacy of the CP current requirement & number of anode ground beds.

6.2.1 Magnesium anode

The anode shall confirm to the requirements of ASTM-B 418 standard. The anode shall be of high manganese, magnesium alloy packed with special back fill. The metallurgical composition, potential and consumption rate of anode shall be as below:

(i) Composition:

Element	Weight (Low Potential type)	Weight (High Potential type)
Manganese	0.15%	0.5 – 1.3%
Copper	0.02% max.	0.02% max.
Silicon	0.1% max.	0.05% max.
Zinc	2.5% - 3.5%	
Aluminium	5.3% - 6.7%	0.01% max.
Iron	0.003% max.	0.03% max.
Nickel	0.002% max.	0.001% max.
Other metallic elements		
- Each	-	0.05% max.
- Total	0.3% max.	0.3% Max.
Magnesium	Balance	Balance


(ii)	Anode closed circuit potential	1.55 volts	1.75 volts
(iii)	Anode consumption rate	7.9 kg/(A yr)Max.	7.9 kg/(A yr) Max.

6.2 Zinc Anode

The anode shall confirm to the requirements of ASTM-B 418 standard. The anode (other than ribbon anode) shall be packaged with special back fill. The metallurgical composition of anode, potential and consumption rate shall be as below. Anodes of Type-I shall be used for seawater, brackish water or saline electrolyte application and anodes of Type-II shall be used for fresh water, back fill and soil applications.

(i) Composition:

<u>Element</u>	<u>Weight Type-I</u>	<u>Weight Type-II</u>
Aluminum	0.1% to 0.5%	0.005% max.
Cadmium	0.025 – 0.07%	0.003% max.
Copper	0.005% max.	0.002% max.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	TEMPORARY CATHODIC PROTECTION SYSTEM	DOCUMENT NO. BR/TS/064	Page 9 of 21
			REVISION : 0
			EDITION : 1

Iron	0.005% max.	0.0014% max.
Lead	0.006% max.	0.003% max.
Others	0.01% max.	-
Zinc	Remainder	Remainder

(ii)	Anode closed circuit potential	1.1 volts	1.1 volts
(iii)	Anode consumption Rate	11.24 kg/(A yr) max.	11.24 kg/(A yr) max.

6.2.1 Contractor shall furnish spectrographic analysis from each heat both for zinc and magnesium anodes along with electrochemical test results.

6.2.2 The anodes for grounding of cathodically protected above ground pipelines at intermediate SV station, pigging stations, etc., grounding of motor operated valves on cathodically protected portion of the pipeline, grounding of pipeline through polarization cell at EHV / HV line crossings or running in parallel, etc. shall be of minimum 20 kg net weight each. The anode and cable terminations shall be suitable for the anticipated fault current at the location of installation. For pipelines protected by sacrificial anodes, for directly grounding the pipeline shall be of the same type as the one provided for the protection of the pipeline.

6.3 Special Backfill

The composition of special back fill for anodes shall be as below. In any case, the thickness of back fill shall not be less than 50 mm on all sides of the anode.

Gypsum	75%
Bentonite	20%
Sodium Sulphate	5%

6.3.1 The anodes shall be provided with cable tail of sufficient length to reach junction box test station as applicable without tension.

6.3.2 Tolerance in fabrication of anodes


The anode surface shall be free from cracks which may reduce the performance of the anode.

Any cracks which follow the longitudinal direction of elongated anodes shall not be acceptable.

Small cracks in the transverse direction of elongated anodes and in anodes of other shapes may be accepted provided the cracks would not cause any mechanical failure during service of the anode considering that the combination of cracks and lack of bond to the anode core is detrimental.

For transverse cracks the acceptable limits shall be furnished by the bidders along with the offer.

The anode shall be free from excessive shrinkages. The following limits shall be used:

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	TEMPORARY CATHODIC PROTECTION SYSTEM	DOCUMENT NO. BR/TS/064	Page 10 of 21
			REVISION : 0
			EDITION : 1

- Maximum 10% of the depth of anode or 50% of the depth of the anode core whichever is less. The depression may be measured from the edged of one side.

The surface of the anodes shall be free from coatings and slag/dross inclusions etc.

The maximum deviation from straightness shall not exceed 2%.

The weight tolerance on individual anodes may be taken as $\pm 5\%$. The total weight of the anodes shall not have negative tolerance.

Recommended dimensional tolerance shall be as follows:


Length	$\pm 2.5\%$
Width/thickness	$\pm 5\%$

6.4 Test Stations

6.4.1 Test stations shall be provided along the pipeline ROW for monitoring the performance of the Cathodic Protection system at intervals not exceeding 1000 meters area unless otherwise specified. In addition to above, test stations shall also be provided at the following locations:

- a. At the locations of anode ground beds
- b. At all insulating joints
- c. At vulnerable locations with drastic changes in soil resistivity
- d. At connections of surge diverters, grounding cells and polarisation cells
- e. At HV AC/DC overhead line crossings and selected locations where HT overhead line is in the vicinity of the pipeline & running parallel.
- f. At location of cable crossing.
- g. At tap-off stations, at receipt station.
- h. At both sides of major river crossings.
- i. At high voltage cable crossings or along routes where HV cables are running in parallel.
- j. In the vicinity of DC net works or grounding system where interference problems are suspected.
- k. At crossings/parallel running of other pipeline / structures
- l. At the locations of reference cell and Electrical Resistance probe installation.
- m. At both sides of cased crossings, at both sides of railway line crossings.
- n. At any other locations considered vulnerable locations where interference is expected
- o. At location of CTSU.
- p. At the locations of reference cell, Polarisation coupons Installation and ER probe installation.
- q. At locations of Sectionalising Valve (SV) stations & IP (Intermediate Pigging Stations).
- r. At any other locations considered necessary by owner/owner's representative

6.4.2 Bond stations shall be provided with high quality shunt & resistor at required locations as a means to monitor and control current flow between the pipeline and foreign pipelines / structures /


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	TEMPORARY CATHODIC PROTECTION SYSTEM	DOCUMENT NO. BR/TS/064	Page 11 of 21
			REVISION : 0
			EDITION : 1

electrified railway tracks etc. that crossing and running parallel to the pipeline in common ROW or within 25 metre from the pipeline.

- 6.4.3 Test stations used for sacrificial anodes shall have high quality shunt for measurement of anode current, and provision for resistance insertion to limit the anode current output & anode disconnecting link.
- 6.4.4 Sealing of Test stations shall be carried out by solid foam sealant or other solid sealing compound as approved by the engineer-in-charge.
- 6.4.5 Test station with current measuring facility shall be provided at each intermediate CP station drainage point (to measure pipeline from drainage point), at interference prone areas, on both sides of major river crossings and minimum one for every 10 km (max.) alongwith pipeline.
- 6.4.6 All test stations shall have weather proof enclosure, having degree of protection IP 55 with hinged lockable shutter. Enclosure shall be made of sheet steel of at least 3 mm thickness and shall be suitable for M.S. post mounting. The test stations shall be designed with terminals required for both temporary and permanent CP system and shall be suitable for total life of permanent CP system.
- 6.4.7 The test stations shall be installed with the front of the test station facing the pipeline. The name plate of test stations shall in minimum carry following information.
- Test station number
 - Chainage in km
 - Test station connection scheme type
 - Distance from pipeline in meters
 - Direction of product flow
- 6.4.8 Terminal blocks and different scheme of wiring as required shall be provided in the test station as per the test station connection scheme sketch. Minimum 20% spare terminals shall be provided in each TLP.
- 6.4.9 The location of all the test stations shall be marked with their connection schemes and other relevant information's on alignment sheets. A detailed test station schedule shall be prepared.

6.5 Surge diverter, Grounding cell and Polarisation cell

- 6.5.1 Where high voltage (66 KV and above) transmission line runs in parallel or crosses the pipeline, the pipeline shall be grounded through polarisation cells (Solid State) & zinc anodes of minimum 20 kg net wt. each. Grounding shall be done at regular intervals of maximum 0.5 km where transmission lines run parallel within 25 meter of the pipeline through polarisation cell to ground any surges on the pipeline that would appear in case of transmission line faults.
- 6.5.2 In case of continuous induction of voltage on the pipeline beyond safe limits is expected or observed during commissioning due to HV Line or other of any rating, the pipeline shall be grounded to the earth system of nearest HV transmission tower of the transmission line or other system causing the voltage induction through polarisation cell or the pipeline shall be grounded to

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	TEMPORARY CATHODIC PROTECTION SYSTEM	DOCUMENT NO. BR/TS/064	Page 12 of 21
			REVISION : 0
			EDITION : 1

a separate earthing system of zinc galvanic anodes through polarisation cell. The polarisation cell shall be installed in test station.

6.5.3 Explosion proof Surge Diverter (Spark Gap Arrester) shall be connected across each insulating joint to protect it from high voltage surges as per drawing.

6.5.4 Alternatively, zinc grounding cell may be provided across insulating joints along ROW where the pipeline on both the sides of the insulating joint are cathodically protected and difference of protection voltage is not more than 0.4 volts.

Alternatively, owner on its own discretion may permit use of Magnesium / Zinc galvanic anodes for protection of insulating joints. Choice between Magnesium or zinc anodes shall depend upon the potential valves on either side of the insulating joint. These anodes shall be sized for the specified design life of permanent cathodic protection system.


6.5.5 The total system including cables, cable termination, anodes/ surge diverters, polarization cells shall be suitable for the anticipated fault current at the location of installation.

6.5.6 Unless otherwise specified on data sheet, the minimum rating of grounding cells, polarisation cells and surge diverters shall be as below:

- (i) Polarisation cell
 - Type : Solid state (Min. 3.7 kA @ 30 Cycle) or as per scope of work/PJS
 - Rating : Suitable to pass Min 5KA or more surge
- (ii) Surge Diverter (Spark Gap Arrester)
 - Type : Spark gap, Explosion Proof Type
 - Current, 8/20 wave : 100 kA
 - Spark over AC voltage : 1 kV
 - 50 Hz : 2.2 kV
 - Impulse (1.2/50 micro sec)

6.5.7 The grounding cell, Surge Diverter (Spark Gap Arrester), and polarisation cell system shall be sized for the design life of permanent CP system. The zinc or magnesium anodes meant for pipeline grounding shall also be sized for the life of the permanent CP system taking into account the current discharge from the anodes. The grounding system shall have minimum resistance to earth to restrict the pipeline voltage as per NACE / VDE criteria but shall not exceed 5 ohms. The anodes shall be pre packed with special backfill adequately so that the performance of the anode is not affected by the carbonates, bicarbonates, nitrates, etc. present in the soil. In any case, the thickness of back fill shall not be less than 50 mm on all the sides of the anode.

6.5.8 In case of HT transmission overhead lines of voltage below 66KV also requisite mitigation measures should be provided to take care of continuous induction of voltage interface due to

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	TEMPORARY CATHODIC PROTECTION SYSTEM	DOCUMENT NO. BR/TS/064	Page 13 of 21
			REVISION : 0
			EDITION : 1

presence of transmission line in close proximity. The pipeline shall be grounded through polarization cell to earth system of HV tower causing the voltage induction or to a separate earthing system of zinc anodes through polarization cell.

- 6.5.9 Motor operated valves where located on the cathodically protected portion of the pipeline shall be grounded by a zinc or magnesium anode of 20 kg net where the type of anode provided for the CP system of the pipeline is zinc or magnesium respectively. The MOV power supply cable armour shall be insulated (by cutting and taping with insulation tape) at MOV end to avoid armour carrying CP current.
- 6.5.10 The above ground cathodically unprotected pipeline at intermediate SV stations, pigging stations, etc. and terminals shall be earthed with GI earth electrodes. The resistance to earth of grounding shall be limited to 2-3 ohms max.

6.6 Polarisation Coupons

The coupon shall have one side exposed area of 10 mm x 10 mm (or as decided in detail engineering to simulate the discharge current from coating holiday) unless other wise specified in project specification/data sheet. The Polarisation Coupons shall be made from the material of the pipeline. Cable connection of 10 mm² and 4 mm² shall be provided to the coupon for connecting it to pipeline for cathodic protection and potential measurements respectively. Connection of coupon to pipeline shall be through a vacuum sealed magnetic reed switch housed inside the test station/ rapid disconnection switch. The magnetic reed switch shall be rated to carry and break minimum 10 mA at 50 V DC.


Polarisation coupons shall be provided as per the requirement of NACE SP104:2014.

6.7 Electrical Resistance Probe

- 6.7.1 Where specified in project specifications, electrical resistance probes utilising the electrical resistance technique shall be provided along the pipeline at marshy areas and at vulnerable locations to monitor the external corrosion activity on the pipeline. The lead wires of the probe shall be connected to pipeline and terminated inside test station enabling periodic resistance measurement with the probe using a portable measuring instrument.
- 6.7.2 The material of the E/R probe element shall be of the same alloy as of the pipeline material. The E/R probes shall be provided preferably at the bottom portion of pipeline. The locations of E/R probes shall be got approved. Portable E/R probe reading instrument shall be supplied by contractor as per SOR/Data Sheet. The probe reading instrument have IP-55 protection & digital display.

6.8 CP at Cased Crossing

At cased crossings where casing is coated, the casing shall be protected by sacrificial anode installations. The sacrificial anode installations shall be provided at both ends of casing. The anode installation shall be sized based on permanent C.P. design parameters specified for the main pipeline. At cased crossings where casing is painted or uncoated, additional protection for casing pipes may not be provided.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	TEMPORARY CATHODIC PROTECTION SYSTEM	DOCUMENT NO. BR/TS/064	Page 14 of 21
			REVISION : 0
			EDITION : 1

For Bare Casing (Uncoated or Un-Painted) protection for carrier pipe by ribbon anodes may not be provided.

6.9 Reference Cell Access Points

Reference cell access points shall be provided near insulating joint locations and at SV stations, where the ground is paved, for measurement of pipe to soil potentials. A perforated PVC pipe filled with native soil and buried at the location shall be provided for the purpose. The length of the PVC pipe shall be adequate to reach the native soil below the paving.

6.10 Painting

The sheet steel used for fabrication shall be thoroughly cleaned and degreased to remove mill scale, rust, grease and dirt. Fabricated structures shall be pickled and then rinsed to remove any trace of acid. The under surfaces shall be prepared by applying a coat of phosphate paint and a coat of yellow zinc chromate primer. The under surfaces shall be free from all imperfections before undertaking the finished coat. After preparation of the under surface, spray painting with two coats of final paint shall be done. The finished panel shall be dried in oven in dust free atmosphere. Panel finish shall be free from imperfections like pin holes, orange peels, run off paint, etc.

All unpainted steel parts shall be painted with corrosion resistance paint as per approved procedure.

6.11 TCP Cables


TCP Cables shall be annealed high conductivity, tinned, stranded copper conductor, XLPE insulated 650/1100 V grade, armoured/un-armoured, PVC sheathed. The size of the copper conductor shall be 6 sq mm for anode cable from anode to buried junction box, 10 sq mm from junction box to test station, 10mm² from test station to pipeline. The size of the conductor shall be 6 sq mm for potential measurement, 10 sq.mm for current measurement and 25mm² for bonding, polarisation cell/grounding cell/Earthing and surge diverter connection purpose. The anode cable from anode to junction box (buried) shall be unarmoured. The length of anode tail cable shall be sufficient enough to reach junction box (buried) in case of temporary CP anodes and up to test station in case of permanent CP sacrificial anodes. PE Sleeves shall be provided for unarmoured cables.

7.0 INSTALLATION

7.1 Cable Laying

7.1.1 Cables shall be laid in accordance with approved layout drawings to be prepared by the contractor. No straight through joint shall be permitted in a single run of cable. Cable route shall be carefully measured and cables cut to required length. Minimum ½ metre cable slack shall be provided near anodes, pipeline and test stations to account for any settling.

7.1.2 All cables inside station/plant area shall be laid at a depth of 0.75 M. Cables outside station/plant area shall be laid at a depth of 1.5m. Cables shall be laid in sand under brick cover back filled with

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	TEMPORARY CATHODIC PROTECTION SYSTEM	DOCUMENT NO. BR/TS/064	Page 15 of 21
			REVISION : 0
			EDITION : 1

normal soil. Outside the station/plant area the routes shall be marked with Polyethylene cable warning mats placed at a depth of 0.9m from the finished grade.

- 7.1.3 All underground unarmoured cables forming part of permanent CP system shall run through PE sleeves. Cables along the pipeline shall be carried along the top of the pipe by securely strapping it with adhesive tape or equivalent as required.
- 7.1.4 Hume pipe of proper size shall be provided for all underground cables for road crossings.
- 7.1.5 Cables shall be neatly arranged in trenches in such a manner that criss-crossing is avoided and final take off to equipment is facilitated.
- 7.1.6 In case of above ground cable, all unarmoured CP cables shall be laid in GI conduits of sufficiently large size, up to accessible height for protecting against the mechanical damage.
- 7.1.7 The armour of all the cables from pipeline to test station (potential measurement, reference cell cables, cathode cables, etc.) and test station to ground bed (anode cable) shall be earthed only at test station end of the cable to avoid armour carrying CP current. The cable armour shall be insulated by cutting and taping with insulation tape.

7.2 Cable to Pipe Connections

All the cable connections to the pipeline including charged foreign pipeline shall be made using an approved exothermic process. A suitable water proof sealing system of the cable connections shall be made which will be compatible with parent coating system of the pipeline after exothermic process. The resistance of cable to pipe at the connection point shall not exceed 0.1 ohm. Coating shall be repaired after connection of cable conductor to pipeline. The coating repair material shall be compatible with the original coating and shall prevent ingress of water along the cable surface and at the interface of coating repair with the original pipe coating.


For charged pipeline pin-brazing shall be used. Eutectic solder shall not be acceptable for charged or non-charged pipeline.

8.0 CIVIL WORKS

All civil works associated with the complete cathodic protection work shall be included in the scope of contractor. This shall include providing cable trenches, foundation for equipment and all test stations, etc.

9.0 TESTING AND INSPECTION AT WORKS

- 9.1 OWNER/OWNER's representative shall visit the works during manufacture of various equipment to assess the progress of work as well as to ascertain that only quality raw material is used for the same. All necessary assistance during such inspections shall be provided.
- 9.2 The minimum testing, inspection requirements for all components/ equipments shall confirm to the requirements as defined in the relevant codes and standards. Detailed inspection and testing procedures along with the acceptance criteria shall be prepared by CONTRACTOR for OWNER's approval.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	TEMPORARY CATHODIC PROTECTION SYSTEM	DOCUMENT NO. BR/TS/064	Page 16 of 21
			REVISION : 0
			EDITION : 1

9.3 Test certificates including test records, performance curves etc., shall be furnished. All test certificates shall be endorsed with sufficient information to identify equipment to which the certificate refers to and must carry project title, owner's name and purchase order details etc.

9.4 Owner reserves the right to ask for inspection of all or any item under the contract and witness all tests and carry out inspection or authorise his representative to witness test and carry out inspection. CONTRACTOR shall notify the OWNER or OWNER's representative at least 20 days in advance giving exact details of tests, dates and addresses of locations where the tests would be carried out.

10.0 PACKING AND TRANSPORT

All equipment/material shall be protected for inland/marine transport, carriage at site and outdoor storage during transit and at site. All packages shall be clearly, legibly and durably marked with uniform block letters giving the relevant equipment/material details. each package shall contain a packing list in a water proof envelope. Copies of the packing list in triplicate, shall be forwarded to owner prior to despatch. All items of material shall be clearly marked for easy identification against the packing list.

11.0 SYSTEM TESTING, COMMISSIONING AND INTERFERENCE MITIGATION

11.1 System testing at site

11.2 Contractor shall furnish the detailed field testing and commissioning procedure for approval. Field tests as per the approved procedures shall be carried out on the equipment/systems before being put into service. the acceptance of the complete installation shall be contingent upon inspection and field test results.


11.3 Before the CP facilities are placed in operation all necessary tests shall be carried out to establish that all equipment, devices, wiring and connection, etc., have been correctly installed, connected and are in good working condition as required for intended operation.

11.4 Owner/owner's representative may witness all the tests. At least one week's notice shall be given before commencing the tests.

11.5 All tools, equipments and instruments required for testing shall be provided by CONTRACTOR.

11.6 Generally following tests shall be carried out and recorded in proforma given in subsequent clauses:

Checking	:	Visual inspection, comparison with drawings and specifications.
Inspection	:	Detailed physical inspection
Testing	:	Simulation tests of equipment to determine its operational fitness.
Cables		

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	TEMPORARY CATHODIC PROTECTION SYSTEM	DOCUMENT NO. BR/TS/064	Page 17 of 21
			REVISION : 0
			EDITION : 1

- Cable no.
- Voltage grade
- Conductor cross-section
- Continuity check
- Voltage test
- Insulation resistance values between core to earth and between cores
- All cables shall be tested by 500 V megger

Insulating joint

Checking of insulating joint for leakage, before and after energisation of C.P. by means of insulating joint tester. Pipe to soil potential of both protected and non-protected sides of insulating joint shall be checked before and after energisation of CP system.

Polarisation cell

- Location/identification number
- Rating
- Check for wiring
- Check for standby current drain with CP energisation (current drain with respect to voltage across the cell shall be recorded)
- Details of grounding provided for polarization cell.

Grounding cell

- Location
- Type (no. of anodes)
- Ratings

Surge diverter


- Location/identification no.
- Ratings
- Check for healthiness
- Explosion proof enclosure
- Check for proper connection.

E/R Probe

- Location / Identification number
- Checking of wiring as per schematics
- Resistance reading of probe

Anode ground beds

- Location/test station number

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	TEMPORARY CATHODIC PROTECTION SYSTEM	DOCUMENT NO. BR/TS/064	Page 18 of 21
			REVISION : 0
			EDITION : 1

- Current output of the ground bed
- Vertical / horizontal
- Check for actual layout and compliance with drawings.

11.7 Commissioning

11.7.1 Natural pipe to soil potential shall be measured at each test station location and casing pipeline at the locations of cased crossings prior to connecting anodes to pipeline. The pipe to soil potential observation shall be repeated after connecting the anodes after allowing sufficient time for polarisation. The current output of the anode installation shall also be measured to ensure that it does not exceed the output current capacity of the anodes. In case the anode output current exceeds the rated capacity it shall be controlled by insertion of resistance element in the anode circuit inside test station and the pipe to soil potential shall be rechecked for adequacy of protection. Additional anodes shall be provided where required to achieve desired level of protection. In case pipe to soil potential exceeds the specified value, suitable resistance shall be inserted in the anode circuit to limit the potential.

Each anode installation shall become individually operational as above.

11.7.2 After connecting all the anode ground beds to pipeline, measurement of pipe to soil potentials shall be taken at each test station to ensure conformity to protection criteria.

11.7.3 In case of insufficient protection as per the CP design criteria on any portion of the pipeline, CONTRACTOR shall carry out necessary additions modification to the provided protection in consultation with the OWNER / OWNER's Representative.

11.7.4 Resistance readings of the probe shall be taken at all the locations of electrical resistance probes.

11.8 Interference Mitigation


11.8.1 Investigation shall be made for stray current electrolysis of the pipeline, mutual interface between the pipeline and foreign pipelines / structures, interference on foreign pipeline / structures due to the CP of the pipeline and ground bed. AC induction on pipeline due to overhead high voltage line, interference due to high voltage DC lines & grounding, electric traction, etc.

11.8.2 Where transmission lines cross the pipeline or run in parallel within or more than 25m from the pipeline, AC voltage measurements shall also be made on the pipeline to find out continuous induction of voltage. In case of induced voltage being beyond safe limits, the pipeline shall be grounded in line with clause no. 6.4 above.

11.8.3 Measurements including pipe to soil potential and pipeline current etc., on the pipeline/structure being CP protected shall be made to investigate the current discharge and collection locations.

11.8.4 In case of fluctuating stray currents investigation shall be made continuously over a period of time and if required simultaneously at different locations to find out the stray current source. For long time measurements, recorders shall preferably be used.

11.8.5 Where foreign pipeline (unprotected or protected by independent CP system) runs in parallel to

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	TEMPORARY CATHODIC PROTECTION SYSTEM	DOCUMENT NO. BR/TS/064	Page 19 of 21
			REVISION : 0
			EDITION : 1

the pipeline in same trench or very near to the pipeline, and is not bonded to the pipeline then investigation shall be made for current discharge points on both the pipelines.

- 11.8.6 Mitigation measured shall be provided depending on type of interference. These shall include installation of bond with variable resistor and diodes, installation of galvanic anodes for auxiliary drainage of current, adjustment/relocation (if possible) of offending interference source, provision of electric shield etc., depending on the type of interference.
- 11.8.7 Bonding with foreign pipeline/structure as a mitigation measure shall be provided where the owner of the pipeline/structure has no objection, otherwise, alternative mitigation measure shall be provided. Where bonding is provided for mitigation the bonding resistor shall be adjusted for optimum value for minimum/no interference. Galvanic anodes installed as a mitigation measure shall be sized for the life specified for permanent CP.

12.0 SYSTEM MONITORING


The temporary CP system provided shall be monitored at all the test stations once in a month for healthiness/adequacy of protection till commissioning of permanent CP or for design life of temporary CP specified, whichever is less. During this period if any deficiency/interference in protection system is noticed the same shall be rectified/augmented by additional anodes as required. The monitoring report shall be submitted regularly to owner for his review/information.

13.0 DRAWINGS AND DOCUMENTS

13.1 General

- 13.1.1 Within three weeks from the date of issue of PURCHASE ORDER, CONTRACTOR shall submit four copies of the list of all drawings/ data/ manuals/ procedures for approval, identifying each by a number and descriptive title and giving the schedule date. This list shall be revised and extended, as necessary, during the progress of work
- 13.1.2 All drawings and documents shall be in English and shall follow metric system. Number of copies of each submission shall be as follows unless otherwise specified.

Submission		No. of Copies
a.	For review/approval	4
b.	Drawings issued for execution construction	5+1
c.	Final / As built drawings execution/construction	5+1
d.	Operation/Maintenance manual, vendor data	5+1

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	TEMPORARY CATHODIC PROTECTION SYSTEM	DOCUMENT NO. BR/TS/064	Page 20 of 21
			REVISION : 0
			EDITION : 1

13.2 Contract drawings and documents

13.2.1 As a part of the contract, drawings and documents shall be furnished which shall include but not be limited to the following:

- a. Report on corrosion survey
- b. Basis of system design calculations, equipment selection criteria and sizing calculations.
- c. Bill of material, material requisitions, purchase requisitions


13.2.2 Detailed construction drawings (including as built drawings)

- a. Sacrificial anode fabrication drawings
- b. Typical layout drawing for anode ground bed installation and connection
- c. Equipment layout, cable layout and schedules
- d. Fabrication, installation and connection scheme drawing for different types of test stations.
- e. Fabrication and installation details of surge diverter, grounding cell and polarisation cell with its enclosure and housing
- f. Cable-to-pipe joint details for charged and non-charged pipelines.
- g. Incorporation of anode beds, polarisation cell, surge diverters, test stations, etc., and other relevant features of CP system design in Pipeline alignment sheet and other related drawings
- h. Identification of section of pipeline affected by interference, source of interference and details of interference mitigation arrangements provided. various measurement data at all relevant test stations with and without mitigation measures provided.
- i. Detailed commissioning report including various measurement data at all test stations, etc.
- j. Vendor drawings and catalogues, test certificates
- k. Operation and maintenance manual
- l. Miscellaneous
 - Equipment inspection and testing procedure
 - Construction, installation procedures
 - Field testing and commissioning procedures
 - Procedure for monitoring of cathodic protection after commissioning
 - Quality control procedures

14.0 INSTRUMENT, TOOLS AND SPARES

14.1 CONTRACTOR shall supply all instruments, tools and tackles necessary for proper operation and maintenance of complete cathodic protection system and associated equipment.

14.2 CONTRACTOR shall provide a list of spares and consumables required for proper operation and maintenance of part of cathodic protection system to be integrated with permanent CP system

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	TEMPORARY CATHODIC PROTECTION SYSTEM	DOCUMENT NO. BR/TS/064	Page 21 of 21
			REVISION : 0
			EDITION : 1

designed on the basis of permanent CP design parameters and associated equipment, for two years operation of the system.

15.0 INFORMATION REQUIRED WITH THE BID

Bidders are advised in their own interest to provide the following information along with the bid without which the bids are liable for summary rejection.

- a. Basis and calculations for preliminary system design for cathodic protection system.
- b. List of formulas to be used for detailed system design calculations.
- c. Basis of system design, design calculations, equipment selection criteria, sizing calculations along with characteristics curves for various equipments.
- d. Preliminary bill of material for major equipment.
- e. Details of the equipment/material offered along with technical leaflets/related literatures/catalogues, make, rating, type test certificates.
- f. Dimensions, weight and general arrangement drawings for each offered equipment.
- g. List of instruments, tools and tackles offered for maintenance and operation.
- h. List of recommended maintenance/operation spares.
- i. Clause-wise deviations, if any, to the specifications along with justifications.


-X-X-X-

SPECIFICATION FOR CORROSION SURVEY

SPECIFICATION NO.: BR/TS/065




**(OIL & GAS)
BRIDGE AND ROOF CO.(I)
LTD.**

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	CORROSION SURVEY	DOCUMENT NO. BR/TS/065	Page 1 of 1
			REVISION : 0
			EDITION : 1

C O N T E N T S


SL. NO.	DESCRIPTION
1.0	SCOPE
2.0	CODES AND STANDARDS
3.0	GENERAL
4.0	SOIL RESISTIVITY SURVEY
5.0	TESTS ON SOIL SAMPLES
6.0	ADDITIONAL DATA COLLECTION
7.0	REPORT
8.0	INFORMATION REQUIRED WITH BID

PREPARED BY:	CHECKED BY:	APPROVED BY:	ISSUE DATE :

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	CORROSION SURVEY	DOCUMENT NO. BR/TS/065	Page 2 of 1
			REVISION : 0
			EDITION : 1

AMENDMENT STATUS

Sl. No.	Clause / Paragraph / Annexure / Exhibit / Drawing Amended	Page No.	Rev.	Date	By		Verified	
					Name	Sig.	Name	Sig.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	CORROSION SURVEY	DOCUMENT NO. BR/TS/065	Page 1 of 4
			REVISION : 0
			EDITION : 1

1.0 **SCOPE**

The specification covers the corrosion survey including measurement of soil resistivity, chemical analysis of soil/ water and other cathodic protection related data collection along right of way of the pipelines.

2.0 **CODES AND STANDARDS**

Equipment and measurement techniques shall unless otherwise specified, conform to the requirement of following latest applicable standards:-

BIS Specifications

BS Specifications and Codes of Practice

NACE TM0106:2006 [Detection, Testing, and Evaluation of Microbiologically Influenced Corrosion (MIC) on External Surfaces of Buried Pipelines]

NACE standards


Pbody book on control of pipeline corrosion

3.0 **GENERAL**

This specification defines the basic guidelines for carrying out the corrosion survey. Contractor shall be responsible for providing necessary data interpretation based on corrosion survey measurement which is intended to form a basis for design of cathodic protection system for the pipeline to be buried along ROW.

4.0 **SOIL RESISTIVITY SURVEY**

- 4.1 Unless otherwise specified the soil resistivity measurements shall be carried out at intervals of approximately 500 mtr. along the ROW. Where soil resistivity is less than 100 ohm mtr and two successive readings differ by more than 2:1 then additional soil resistivity readings in between the two locations shall be taken.
- 4.2 To carryout the soil resistivity measurement Wenner's 4 pin method or approved equal shall be used. The depth of resistivity measurement shall be around the burial depth of the pipeline or 1.5 mtr & additional depth of 2.5 mtr (approx.) & 3.5 mtr (approx.) or more shall be taken for Temprrory CP design & shallow bed design for Permanent CP design. In general the resistivity of soil which shall be surrounding the pipe shall be measured. Hence the depth of measurement/ electrode spacings may vary depending on totography and strata at the area.
- 4.3 At locations where multi layer soil with large variation in resistivity/ corrosiveness is expected and/ or locations specifically advised by Owner or his representative resistivity measurements at additional depth


BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	CORROSION SURVEY	DOCUMENT NO. BR/TS/065	Page 2 of 4
			REVISION : 0
			EDITION : 1

- 4.4 For design of Permanent CP deep well anode ground beds two or more ground bed plots may be required to be selected for soil resistivity survey at proposed anode bed location. Depth of soil resistivity shall be as per type of anode ground bed.

For shallow type-1.5, 2.5 & 3.5 meter depth

For Deepwell anode bed-1, 3, 5, 7, 10, 15, 20, 25, 30, 35, 40, 45, 50...Meter as per depth of anode ground bed

- 4.5 Soil layer resistivity shall be calculated from soil survey results to enable to know the layer resistivity and to compensate the averaging effect of wenner's four pin method.
- 4.6 At places where Right-of-way has not yet been cleared, measurement shall be made right over the centre line of pipeline route surveyed accounting for the cuttings/ fillings also.
- 4.7 Observations shall be made enclosing the soils adjoining the trench wherever pipeline trenching has already been done.
- 4.8 The observations shall be made enclosing the soil immediately surrounding the pipeline route where right of way has been cleared but trenching has not been done.
- 4.9 All measurement shall be taken at right angles to the right of way unless otherwise asked by Owner or his representative at site.
- 4.10 At places in right of way where other pipelines are already existing care shall be taken to precisely locate such pipes line and take such precautions that observations are not adversely affected by presence of such pipelines.
- 4.11 Care shall also be taken that the observations are not influenced by presence of other earth currents in the area especially in the vicinity of HT lines and plants using earth return in their source of power etc.
- 4.12 Wherever possible/ advised by Owner or his representative depth of water table shall be determined by resistivity observations.
- 4.13 All measurements shall be made and recorded in metric units. While recording the data reference to the nearest point shall be made. To provide visual representation of variations in the resistivities along right of way, values shall be plotted on semilog graph sheets. The resistivity graph shall also indicate the resistivities at additional depths measured at various locations and depth of water table.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	CORROSION SURVEY	DOCUMENT NO. BR/TS/065	Page 3 of 4
			REVISION : 0
			EDITION : 1

5.0 TESTS ON SOIL SAMPLES


Soil/ water samples shall be collected along the right of way for analysis. Samples shall be collected on an average at one location per every 5 km along right of way with minimum at two locations. Exact locations shall be decided at site depending on the type of soil, soil resistivity and in consultation with Owner or his representative. The soil samples shall be collected at 1 mtr & 2 mtr depth at each location for Temporary CP system & for shallow type anodebed location for Permanent CP system.

The collected soil/ water samples shall be analysed to determine presence and percentage of corrosive compounds i.e. chloride, sulphate, including moisture content, oxygen activity, MIC, presence of bacteria and pH value at NABL accredited laboratories as per NACE TM 106:2006.

6.0 ADDITIONAL DATA COLLECTION

The following data shall be collected with a view to generate design data of evaluation of cathodic protection interaction possibilities due to presence of other services in right of way and its vicinity.

- 6.1 Route and types of foreign service/ pipelines in and around, running parallel or crossing the right of way.
- 6.2 Diameter, wall thickness, pressure, soil cover etc. of the foreign pipeline.
- 6.3 Foreign pipeline coating details.
- 6.4 Details of existing cathodic protection systems protecting the services including rating and location of grounds bed, test station locations and connections schemes etc. Where pipeline is likely to pass close to any existing ground bed, necessary anode-bed potential gradient survey shall be carried out.
- 6.5 Interference remedial measures existing on foreign pipelines/ services/ shall be collected from the owner of the foreign pipeline/ services.
- 6.6 Graphical representation of existing structure/ pipe to soil potential records, Transformer Rectifier Unit/ CP Power source voltage/ current readings.
- 6.7 Possibilities of integration / isolation of the proposed pipeline CP System with foreign pipeline / structure CP System, which may involve negotiation with Owner's of foreign services.
- 6.8 Crossings or parallel running of any H.T. AC/ DC overhead line with in approximately 25 mtr from ROW along with details of voltage rating, fault level etc.

BRIDGE AND ROOF CO.(I) LTD.	STANDARD TECHNICAL SPECIFICATION		
	OIL & GAS		
TITLE	CORROSION SURVEY	DOCUMENT NO. BR/TS/065	Page 4 of 4
			REVISION : 0
			EDITION : 1

- 6.9 Voltage rating, phases and sheathing details of parallel running or crossing of under ground cables with ROW.
- 6.10 Crossing and parallel running of electrified and non-electrified railway tracks along with details of operating voltage and type (AC/ DC) as well as abandoned tracks near ROW having electrical continuity with track in use.
- 6.11 Information on existing and proposed DC / AC power sources and system such as electric substations / earthing stations, fabrication yards with electric welding in the vicinity of the entire right of way.
- 6.12 Major river / canal crossings.
- 6.13 Major cased crossings.
- 6.14 Any other relevant information that may be needed in designing and implementing of proper cathodic protection scheme for the proposed pipeline.

7.0 REPORT

On completion of all the field and laboratory work, an interim report incorporating results generated from surveys, additional data collected, results of test carried out, etc. shall be submitted for comments/ approval. The final report incorporating comments/ missing data shall be furnished for records. The report alongwith various drawings, graphs etc. prepared in connection with the work shall be submitted alongwith six prints by the contractor.

8.0 INFORMATION REQUIRED AFTER AWARD OF CONTRACT

- 8.1 Instruments that will be used for carrying out soil resistivity survey.
- 8.2 Measures that will be taken to avoid foreign pipelines/ HT lines etc. affecting the soil resistivity observations.
- 8.3 Measurement location identification procedure.
- 8.4 Procedure for collection of soil samples.
- 8.5 Description of soil test procedure.
- 8.6 Specification of soil testing instruments.
- 8.7 Formats for presentation of results.

-X-X-X-



**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED WORKS OF STEEL PIPELINE
UNDER JAMSHEDPUR GA (CITY AREA) FOR CITY GAS DISTRIBUTION
NETWORK (1 YEAR ARC)**

TENDER REF. NO. GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101



GAIL (India) Limited
(A Government of India Undertaking)
A Maharatna Company
GAIL Jubilee Tower, B-35 & 36, Sector-1,
Noida- 201301, State: Uttar Pradesh, India

TENDER REF.- GAIL/BNR/PROJ/WORKS/STEEL LAYING/26-27/101

TENDER ID: 2026_GAIL_278290_1

**TENDER DOCUMENT FOR LAYING, HDD AND ASSOCIATED
WORKS OF STEEL PIPELINE UNDER JAMSHEDPUR GA
(CITY AREA) FOR CITY GAS DISTRIBUTION NETWORK
(1 YEAR ARC)**

OPEN DOMESTIC COMPETITIVE BIDDING

VOLUME – III OF III



PREPARED AND ISSUED BY
BRIDGE AND ROOF COMPANY (INDIA) LIMITED
(A Govt. of India Enterprise)
KANKARIA CENTER (5TH FLOOR), 2/1 RUSSEL STREET,
KOLKATA – 700071, WEST BENGAL (INDIA)
PHONE: +91(33)2217-2108/2274.

MECHANICAL DRAWINGS

STANDARD DRAWINGS

TRENCH CROSS-SECTION FOR CITY CONDITION
(FOR SOFT SOIL TRENCH BOTTOM)

NOTE-3
(MIN. COVER)

TO BE MINIMUM
DEPENDING ON SOIL
CONDITIONS

α

MATERIAL FOR RECONDITIONING
TO ITS ORIGINAL CONDITION

GL

BACK FILL
(WITH EXCAVATED SOIL
OR AS PER
INSTRUCTION OF EIC)

HDPE WARNING MAT
(D+300mm WIDE x 1mmTHK.)

50

HDPE DUCT
(SIZE NB 50 / NB 40)

50

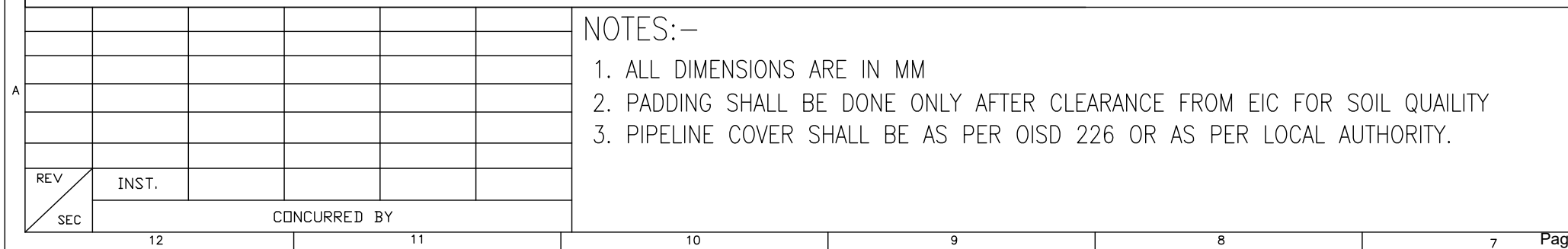
SOFT GRADED SOIL
/SAND (NOTE-2)

200

D

200

STEEL P/L



TRENCH CROSS-SECTION FOR CITY CONDITION
(FOR ROCKY/HARD SOIL TRENCH BOTTOM)

MATERIAL FOR RECONDITIONING
TO ITS ORIGINAL CONDITION

GL

BACK FILL
(WITH EXCAVATED SOIL
OR AS PER
INSTRUCTION OF EIC)

NOTE-3
(MIN. COVER)

150 STEEL P/L

200

200

50

50

300

D

300

HDPE WARNING MAT
(D+300mm WIDE x 1mmTHK.)

HDPE DUCT
(SIZE NB 50 / NB 40)

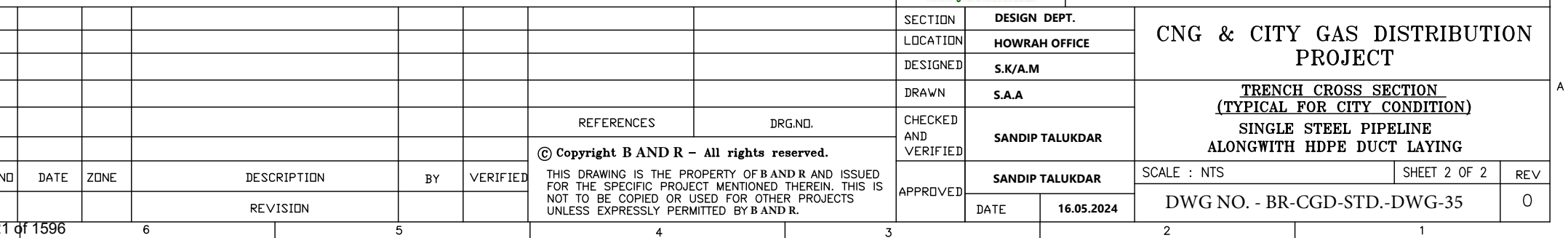
SOFT GRADED SOIL
/SAND (NOTE-2)

FOR TENDER PURPOSE

**बी एण्ड आर
B AND R**
Building Nation Since 1920

ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड

BRIDGE AND ROOF CO.(I) LTD.



12 11 10 9 8 7

TRENCH CROSS-SECTION FOR CITY CONDITION (FOR SOFT SOIL TRENCH BOTTOM)

' α ' TO BE MINIMUM
DEPENDING ON SOIL
CONDITIONS

α

MATERIAL FOR RECONDITIONING
TO ITS ORIGINAL CONDITION

GL

BACK FILL
(WITH EXCAVATED SOIL
OR AS PER
INSTRUCTION OF EIC)

HDPE WARNING MAT
(D+300mm WIDE x 1mmTHK.)

BRICK LAYER/CONCRETE/IMPACT
RESISTANCE TAPE

HDPE DUCT
(SIZE NB 50 / NB 40)

SOFT GRADED SOIL
/SAND (NOTE-2)

NOTE-3
(MIN. COVER)

STEEL P/L

200

D

200

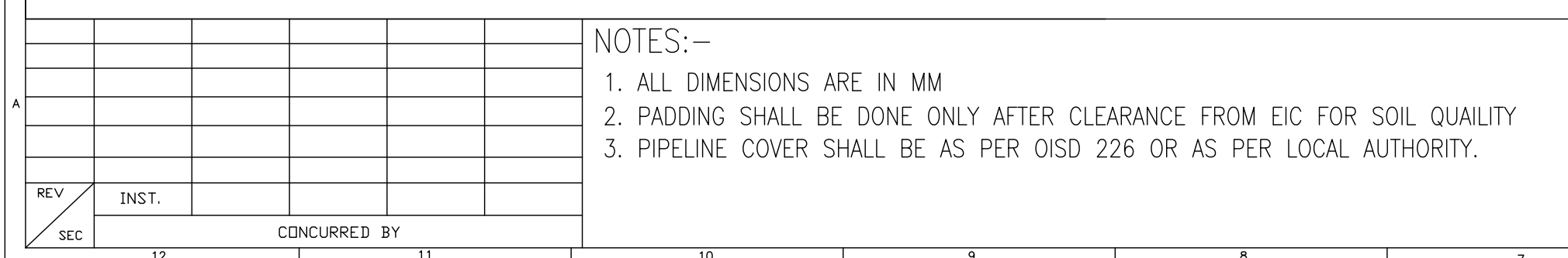
75

200

200

50

50



TRENCH CROSS-SECTION FOR CITY CONDITION
(FOR ROCKY/HARD SOIL TRENCH BOTTOM)

NOTE-3
(MIN. COVER)

75

200

200

150 STEEL P/L

300

D

300

2000

MATERIAL FOR RECONDITIONING TO ITS ORIGINAL CONDITION

GL

BACK FILL (WITH EXCAVATED SOIL OR AS PER INSTRUCTION OF EIC)

HDPE WARNING MAT (D+300mm WIDE x 1mmTHK.)

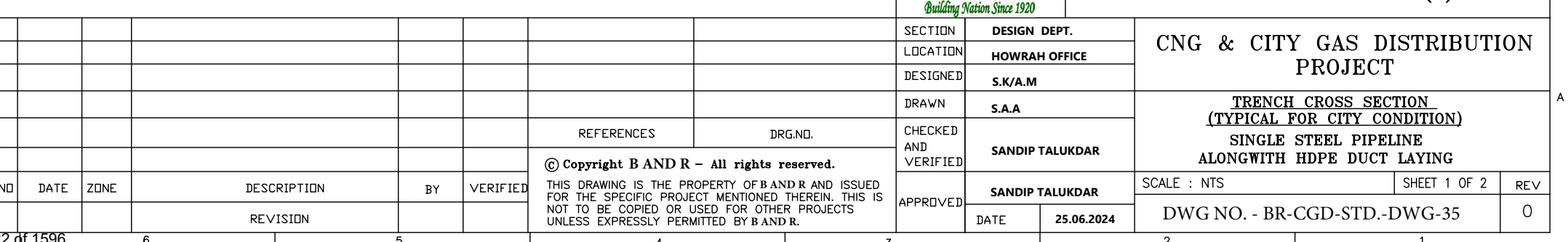
BRICK LAYER/CONCRETE/IMPACT RESISTANCE TAPE

50

HDPE DUCT (SIZE NB 50 / NB 40)

50

SOFT GRADED SOIL /SAND (NOTE-2)

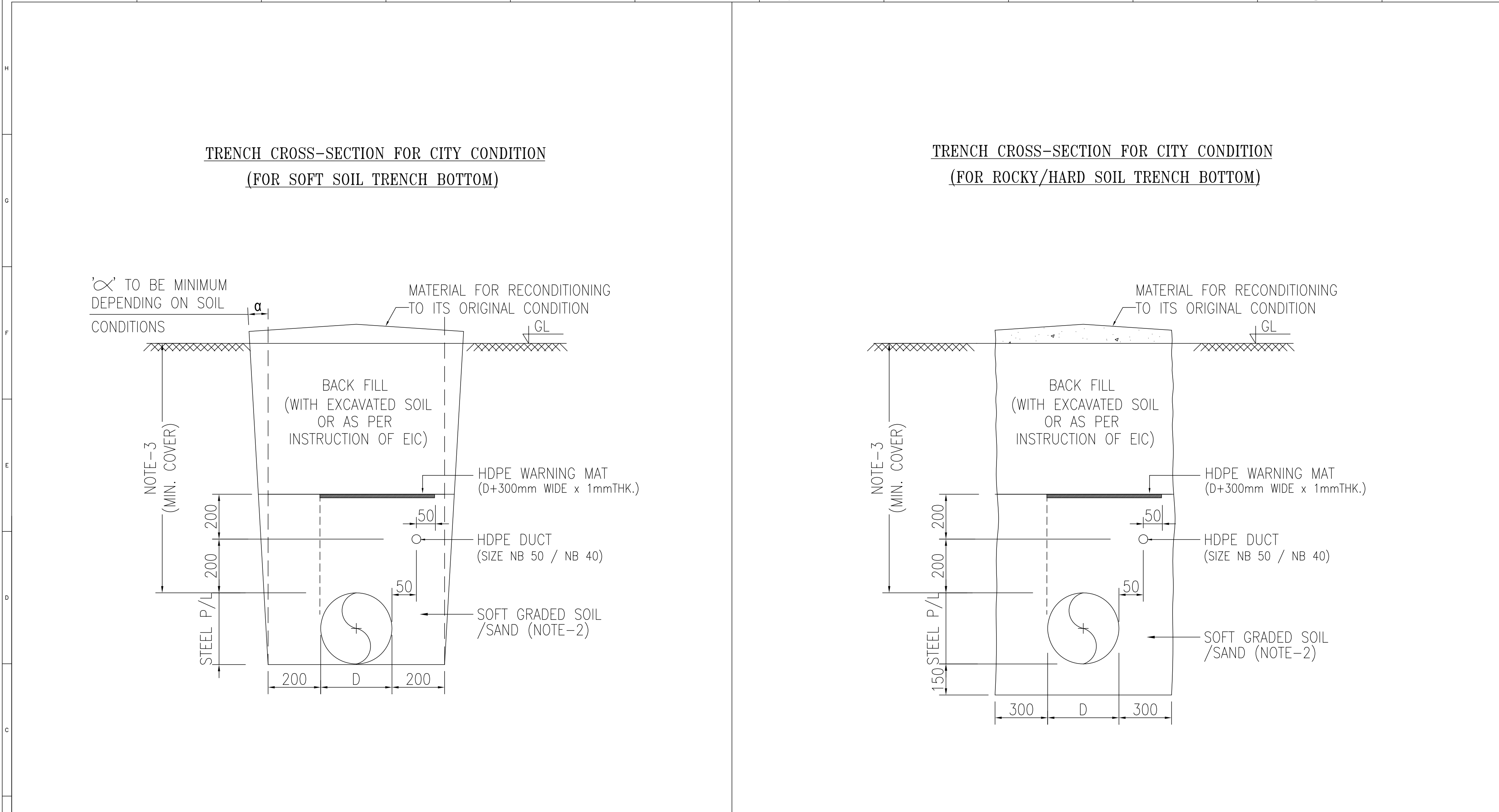


बी एण्ड आर
B AND R
Building Nation Since 1924

BRIDGE AND ROOF CO.(I) LTD.

TRENCH CROSS SECTION
(TYPICAL FOR CITY CONDITION)
SINGLE STEEL PIPELINE
ALONGWITH HDPE DUCT LAYING

SCALE : NTS	SHEET 1 OF 2	REV
DWG NO. - BR-CGD-STD.-DWG-35		0



FOR TENDER PURPOSE

FOR TENDER PURPOSE



ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड	
BRIDGE AND ROOF CO.(I) LTD.	

[illegible]

12 11 10 9 8 7

TRENCH CROSS-SECTION FOR CITY CONDITION (FOR SOFT SOIL TRENCH BOTTOM)

'α' TO BE MINIMUM
DEPENDING ON SOIL
CONDITIONS

α

MATERIAL FOR RECONDITIONING
TO ITS ORIGINAL CONDITION

GL

BACK FILL
(WITH EXCAVATED SOIL
OR AS PER
INSTRUCTION OF EIC)

HDPE WARNING MAT
(D+300mm WIDE x 1mmTHK.)

BRICK LAYER/CONCRETE/IMPACT
RESISTANCE TAPE

HDPE DUCT
(SIZE NB 50 / NB 40)

SOFT GRADED SOIL
/SAND (NOTE-2)

NOTE-3
(MIN. COVER)

STEEL P/L

200

D

200

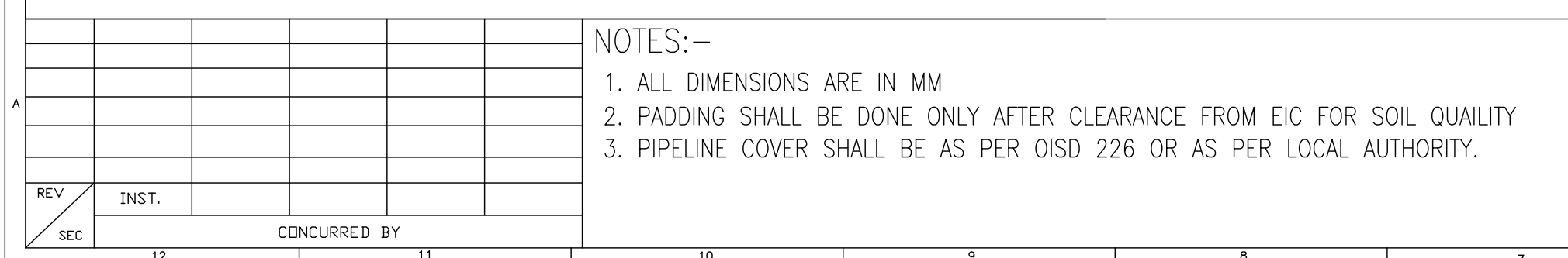
75

200

200

50

50



TRENCH CROSS-SECTION FOR CITY CONDITION
(FOR ROCKY/HARD SOIL TRENCH BOTTOM)

NOTE-3
(MIN. COVER)

150 STEEL P/L

200

75

200

50

50

300

D

300

MATERIAL FOR RECONDITIONING TO ITS ORIGINAL CONDITION

GL

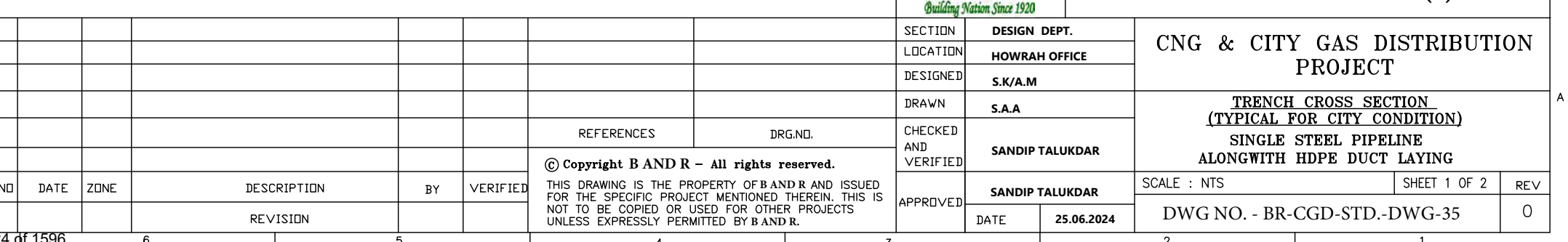
BACK FILL
(WITH EXCAVATED SOIL OR AS PER INSTRUCTION OF EIC)

HDPE WARNING MAT
(D+300mm WIDE x 1mmTHK.)

BRICK LAYER/CONCRETE/IMPACT RESISTANCE TAPE

HDPE DUCT
(SIZE NB 50 / NB 40)

SOFT GRADED SOIL /SAND (NOTE-2)

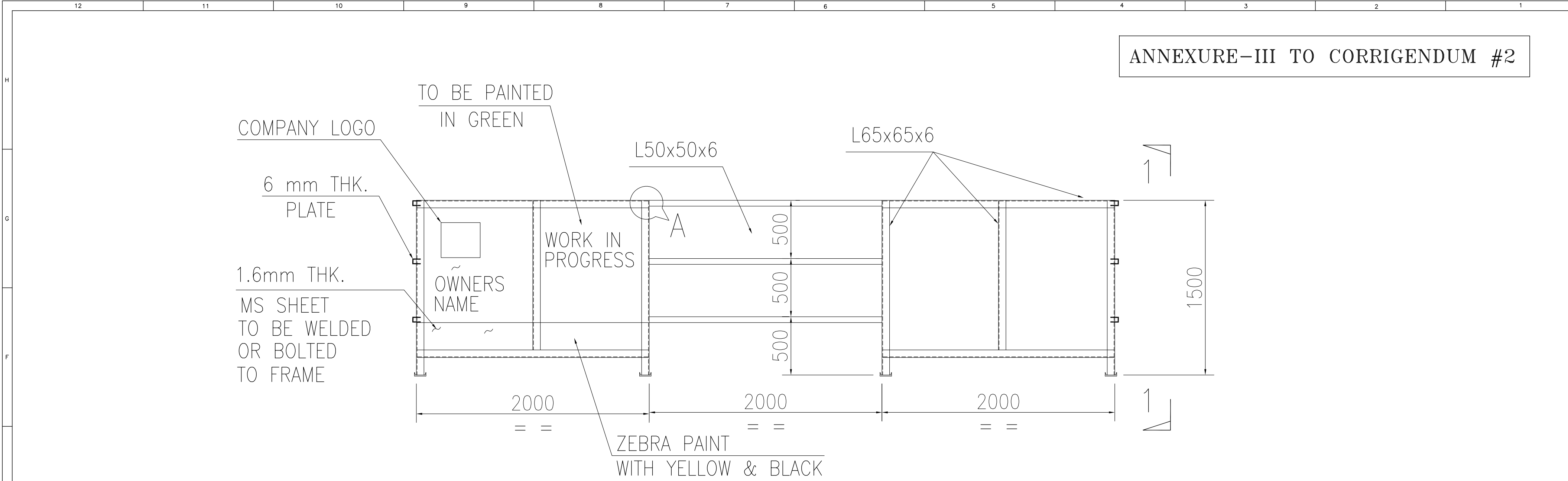


बी एण्ड आर
B AND R
Building Nation Since 1928

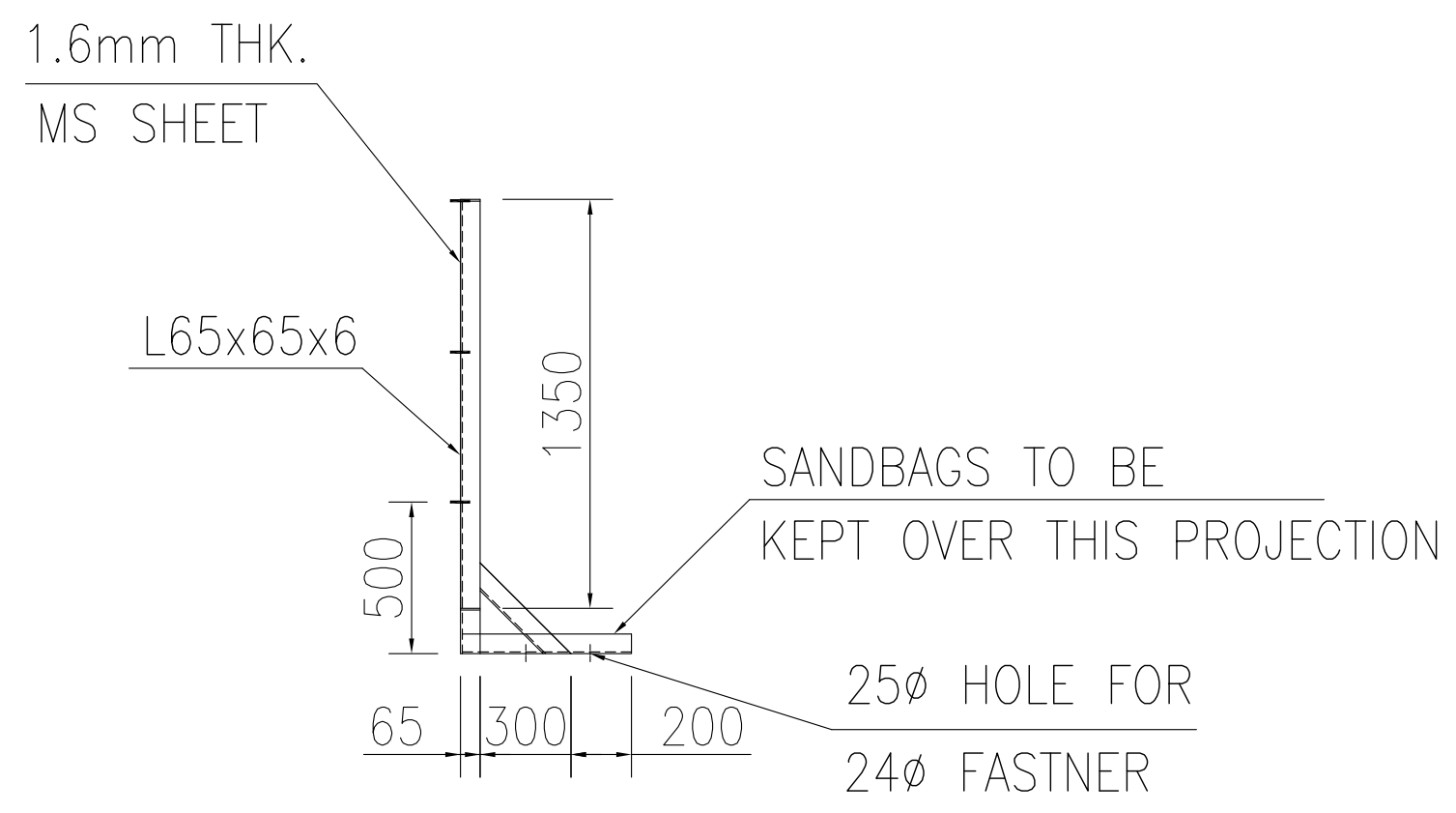
BRIDGE AND ROOF CO.(I) LTD.

TRENCH CROSS SECTION
(TYPICAL FOR CITY CONDITION)
SINGLE STEEL PIPELINE
ALONGWITH HDPE DUCT LAYING

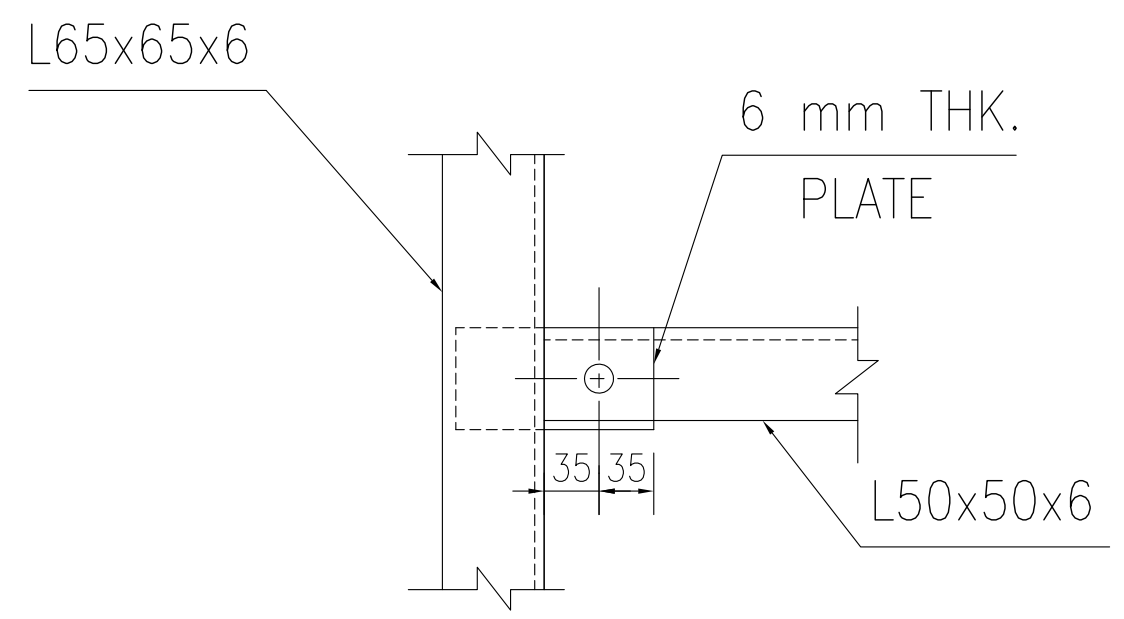
SCALE : NTS	SHEET 1 OF 2	REV
DWG NO. - BR-CGD-STD.-DWG-35		0



LAYOUT PLAN OF BARRICADE



SECTION 1-1



DETAIL-A

ANNEXURE-III TO CORRIGENDUM #2

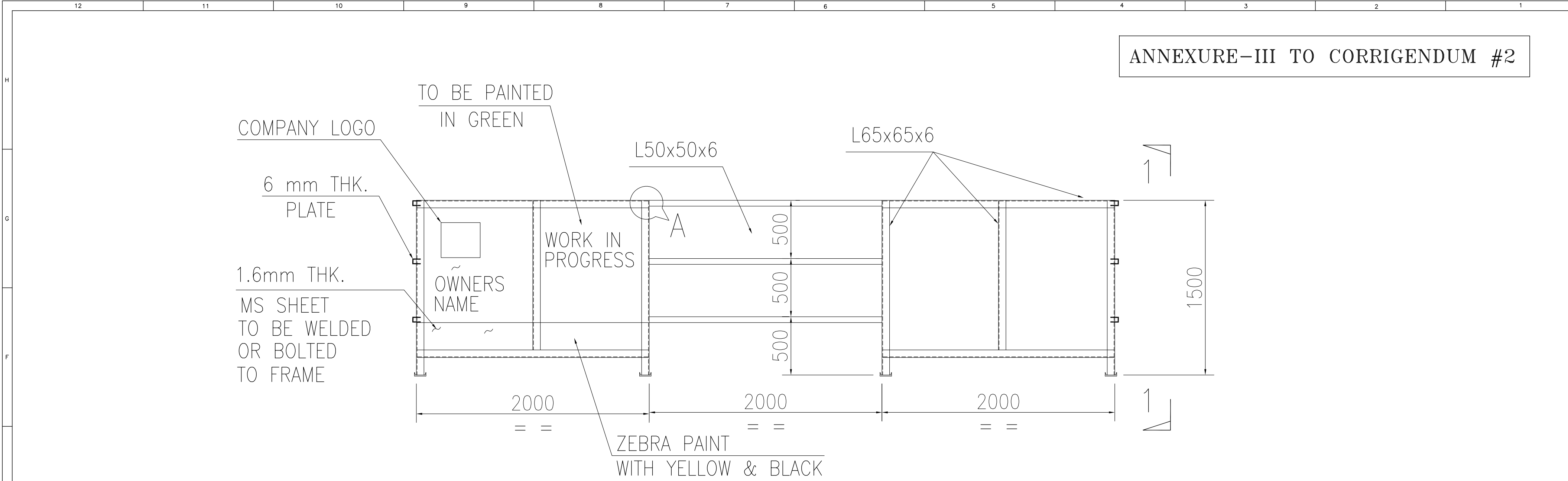
FOR TENDER PURPOSE

												NOTES:- 1. ALL DIMENSIONS ARE IN mm																								SECTION		DESIGN DEPT.		CNG & CITY GAS DISTRIBUTION PROJECT																									
																																				LOCATION		HOWRAH OFFICE																											
																																				DESIGNED		S.K/A.M		BARRICADING																									
																																				DRAWN		S.A.A																											
																																				REFERENCES		DRG.NO.		CHECKED AND VERIFIED		SANDIP TALUKDAR																							
																																				© Copyright B AND R LIMITED - All rights reserved.				APPROVED		SANDIP TALUKDAR		SCALE : NTS				SHEET 1 OF 1		REV															
																																				THIS DRAWING IS THE PROPERTY OF B AND R AND ISSUED FOR THE SPECIFIC PROJECT MENTIONED THEREIN. THIS IS NOT TO BE COPIED OR USED FOR OTHER PROJECTS UNLESS EXPRESSLY PERMITTED BY B AND R.				DATE		25.06.2024		DWG NO. - BR-CGD-STD.-DWG-36										0											
																																				REV.NO		DATE		ZONE		DESCRIPTION		BY		VERIFIED		REVISION		5		6		7		8		9		10		11		12	

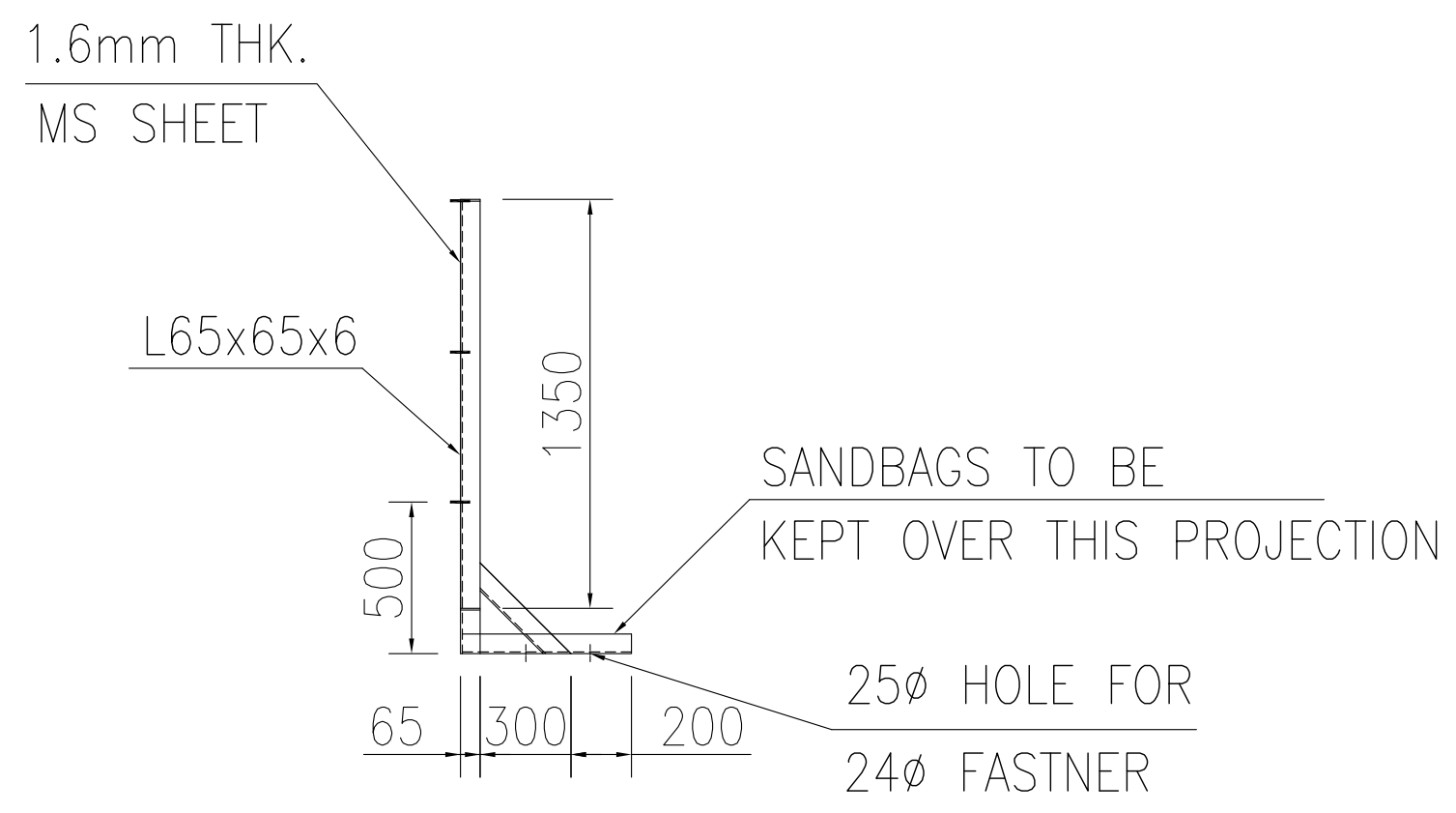


ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड
BRIDGE AND ROOF CO.(I) LTD.

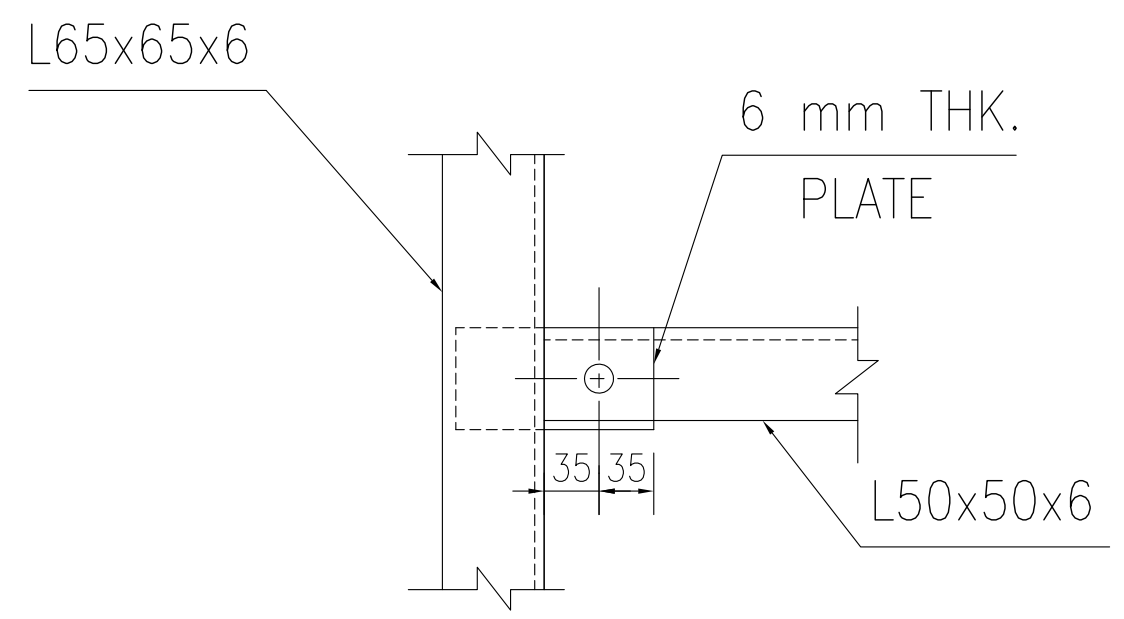
REFERENCES
DRG.NO.
© Copyright B AND R LIMITED - All rights reserved.
THIS DRAWING IS THE PROPERTY OF B AND R AND ISSUED FOR THE SPECIFIC PROJECT MENTIONED THEREIN. THIS IS NOT TO BE COPIED OR USED FOR OTHER PROJECTS UNLESS EXPRESSLY PERMITTED BY B AND R.



LAYOUT PLAN OF BARRICADE



SECTION 1-1

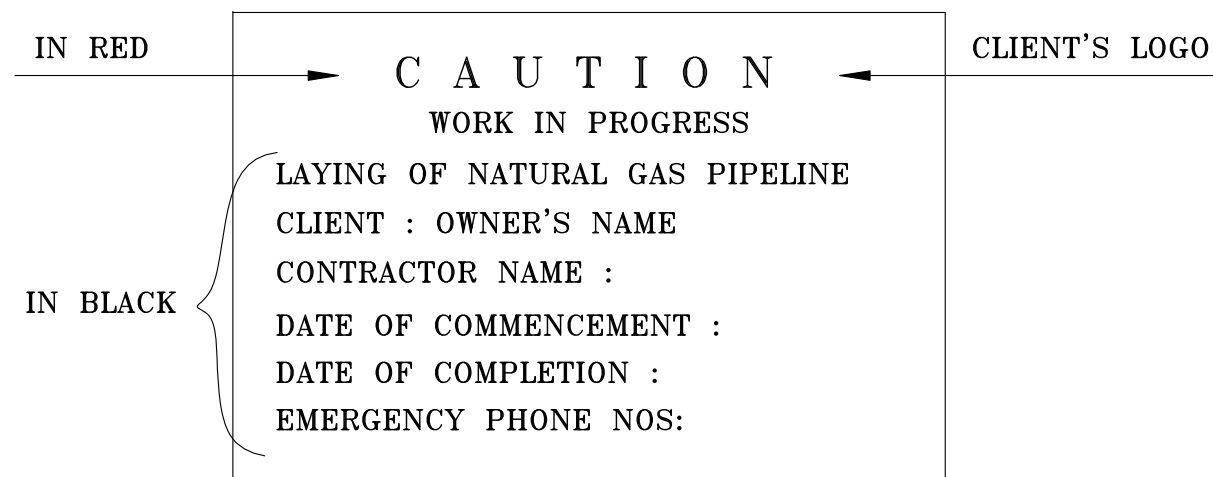


DETAIL-A

ANNEXURE-III TO CORRIGENDUM #2

FOR TENDER PURPOSE

A																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
---	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--



1. ALL DIMENSIONS ARE IN MM. UNLESS NOTED OTHERWISE.

FOR TENDER PURPOSE ONLY



ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड

BRIDGE AND ROOF CO.(I) LTD.

CNG & CITY GAS DISTRIBUTION
PROJECT

CAUTION BOARDS

SCALE : N.T.S.

DWG NO. - BR-CGD-STD.-DWG-11

SHEET	REV
-------	-----

1 OF 1

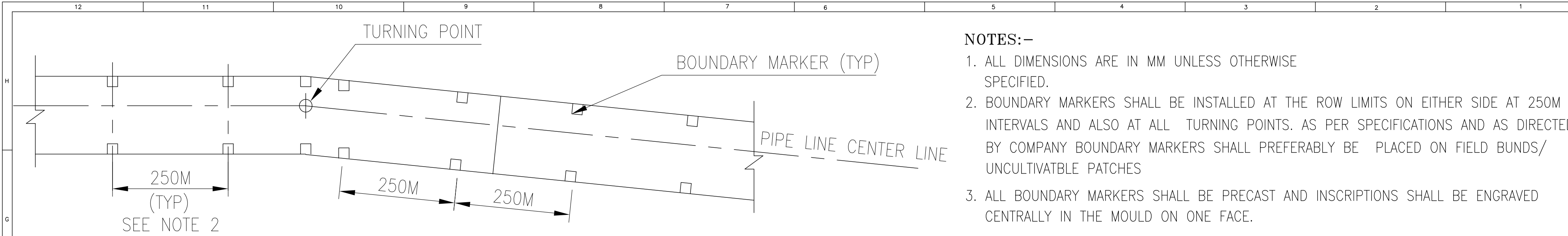
REV

△					
△					
△					
△					
△					
△					
REV					
SEC	CONCURRED BY				

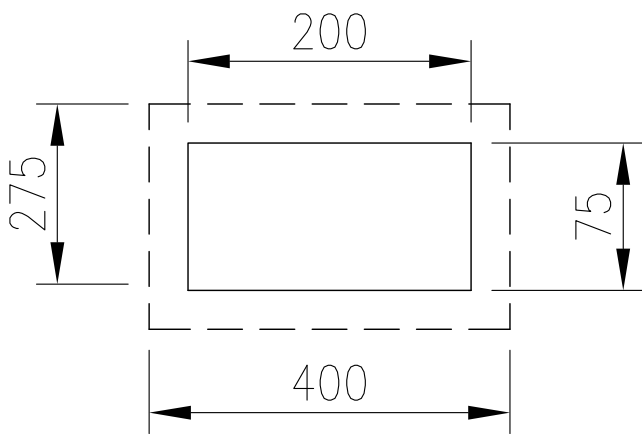
REV. NO.	DATE	ZONE	DESCRIPTION	BY	VERIFIED
			REVISION		

REFERENCES	DRG. NO.
<p>© Copyright B AND R - All right reserved.</p> <p>THIS DRAWING IS THE PROPERTY OF B AND R AND ISSUED FOR THE SPECIFIC PROJECT MENTIONED THEREIN. THIS IS NOT TO BE COPIED OR USED FOR OTHER PROJECTS UNLESS EXPRESSLY PERMITTED BY B AND R.</p>	

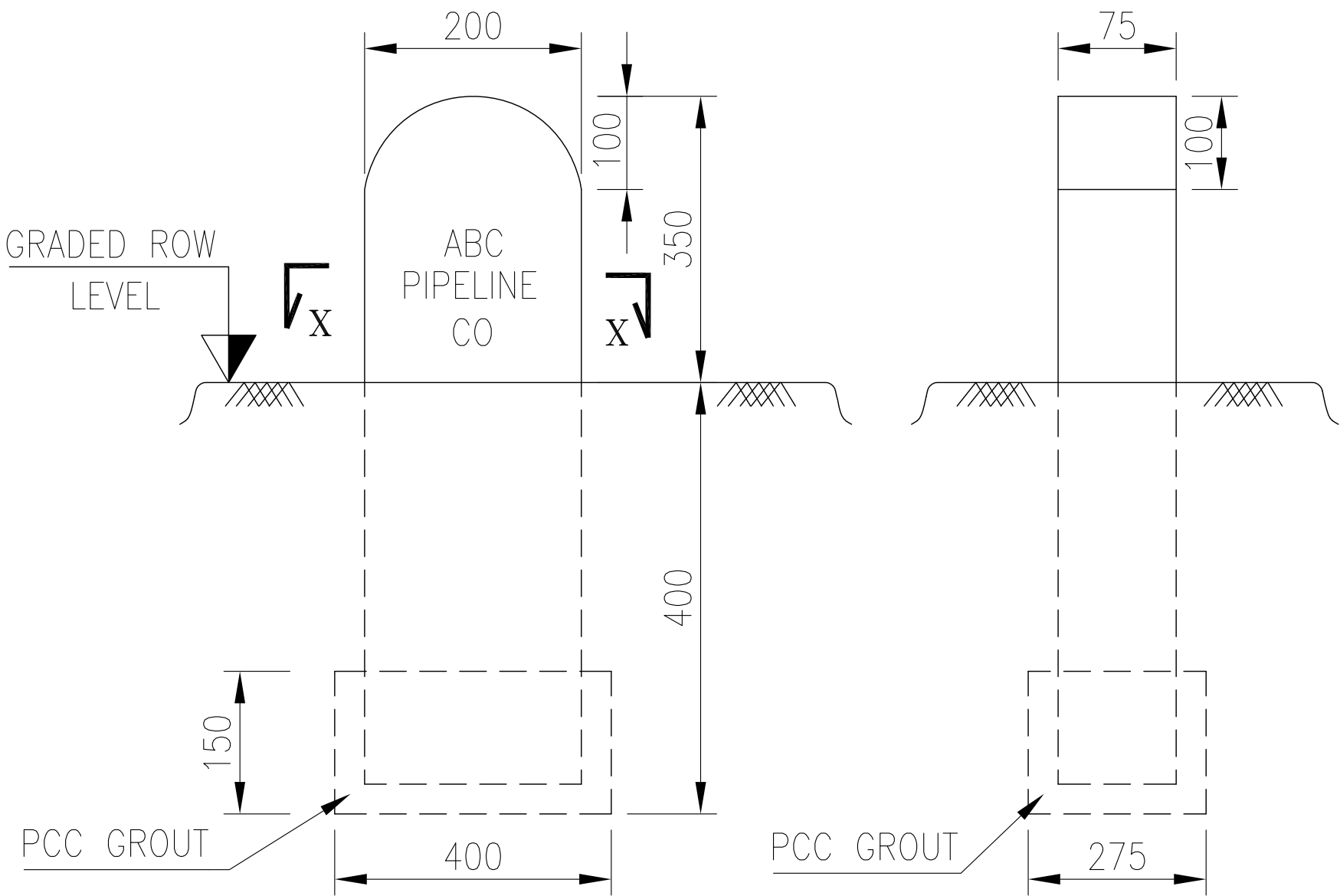
SECTION	DESIGN DEPT.		CNG & CITY GAS DISTRIBUTION PROJECT			
LOCATION	HOWRAH OFFICE					
DESIGNED	S.K/A.M					
DRAWN	S.A.A		CAUTION BOARDS			
CHECKED AND VERIFIED	SANDIP TALUKDAR					
APPROVED	SANDIP TALUKDAR					
			SCALE : N.T.S.		SHEET	REV.
	DATE	22.05.2024	DWG NO. - BR-CGD-STD.-DWG-11		1 OF 1	



LOCATION PLAN OF BOUNDARY MARKER

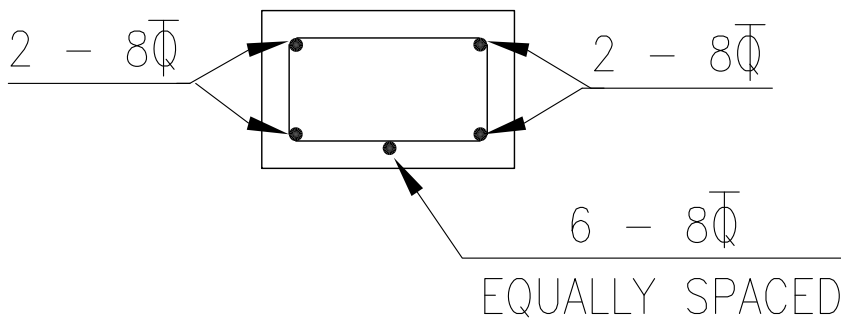


PLAN



ELEVATION

SIDE VIEW



SECTION X-X

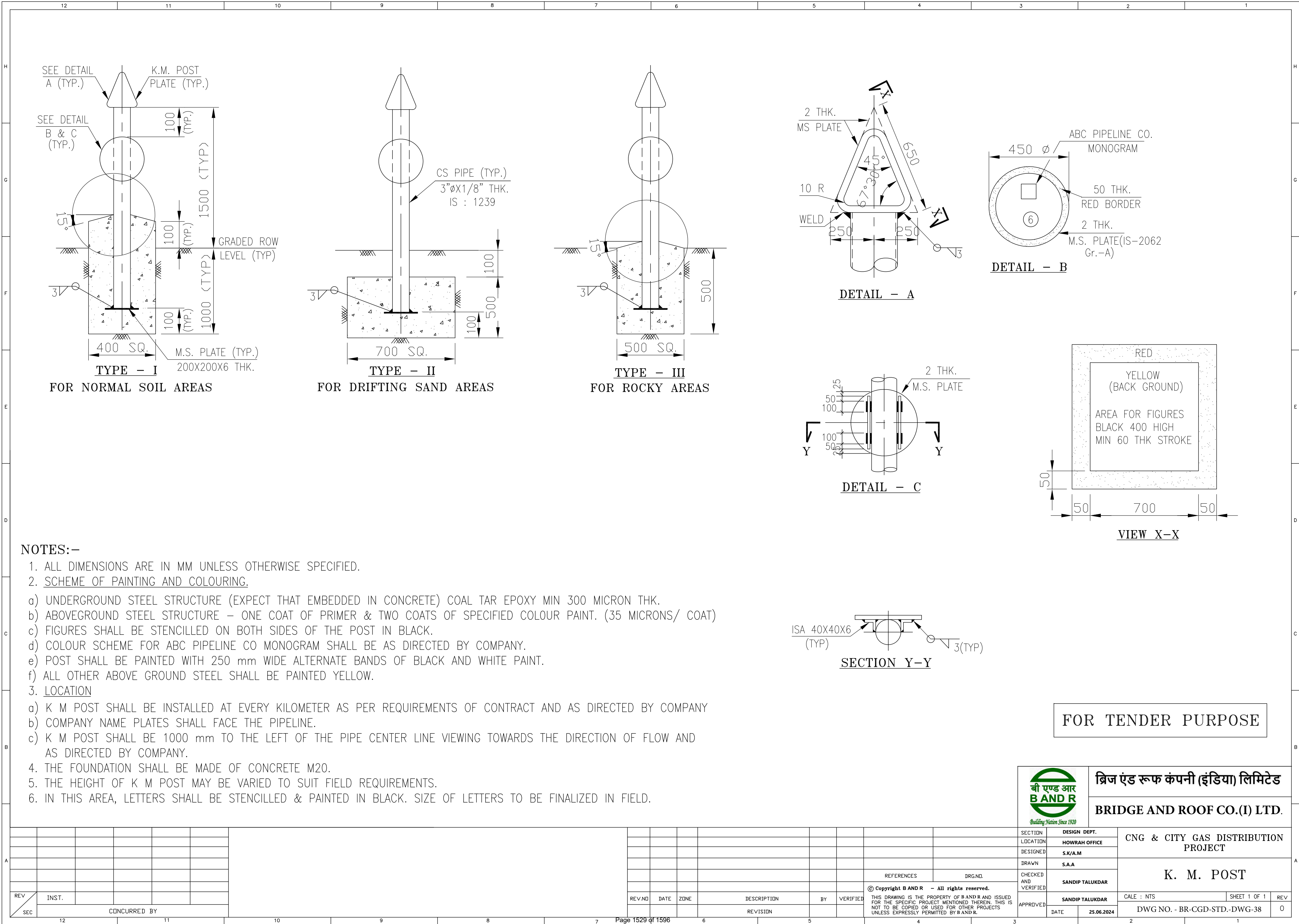
NOTES:-

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. BOUNDARY MARKERS SHALL BE INSTALLED AT THE ROW LIMITS ON EITHER SIDE AT 250M INTERVALS AND ALSO AT ALL TURNING POINTS. AS PER SPECIFICATIONS AND AS DIRECTED BY COMPANY BOUNDARY MARKERS SHALL PREFERABLY BE PLACED ON FIELD BUNDS/ UNCULTIVATBLE PATCHES
3. ALL BOUNDARY MARKERS SHALL BE PRECAST AND INSCRIPTIONS SHALL BE ENGRAVED CENTRALLY IN THE MOULD ON ONE FACE.
4. LETTERS SHALL BE 60 mm. HIGH AND 5 mm. DEEP.
5. INSCRIPTIONS SHALL FACE THE PIPELINE.
6. CONCRETE FOR BOUNDARY MARKER SHALL BE M20.
7. ABOVE GROUND PART OF BOUNDARY MARKERS SHALL BE PAINTED YELLOW WITH MINIMUM THREE COATS OF APPROVED QUALITY PAINT. INSCRIPTIONS SHALL BE PAINTED BLACK. (35 MICRONS/COAT)



FOR TENDER PURPOSE

	ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड		
	BRIDGE AND ROOF CO.(I) LTD.		
	SECTION	DESIGN DEPT.	CNG & CITY GAS DISTRIBUTION PROJECT
	LOCATION	HOWRAH OFFICE	
DESIGNED		S.K/A.M	TYPICAL ROW BOUNDARY MARKER
DRAWN		S.A.A	
CHECKED AND VERIFIED		SANDIP TALUKDAR	SCALE : NTS
APPROVED		SANDIP TALUKDAR	
DATE		25.06.2024	SHEET 1 OF 1
DWG NO. - BR-CGD-STD.-DWG-37		REV	
		0	


A																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
---	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--





1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. SCHEME OF PAINTING AND COLOURING.
 - a) UNDERGROUND STEEL STRUCTURE – ONE COAT OF PRIMER & TWO COATS OF SPECIFIED COLOUR PAINT (35 MICRONS/COAT).
 - b) LETTERS SHOWN AS  ARE TO BE PAINTED BLACK.
 ARE TO BE PAINTED RED.
 - c) POST SHALL BE PAINTED WITH 250 WIDE ALTERNATE BANDS OF BLACK AND WHITE PAINT.
 - d) ALL OTHER ABOVE GROUND STEEL SHALL BE PAINTED YELLOW.
3. LOCATION :- THE NAVIGABLE WATER WAY WARNING SIGN SHALL BE INSTALLED.
 - a) ON BOTH THE BANKS & FACING THE WATER WAY AS CLOSE TO THE BANKS AS POSSIBLE.
 - b) STRADDLING THE PIPE CENTER LINE FOR PIPELINES UP TO 30" DIA., 900 MM TO THE LEFT OF PIPELINE O.D. VIEWING IN THE DIRECTION OF FLOW FOR PIPELINE ABOVE 30" DIA AS INDICATED IN LOCATION SKETCH BELOW.
4. FOR FLUIDS COVERED BY CODE ANSI B 31.8 USE WORD "GAS" AS INDICATED. FOR FLUIDS COVERED BY CODE ANSI B 31.4 USE WORD "PETROLEUM" IN PLACE OF GAS FOR ANY OTHER FLUIDS, MENTION THE FLUID IN PLACE OF THE WORD "GAS".
5. THE FOUNDATION SHALL BE MADE OF CONCRETE M20 CONFORMING TO IS:454 LATEST EDITION.
6. STRUCTURAL STEEL SHALL CONFORM TO IS:2062 LATEST EDITION.
7. M.S. PLATE 3 MM THK. SHALL HAVE A STICH WELD WITH THE ANGLE FRAME AT 100 MM C/C.
8. SIGN PLATE IN REGIONAL LANGUAGE SHALL BE PREPARED BY CONTRACTOR ON SIMILAR LINES AND APPROVED BY COMPANY.

FOR TENDER PURPOSE

		ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड		
		BRIDGE AND ROOF CO.(I) LTD.		
SECTION	DESIGN DEPT.	CNG & CITY GAS DISTRIBUTION PROJECT		
LOCATION	HOWRAH OFFICE			
DESIGNED	S.K/A.M			
DRAWN	S.A.A	NAVIGABLE WAY WATER PIPELINE CROSSING WARNING SIGN.		
CHECKED AND VERIFIED	SANDIP TALUKDAR			
APPROVED	SANDIP TALUKDAR			
DATE	27.06.2024	SCALE : NTS	SHEET 1 OF 1	REV
		DWG NO. - BR-CGD-STD.-DWG-40		0

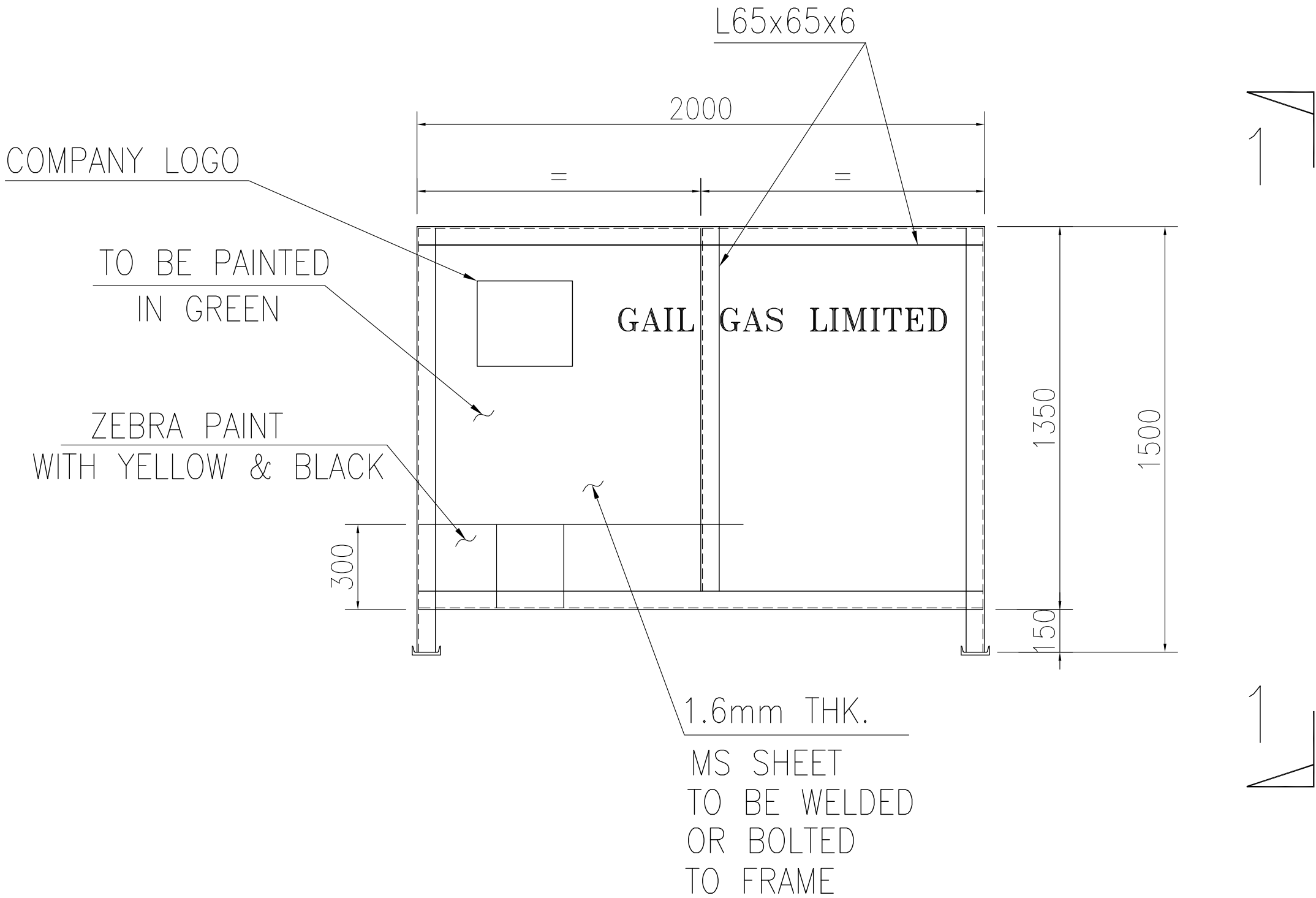
REV	INST.				
SEC	CONCURRED BY				

REV.NO	DATE	ZONE	DESCRIPTION	BY	VERIFIED
			REVISION		

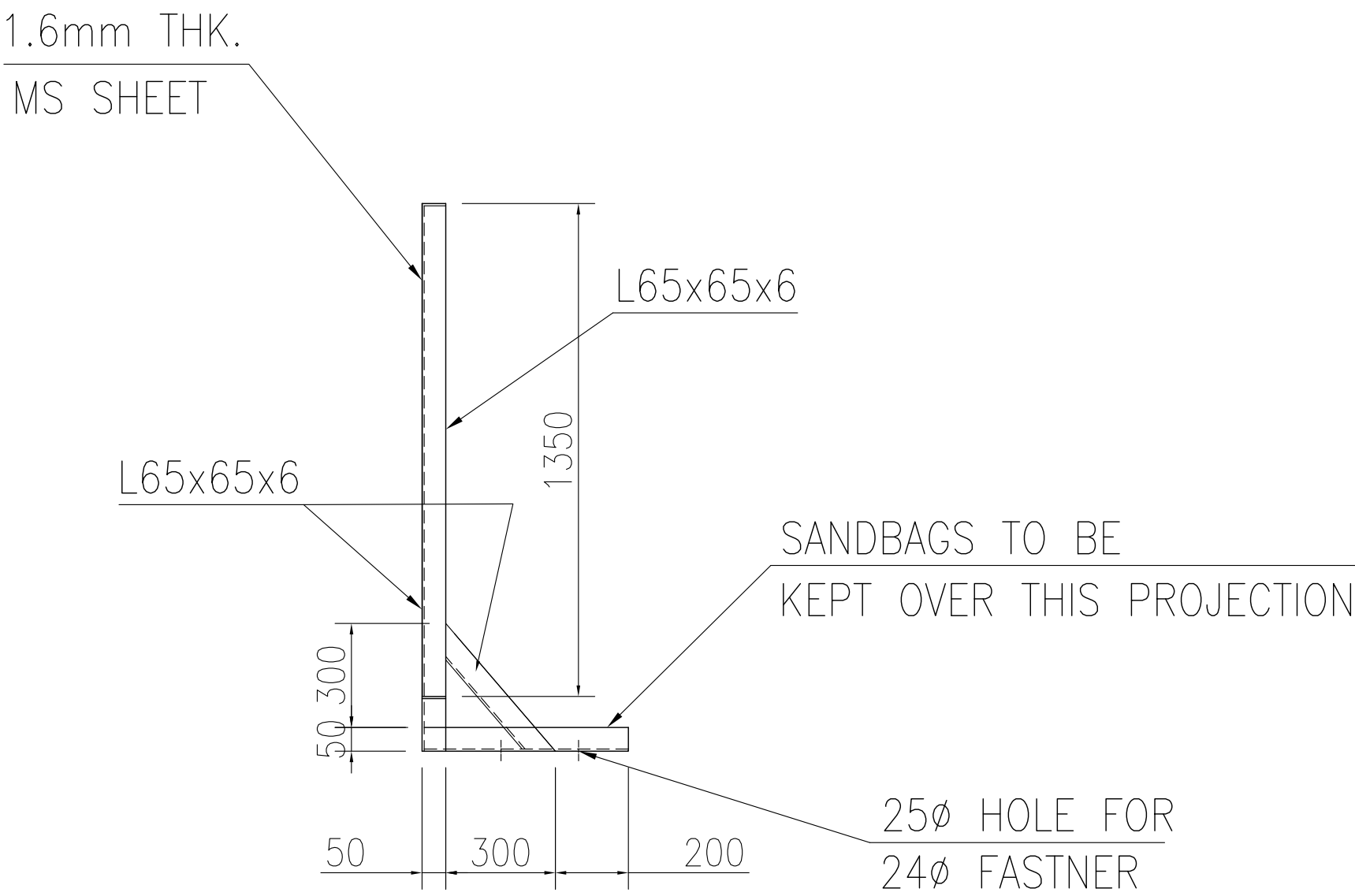


1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. SCHEME OF PAINTING AND COLOURING.
 - a) UNDERGROUND STEEL STRUCTURE (EXCEPT THAT EMBEDDED IN CONCRETE) COAL TAR EPOXY MIN 300 MICRON THK.
 - b) ABOVEGROUND STEEL STRUCTURE – ONE COAT OF PRIMER & TWO COAT OF SPECIFIED COLOUR PAINT.
 - c) COLOUR SCHEME FOR ABC PIPELINE CO MONOGRAM SHALL BE AS DIRECTED BY COMPANY.
 - d) POST SHALL BE PAINTED WITH 250 WIDE ALTERNATE BANDS OF BLACK AND WHITE PAINT.
 - e) ALL OTHER ABOVE GROUND STEEL SHALL BE PAINTED YELLOW.
3. LOCATION
 - a) DIRECTION MARKERS SHALL BE INSTALLED AT LOCATION AS PER SPECIFICATION, AS INDICATED IN APPROVED DRAWING AND AS DIRECTED BY COMPANY.
 - b) COMPANY NAME PLATES SHALL FACE THE PIPELINE.
 - c) DIRECTION MARKER SHALL BE 3000 MM TO THE LEFT OF THE PIPE CENTER LINE VIEWING TOWARDS THE DIRECTION OF FLOW. AND AS DIRECTED BY COMPANY.
4. THE FOUNDATION SHALL BE MADE OF CONCRETE M20.
5. THE HEIGHT OF DIRECTION MARKER MAY BE VARIED TO SUIT FIELD REQUIREMENTS.
6. DIRECTION MARKER SHALL SHOW THE CHANGE IN DIRECTION OF P/L ALIGNMENT.

[illegible]

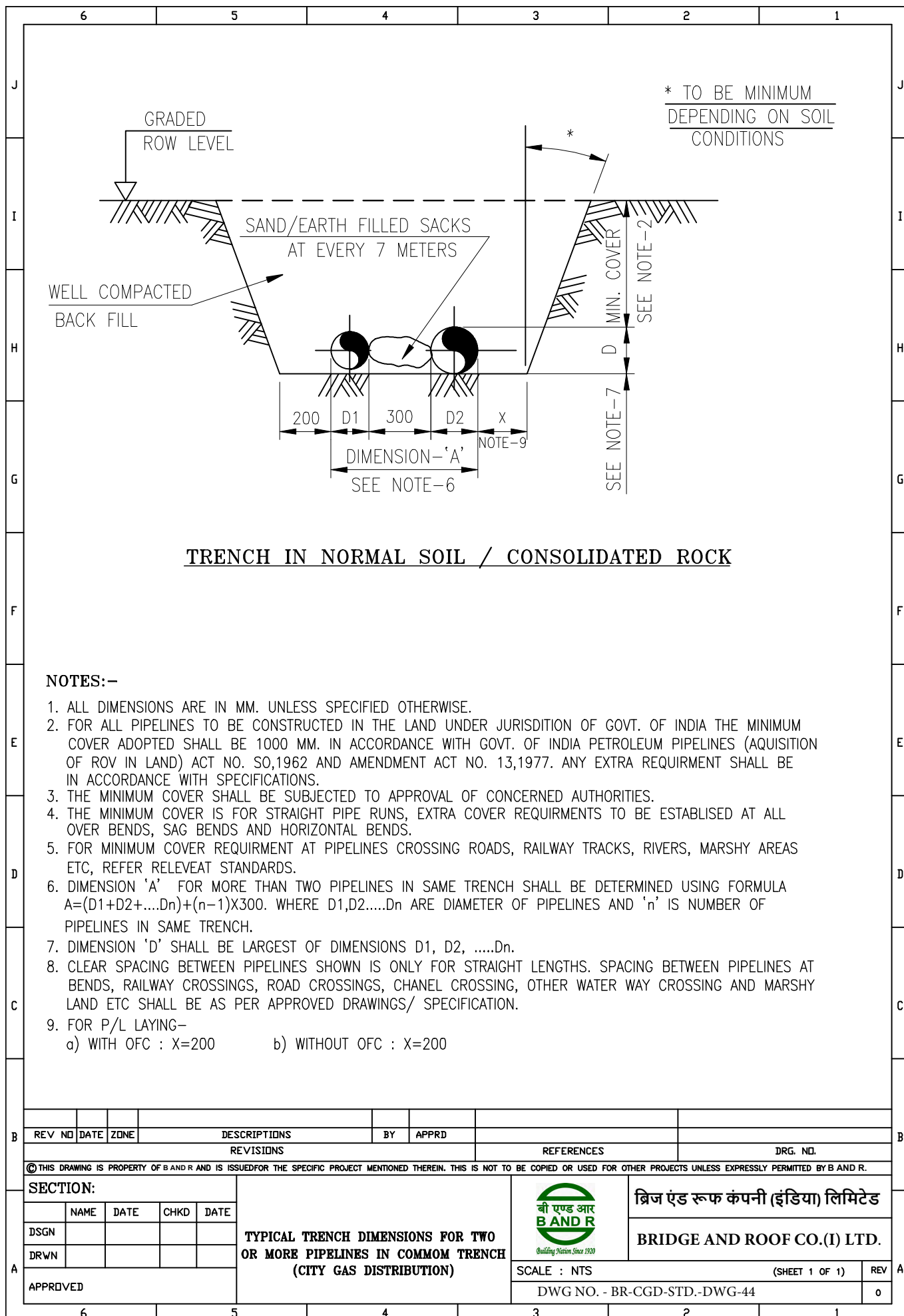


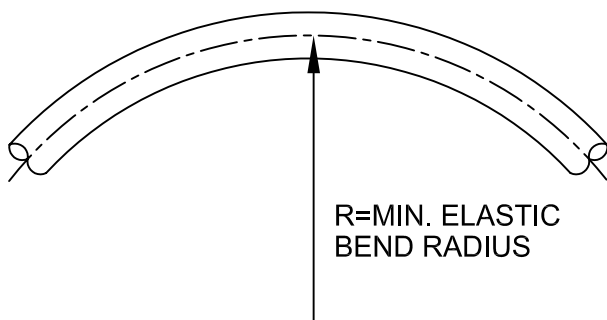
ELEVATION SHOWING TEMPORARY BARRICADE



SECTION 1-1

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--



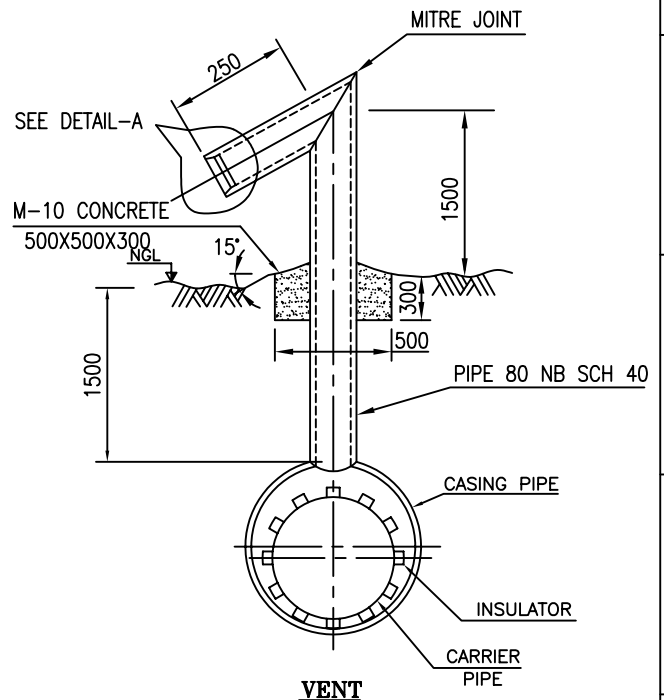
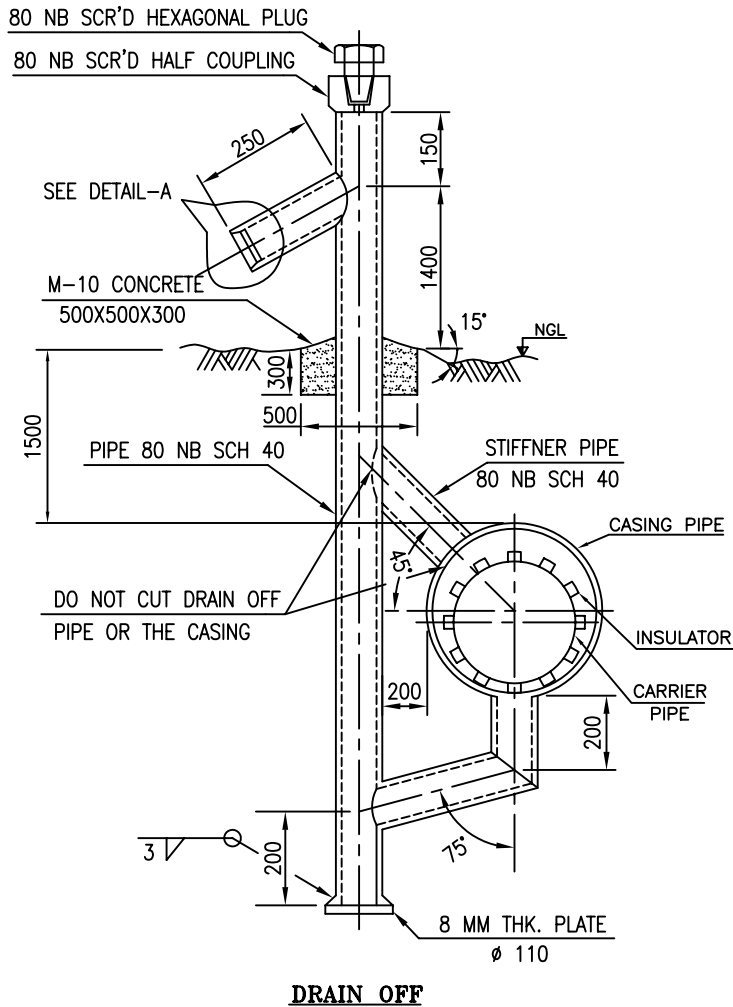
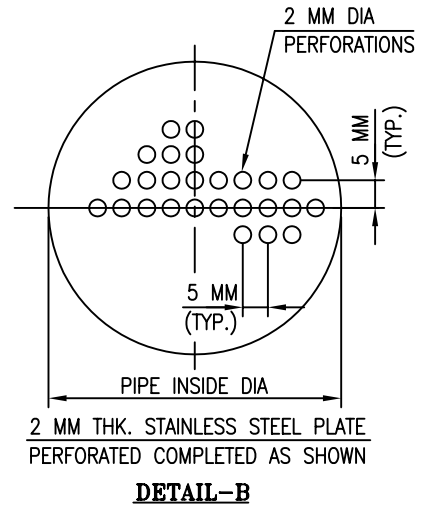
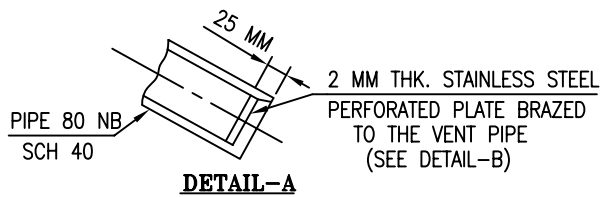


MODULUS OF ELASTICITY FOR
PIPE MATERIAL = $2.059 \times 10^6 \text{ Kg/cm}^2$

**TABLE FOR MINIMUM ELASTIC BEND RADIUS FOR
DIFFERENT PIPE DIAMETER AND WALL THICKNESS**


SIZE (INCH)/ W.T. (mm)	PIPE MATERIAL	MIN. ELASTIC BEND RADIUS (m)
36"/13.2	API 5L Gr. X-70	1500
36"/15.9	API 5L Gr. X-70	1100
36"/19.1	API 5L Gr. X-70	900
20"/7.9	API 5L Gr. X-70	800
20"/8.7	API 5L Gr. X-70	700
20"/11.1	API 5L Gr. X-70	500
20"/14.3	API 5L Gr. X-70	500

REV NO	DATE	ZONE	DESCRIPTIONS	BY	APPRD	REFERENCES	DRG. NO.			
REVISIONS										
© THIS DRAWING IS PROPERTY OF B AND R AND IS ISSUED FOR THE SPECIFIC PROJECT MENTIONED THEREIN. THIS IS NOT TO BE COPIED OR USED FOR OTHER PROJECTS UNLESS EXPRESSLY PERMITTED BY B AND R										
SECTION: DESIGN DEPT.			MINIMUM ELASTIC BEND RADIUS FOR PIPE Page 1536 of 1596				ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड			
NAME	DATE	CHKD					DATE	BRIDGE AND ROOF CO.(I) LTD.		
DSGN	SK/AM	ST								
DRWN	SAA							SCALE : NTS	(SHEET 1 OF 1)	REV
APPROVED						SANDIP TALUKDAR			DWG NO.- BR-CGD-STD-DWG-45	
						0				

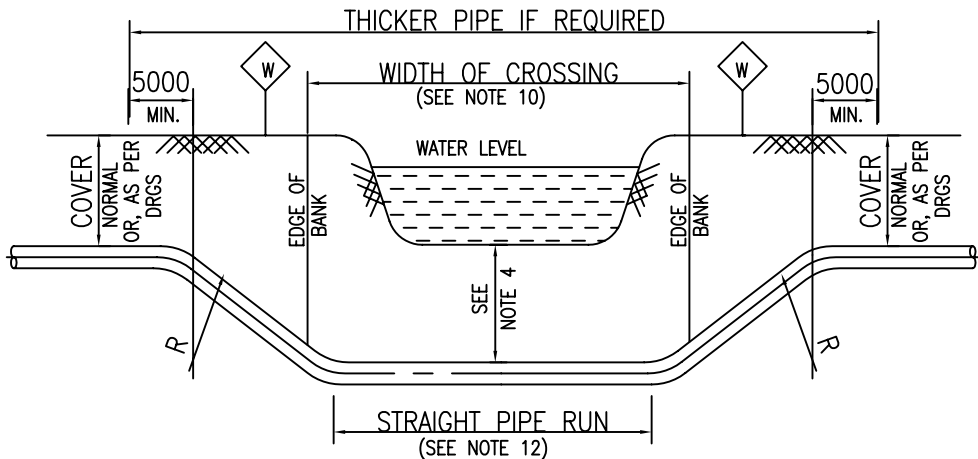
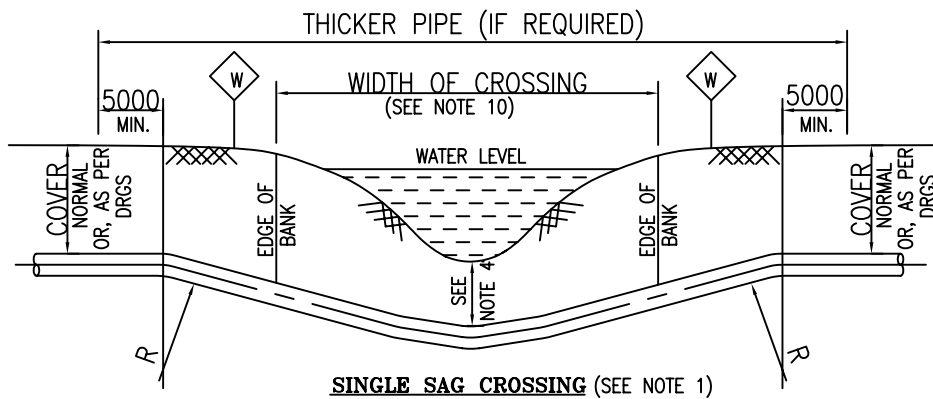


NOTES:-

1. ALL DIMENSIONS ARE IN MM. UNLESS SPECIFIED OTHERWISE.
2. VENT AND DRAIN OFF TO FACE LEFT WHEN LOOKING IN DIRECTION OF FLOW AND SHALL BE PARALLEL TO CROSSING.
3. VENT AND DRAIN OFF PIPE SHALL BE API 5L Gr.B OR IS 1239.
4. PORTION OF VENT AND DRAIN OFF PIPES WHICH ARE UNDER GROUND OR WHICH MAY BE UNDER WATER TO BE COATED WITH COAL TAR EPOXY MIN. 300 MICRON THK. PAINTING FOR PORTION ABOVE GROUND/ WATER LEVEL SHALL BE AS PER STANDARD SPECIFICATION FOR SHOP AND FIELD PAINTING.
5. VENT PIPES MAY BE USED FOR MOUNTING WARNING SIGN.


REV NO	DATE	ZONE	DESCRIPTIONS	BY	APPRD	REFERENCES	DRG. NO.
REVISIONS							
© THIS DRAWING IS PROPERTY OF B AND R AND IS ISSUED FOR THE SPECIFIC PROJECT MENTIONED THEREIN. THIS IS NOT TO BE COPIED OR USED FOR OTHER PROJECTS UNLESS EXPRESSLY PERMITTED BY B AND R.							
SECTION: DESIGN DEPT.				BAND R			
NAME	DATE	CHKD	DATE	<div>  <div> ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड BRIDGE AND ROOF CO.(I) LTD. </div> </div>			
DSGN	SK/AM	ST					
DRWN	SAA	ST					
APPROVED SANDIP TALUKDAR				SCALE : NTS (SHEET 1 OF 1) REV 0			

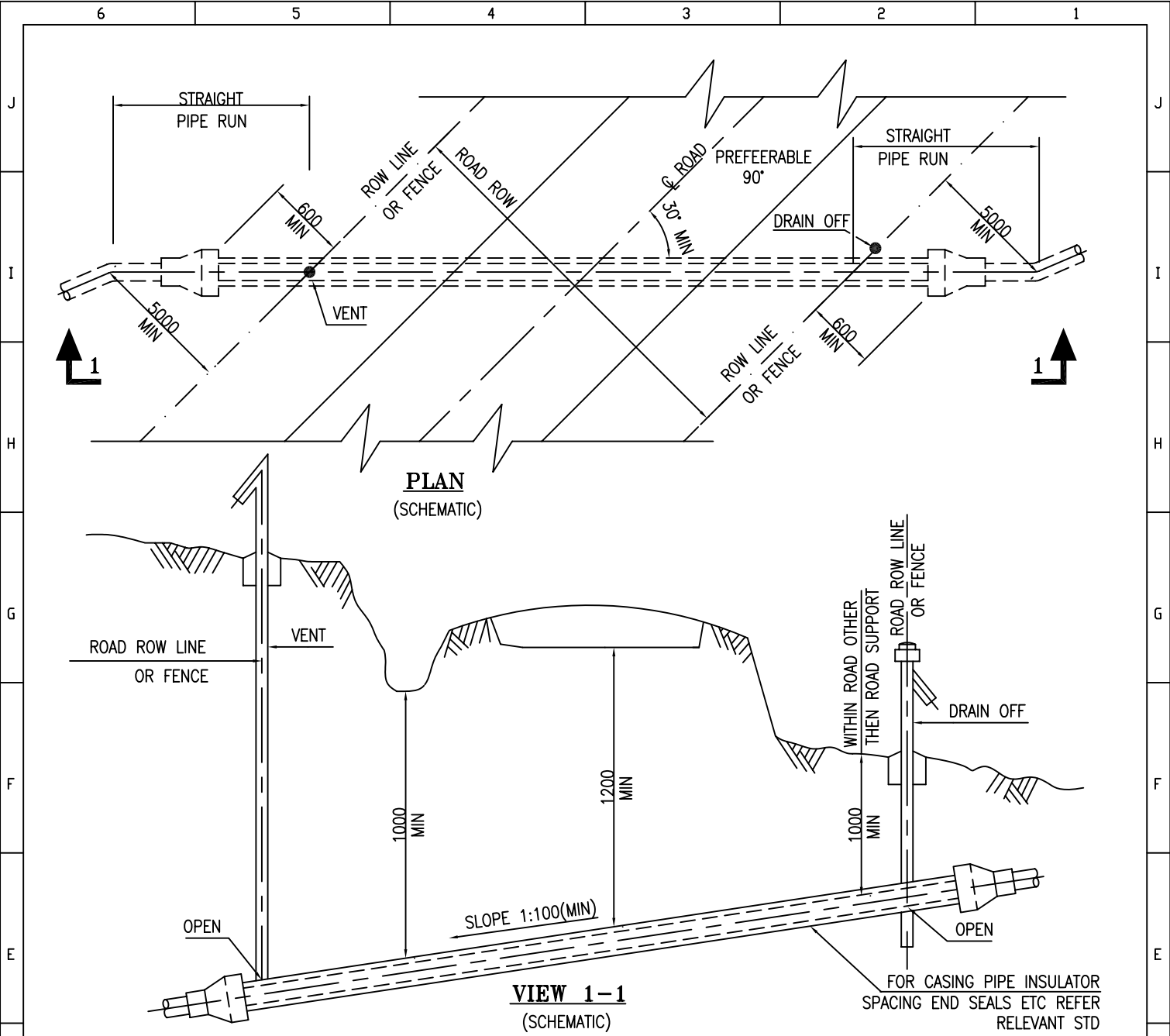
DETAIL OF CASING VENT AND DRAIN OFF



NOTES:-

- SINGLE SAG CROSSING SHALL NORMALLY BE USED WHERE THERE IS NO EVIDENCE OF EROSION OF BANKS AND SCOURING OR SHIFTING OF STREAM BOTTOM AND WHERE BED WIDTH DOES NOT PROHIBIT ITS USE.
- DOUBLE SAG CROSSING SHALL BE USED WHERE THERE IS EVIDENCE OF EROSION OF BANKS, SCOURING OR SHIFTING OF STREAM BOTTOM.
- IN DOUBLE SAG CROSSING GENERALLY COLD FIELD BENDS SHALL BE USED. USE OF FACTORY MADE $R=6D$ BENDS SHALL BE MINIMIZED $R=6D$ BENDS SHALL BE USED ONLY WITH PRIOR APPROVAL OF COMPANY.
- THE MINIMUM COVER OVER THE PIPE MEASURED BELOW THE MAXIMUM SCOUR DEPTH SHALL BE
 - 1500 FOR EARTH STREAM BOTTOM.
 - 1000 FOR ROCKY STREAM BOTTOM.
- THE TYPE AND EXTENT OF BUOYANCY CONTROL MEASURES SHALL BE AS PER SPECIFICATIONS AND AS DIRECTED BY COMPANY FOR INDIVIDUAL CROSSING AND SHALL BE SHOWN ON THE ALIGNMENT SHEETS.
- THE FILL AT THE BANKS SHALL BE TAPPED FIRMLY AND REINFORCED WITH SACKED EARTH. LEAN CONCRETE RIP RAP OR BY OTHER MEANS AS DIRECTED BY COMPANY. ADDITIONAL BANK PROTECTION MEASURES AS PER SPECIFICATIONS SHALL BE ADOPTED WHEN THERE IS EVIDENCE OF EROSION AND SLUMPING OF BANKS OR WHEN THE BANKS ARE STEEP.
- THE LOCATION OF CROSSING SHALL BE IN A LONG STRAIGHT STRETCH OF THE STREAM IF POSSIBLE.
- EXACT POSITION AND ANGLE OF COLD BENDS SHALL BE DETERMINED IN FIELD.
- AFTER INSTALLATION OF THE CROSSING, THE WATER COURSE SHALL BE RESTORED TO ITS ORIGINAL CONDITION TO THE ENTIRE SATISFACTION OF THE AUTHORITIES HAVING JURISDICTION OVER THE SAME. WHERE THE EXCAVATED MATERIAL IS UNSUITABLE, TRENCH SHALL BE BACKFILLED WITH MATERIAL APPROVED BY COMPANY.
- WIDTH OF CROSSING SHALL BE THAT CORRESPONDING TO THE HIGHEST WATER LEVEL. THE HIGHEST WATER LEVEL SHALL BE DETERMINED BY CONTRACTOR BASED ON THE FOLLOWING :-
 - BANK CONDITION VIS-A-VIS EROSION ETC.
 - EVIDENCE OF EXTIRPATION OF VEGETATION ALONG BANKS.
 - DISCUSSIONS WITH LOCAL PEOPLE.
 - HISTORICAL RECORDS (TO THE EXTENT AVAILABLE).
- THE NUMBER OF WARNING SIGNS SHALL BE
 - 1 (ONE) FOR CROSSINGS LESS THAN 15 M WIDTH AT UPSTREAM BANK.
 - 2 (TWO) FOR CROSSINGS ABOVE 15 M WIDTH.
- STRAIGHT LENGTH OF PIPE SHALL BE APPROVED AT LEAST FOR THE ENTIRE WIDTH OF CROSSING.
- CONTRACTOR SHALL VERIFY THE ACTUAL DIMENSIONS WITH RESPECT TO SURVEY DETAILS FOR EACH CROSSING AND WHEN DIRECTED BY COMPANY, CONTRACTOR SHALL PREPARE DETAILED DRAWING FOR INDIVIDUAL CROSSING FOR COMPANY APPROVAL BEFORE COMMENCEMENT OF CONSTRUCTION.
- ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.

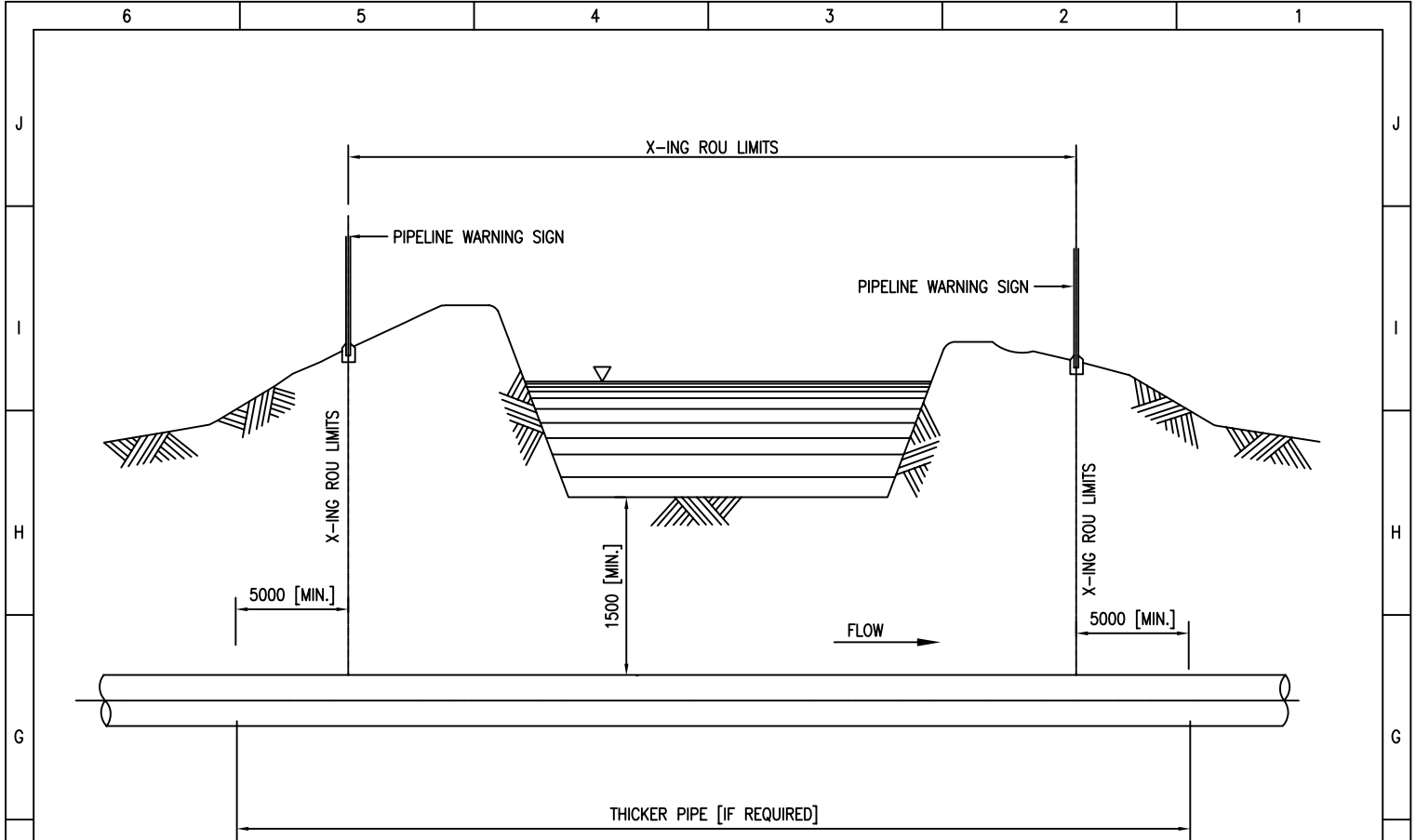
REV NO	DATE	ZONE	DESCRIPTIONS	BY	APPRD	REFERENCES	DRG. NO.
REVISIONS							
© THIS DRAWING IS PROPERTY OF B AND R AND IS ISSUED FOR THE SPECIFIC PROJECT MENTIONED THEREIN. THIS IS NOT TO BE COPIED OR USED FOR OTHER PROJECTS UNLESS EXPRESSLY PERMITTED BY B AND R.							
SECTION: DESIGN DEPT.						ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड BRIDGE AND ROOF CO.(I) LTD.	
NAME	DATE	CHKD	DATE				
DSGN	SK/AM	ST					
DRWN	SAA	ST					
APPROVED SANDIP TALUKDAR				TYPICAL STREAM CROSSING		SCALE : NTS (SHEET 1 OF 1) REV 0	
Page 1539 of 1596				DWG NO.- BR-CGD-STD-DWG-48			



NOTES:-

1. ALL DIMENSIONS ARE IN MM. UNLESS SPECIFIED OTHERWISE.
2. REFER API RP 1102 (LATEST EDITION) FOR OTHER DESIGN AND INSTALLATION REQUIREMENTS.
3. CASING PIPE DIAMETER SHALL BE MINIMUM THREE NOMINAL PIPE SIZES LARGER THAN CARRIER PIPE DIAMETER OR AS PER APPROVED DRG OF COMPETENT (RAILWAY) AUTHORITY.
4. AT EACH CROSSING PIPELINE CROSSING WARNING SIGN SHALL BE INSTALLED ON EITHER SIDE OF CROSSING MAY BE USED FOR MOUNTING OF WARNING PLATE.
5. CONTRACTOR SHALL VERIFY THE ACTUAL DIMENSIONS WITH RESPECT TO SURVEY DETAILS OF EACH CROSSING AND PREPARE DETAILED DRAWINGS FOR INDIVIDUAL CROSSING FOR EXECUTION AND SUBMIT TO CLIENT/CONSULTANT FOR APPROVAL BEFORE COMMENCEMENT OF CONSTRUCTION.
6. ALL PIPELINE JOINTS SHALL BE RADIOGRAPHED.
7. ELECTRICAL INSULATION BETWEEN CASING AND CARRIER PIPE SHALL BE CHECKED WITH A SUITABLE MEGGER.
8. AFTER INSTALLATION OF CASING AND CARRIER PIPES THE ROAD SHALL BE RESTORED TO THE SATISFACTION OF ROAD AUTHORITIES/ COMPANY.
9. PIPELINE SECTION SHALL BE PRETESTED HYDROSTATICALLY SEPARATELY FROM THE MAIN LINE TESTING AS REQUIRED BY ENGINEER INCHARGE OR AS PER THE DIRECTIONS OF THE CLIENT.
10. ANGLE OF INTERSECTION BETWEEN PIPELINE AND THE ROAD/ HIGHWAY SHALL BE AS CLOSED TO 90° AS BUT IN NO CASE LESS THAN 30°.

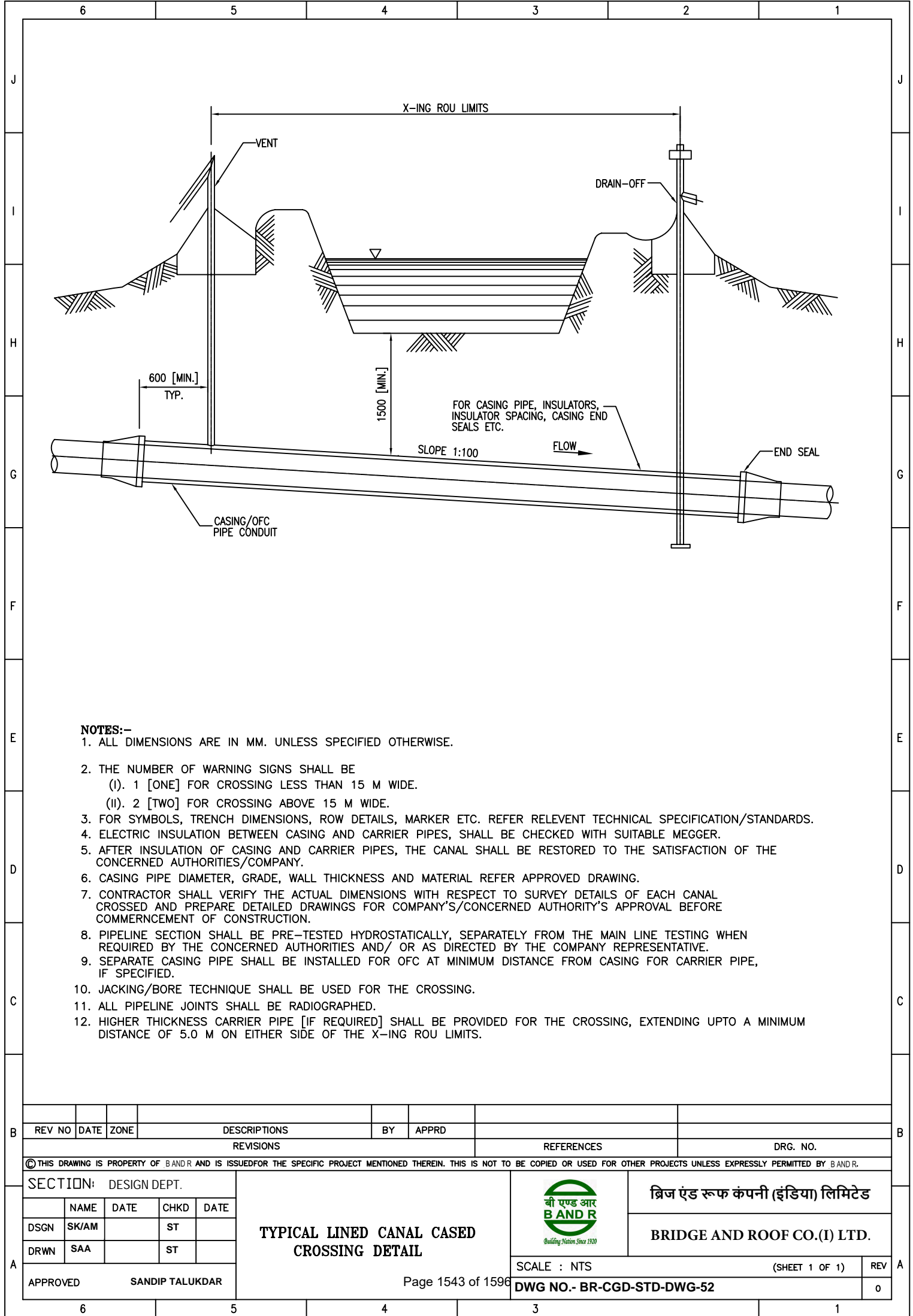
B	REV NO	DATE	ZONE	DESCRIPTIONS	BY	APPRD																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
---	--------	------	------	--------------	----	-------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

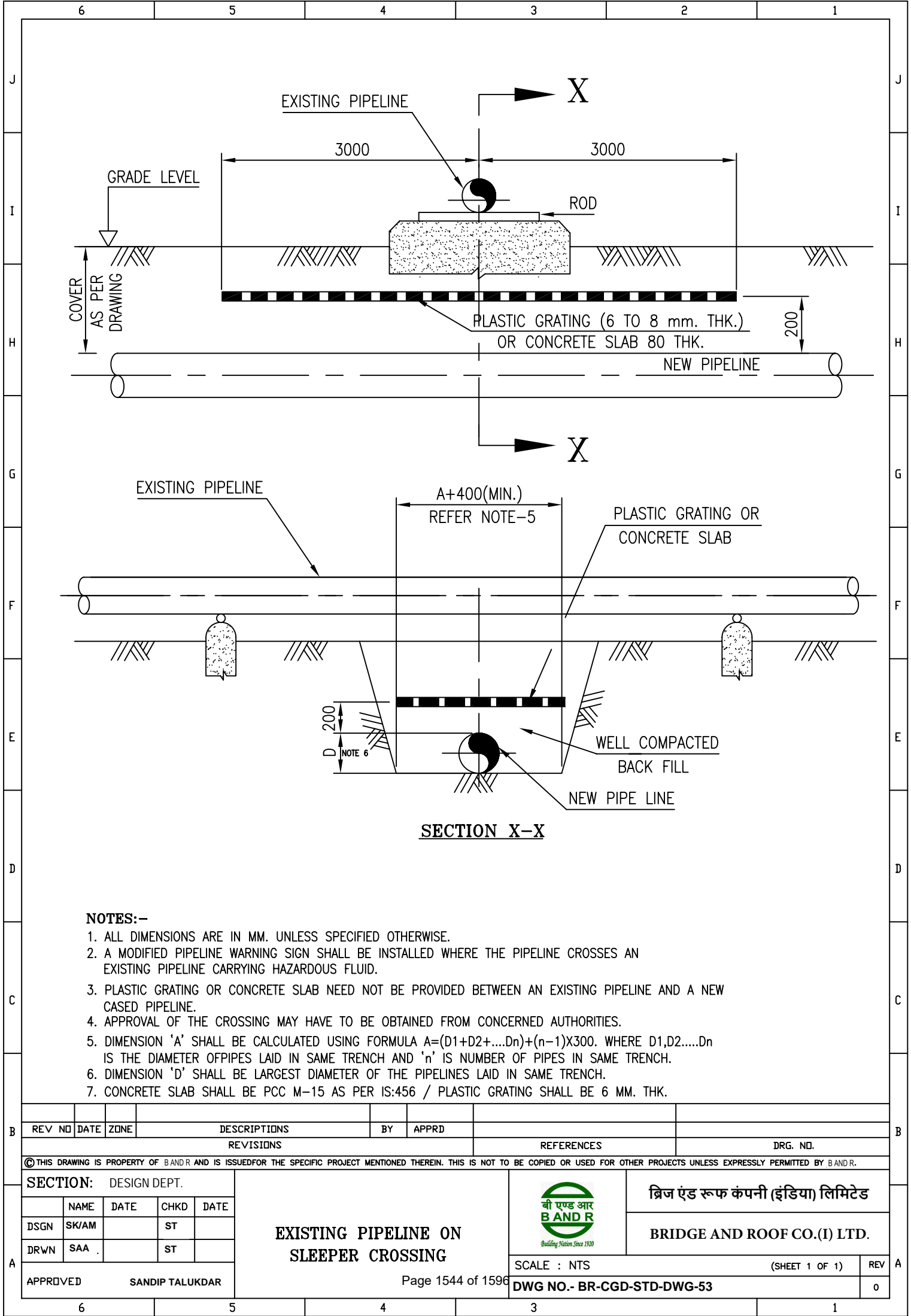


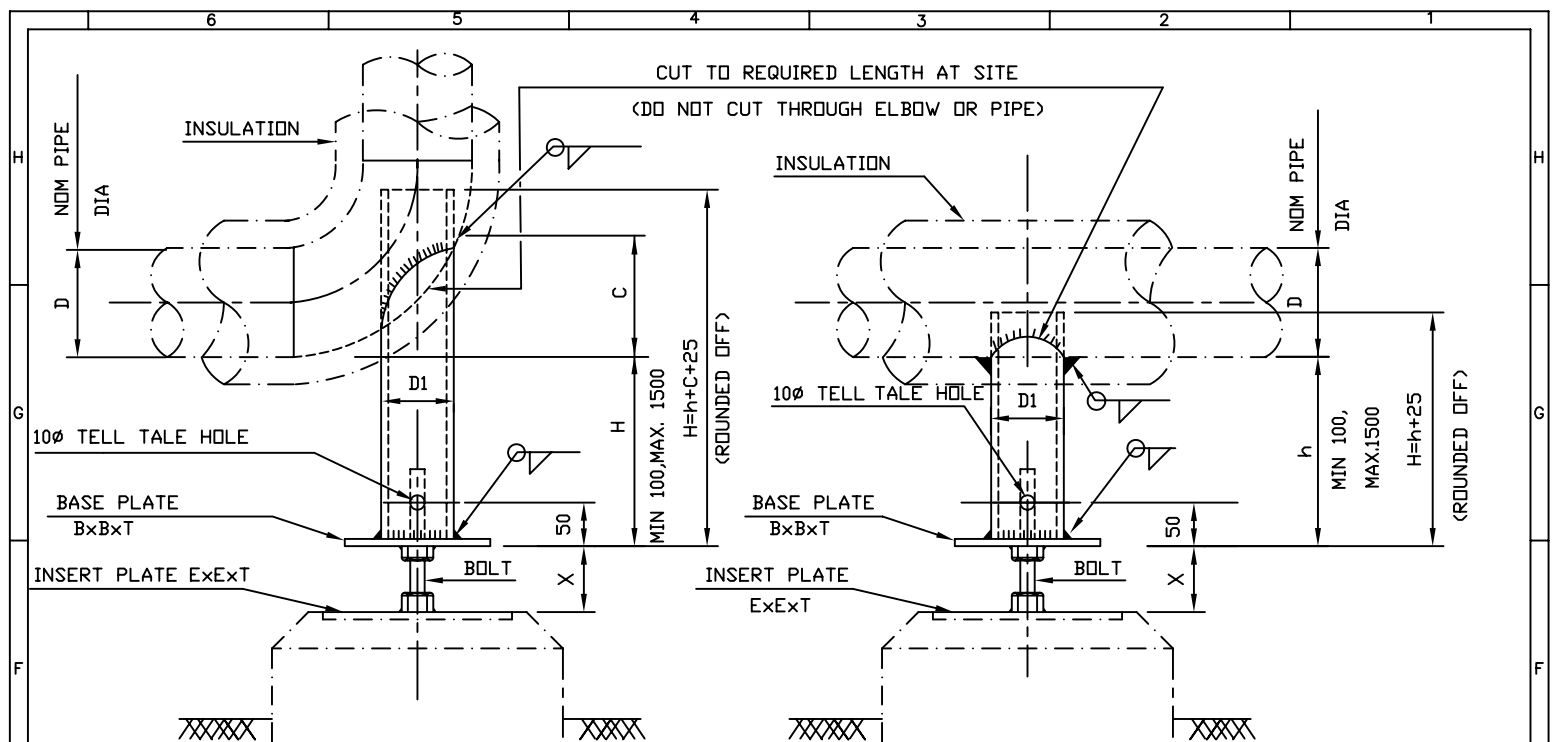
TYPICAL SECTION

- NOTES:-**
1. ALL DIMENSIONS ARE IN MM. UNLESS SPECIFIED OTHERWISE.
 2. CANAL CROSSING SHALL BE RESTORED TO ORIGINAL CONDITION TO THE ENTIRE SATISFACTION OF COMPANY AND CONCERNED AUTHORITIES HAVING JURISDICTION.
 3. THE NUMBER OF WARNING SIGNS SHALL BE
 - (I). 1 [ONE] FOR CROSSING LESS THAN 15 M WIDE.
 - (II). 2 [TWO] FOR CROSSING ABOVE 15 M WIDE.
 4. FOR SYMBOLS, TRENCH DIMENSIONS, ROW DETAILS, MARKER ETC. REFER RELEVANT TECHNICAL SPECIFICATION/STANDARDS.
 5. ANGLE OF INTERSECTION BETWEEN PIPELINE AND CANAL SHALL BE AS CLOSE TO 90° AS POSSIBLE BUT IN NO CASE LESS THAN 30°.
 6. IN CASE PIPELINE COATING IS LIABLE TO DAMAGE WHILE BORING/JACKING, A PROTECTIVE COATING OVER CORROSION COATING OF SUITABLE MATERIAL [APPROVED BY COMPANY] SHALL BE PROVIDED AS DIRECTED BY ENGINEER-IN-CHARGE.
 8. CONTRACTOR SHALL VERIFY THE ACTUAL DIMENSIONS WITH RESPECT TO SURVEY DETAILS OF EACH CANAL CROSSED AND PREPARE DETAILED DRAWINGS FOR COMPANY'S/CONCERNED AUTHORITY'S APPROVAL BEFORE COMMENCEMENT OF CONSTRUCTION.

B																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
---	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

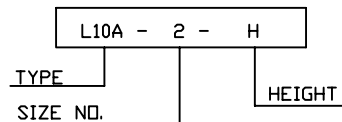
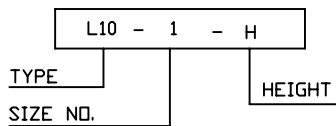






NOTES

1. IN CASE SIZE AND/OR SCH. OF SUPPORT PIPE (D1) LISTED IN THE TABLE IS NOT AVAILABLE, USE NEXT HIGHER SIZE AND/ OR NEAREST EQUIVALENT THICKNESS AVAILABLE.
2. MATERIAL OF SUPPORT PIPE SAME AS MAIN PIPE SPEC. ALL PLATES CARBON STEEL.



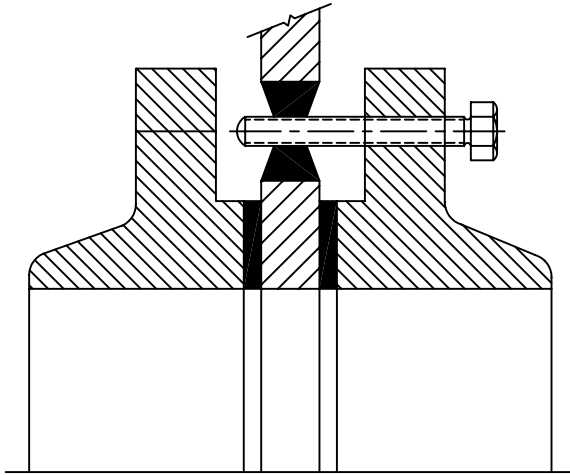
SYMBOL

SIZE NO	D	D1 (NOTE-1)	B	E	T	C	HEX. BOLT FULLY THD.	X
1	2"	2" SCH. 40	150	150	10	70	M-30x150 LONG	100
	3"					115		
2	4"	3" SCH. 40	200	200	10	137	M-30x150 LONG	
	6"					174		
3	8"	4" SCH. 40	200	200	12	205	M-39x175 LONG	
	10"					262		
	12"					287		
4	14"	6" SCH. 40	250	250	12	388		
	16"					418		
5	18"	8" SCH. 40	300	300	12	454		
6	20"	10" SCH. 40	350	350	12	554	M-48x200 LONG	120
	24"					615		

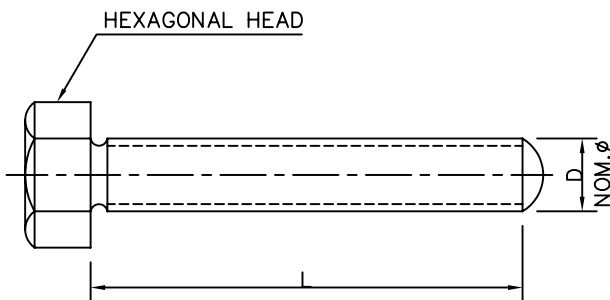
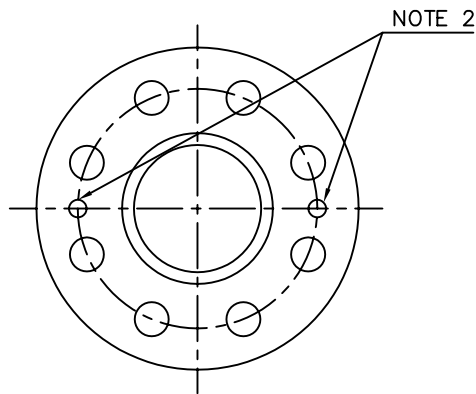
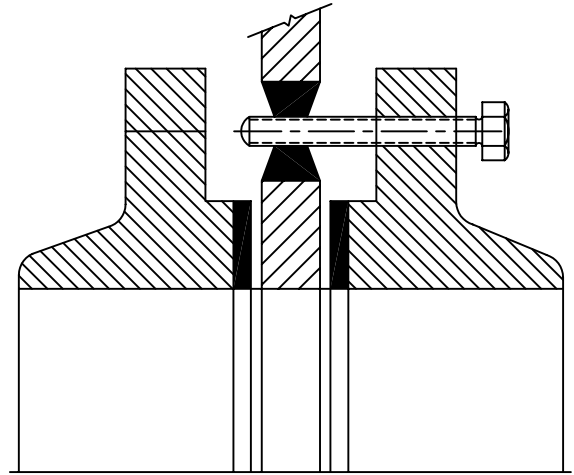
SYMBOL

REV NO.	DATE	ZONE	DESCRIPTIONS	BY	APPRD	REFERENCES	DRG. NO.	
SECTION: DESIGN DEPT.			ADJUSTABLE LOW SUPPORT SLIDING FOR PIPE SIZE 2" THRU 24" TYPE L10 & L10A					
NAME	DATE	CHKD						DATE
DSGN	SK/AM	ST						
DRWN	SAA	ST						
APPROVED			SANDIP TALUKDAR				SCALE : N.T.S. (SHEET 1 OF 1) DWG NO.- BR-CGD-STD-DWG-55	

IN OPERATING POSITION




IN JACKING POSITION

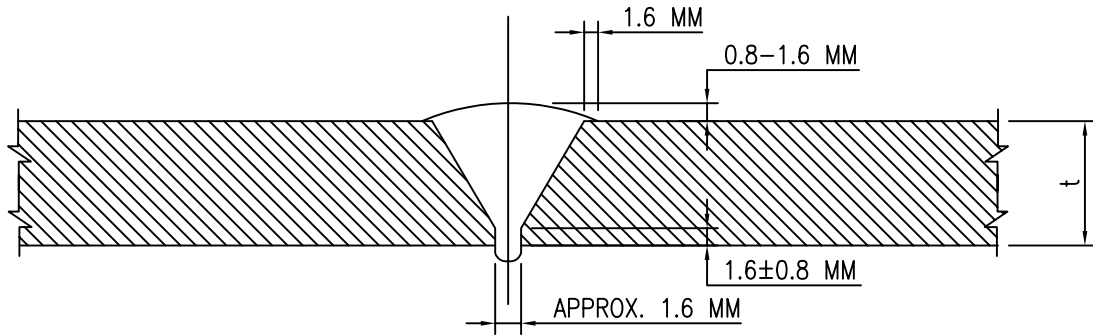


NOM. Ø	150 # RF		300 # RF		600 # RF	
	L	D	L	D	L	D
3"					100	20
4"					110	20
6"	80	20	100	20	120	20
8"	90	20	110	20	140	20
10"	90	20	120	20	150	20
12"	100	20	130	20	160	20
14"	110	20	140	20	170	20
16"	110	20	150	20	190	20
18"	120	20	160	20	200	20
20"	120	20	170	20	210	20
24"	140	20	180	20	240	20
26"	140	20	180	20	250	20
28"	140	20	190	20	250	20
30"	140	20	200	20	270	20

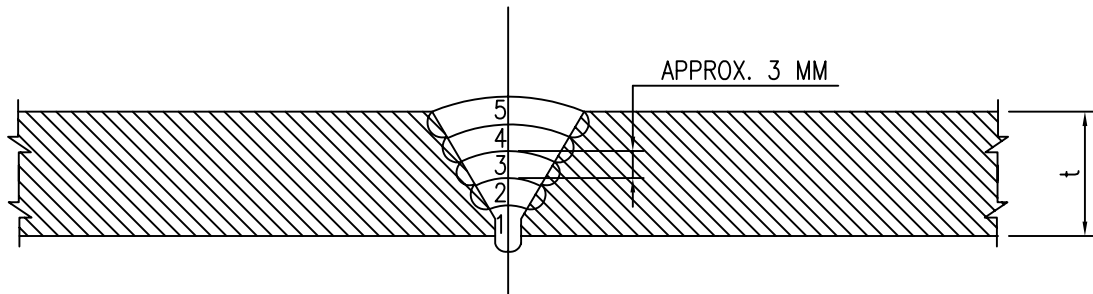
NOTES :-

1. DRILLED & TAPPED AT FIELD FOR TWO JACK SCREWS AT 180° APART SUCH THAT SPECTACLE BLIND CAN BE HANDLED WITHOUT INTERFERENCE WITH OTHER LINES OR EQUIPMENT.
2. THESE JACK SCREW DIMENSIONS ARE FOR RF FLANGES TO ANSI B 16.9 FOR SIZES UP TO 24" AND FOR SIZES ABOVE 24".
3. JACK SCREW MATERIAL SHALL BE ALLOY STEEL.


REV NO.	DATE	ZONE	DESCRIPTIONS	BY	APPRD	REFERENCES	DRG. NO.
SECTION: DESIGN DEPT.			JACK SCREW				ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड BRIDGE AND ROOF CO.(I) LTD.
DSGN	SK/AM	DATE	CHKD	ST	SCALE : N.T.S. (SHEET 1 OF 1) DWG NO.- BR-CGD-STD-DWG-56		
DRWN	SAA	DATE	CHKD	ST	APPROVED SANDIP TALUKDAR		



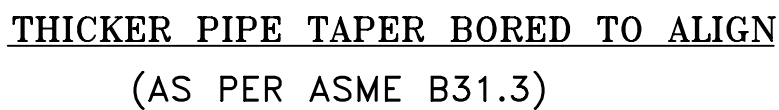
STANDARD 'V' BEVEL BUTT JOINT

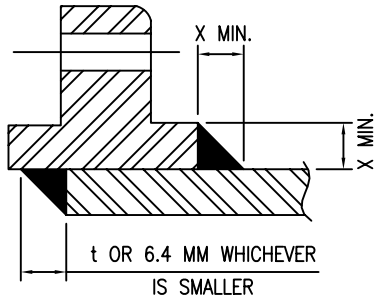


SEQUENCE OF WELDS

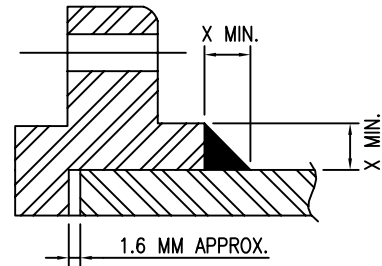
REV NO	DATE	ZONE	DESCRIPTIONS	BY	APPRD	REFERENCES	DRG. NO.
REVISIONS							
© THIS DRAWING IS PROPERTY OF B AND R AND IS ISSUED FOR THE SPECIFIC PROJECT MENTIONED THEREIN. THIS IS NOT TO BE COPIED OR USED FOR OTHER PROJECTS UNLESS EXPRESSLY PERMITTED BY B AND R.							
SECTION: DESIGN DEPT.				 ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड BRIDGE AND ROOF CO.(I) LTD.			
NAME	DATE	CHKD	DATE				
DSGN	SK/AM	ST					
DRWN	SAA	ST					
APPROVED				SANDIP TALUKDAR		SCALE : NTS (SHEET 1 OF 1) REV 0	

BUTT WELD DETAILS

[illegible]



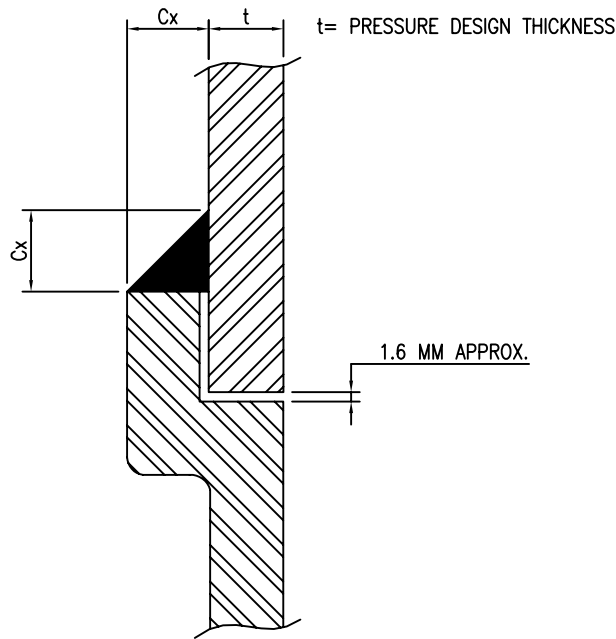
SLIP ON FLANGE



SOCKET WELDED FLANGE

X MIN. = 1.4t OR THE THICKNESS OF HUB, WHICHEVER IS SMALLER


t = PRESSURE DESIGN THICKNESS (NOT CONSIDERING CORROSION ALLOWANCE AND MANUFACTURING TOLERANCE.)

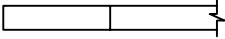
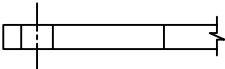

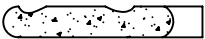

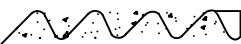
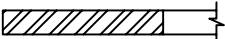

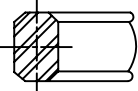
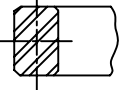

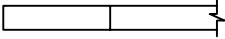
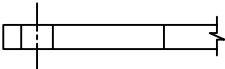

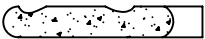

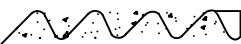
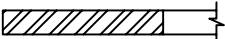

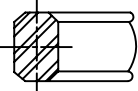
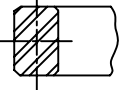

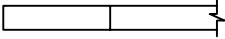
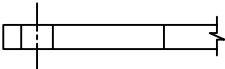

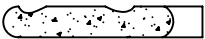

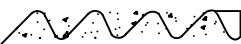
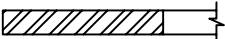

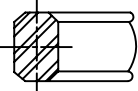
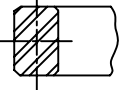






SOCKET WELDING FITTING

C_x (MIN.) = 1.25t BUT NOT LESS THAN 3.2MM.

**FILLET WELD DETAILS
(AS PER ASME B31.3)**

REV NO	DATE	ZONE	DESCRIPTIONS	BY	APPRD	REFERENCES	DRG. NO.
REVISIONS							
© THIS DRAWING IS PROPERTY OF B AND R AND IS ISSUED FOR THE SPECIFIC PROJECT MENTIONED THEREIN. THIS IS NOT TO BE COPIED OR USED FOR OTHER PROJECTS UNLESS EXPRESSLY PERMITTED BY B AND R.							
SECTION: DESIGN DEPT.				 <p>ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड</p> <p>BRIDGE AND ROOF CO.(I) LTD.</p>		<p>SCALE : NTS (SHEET 1 OF 1)</p> <p>DWG NO.- BR-CGD-STD-DWG-59</p>	
NAME	DATE	CHKD	DATE				
DSGN	SK/AM	ST					
DRWN	SAA	ST					
APPROVED SANDIP TALUKDAR				Page 1550 of 1596		REV 0	

6	5	4	3	2	1																																															
J					J																																															
I					I																																															
H					H																																															
G					G																																															
F					F																																															
E					E																																															
D					D																																															
C					C																																															
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th style="width:20%;">TYPICAL CROSS SECTION</th> <th style="width:40%;">DESCRIPTION</th> <th style="width:15%;">THICKNESS OF GASKET</th> <th style="width:25%;">COMPRESSED THICKNESS (NOTE-1)</th> </tr> <tr> <td></td> <td>FLAT RING FOR RAISED FACE FLANGES</td> <td rowspan="2" style="text-align: center; vertical-align: middle;">2.0</td> <td rowspan="2" style="text-align: center; vertical-align: middle;">2.0</td> </tr> <tr> <td></td> <td>FULL FACE FOR FLAT FACE FLANGES</td> </tr> <tr> <td></td> <td>SPIRAL WOUND METAL FLAT RING GASKET, NON METALLIC FILLER , AND A STEEL SOLID RING TYPE CENTERING DEVICE- FOR RAISED FACE FLANGES</td> <td style="text-align: center;">4.4</td> <td style="text-align: center;">3.0</td> </tr> <tr> <td></td> <td>FLAT METAL JACKETED GASKET , NON METALLIC FILLER COMPLETELY ENCLOSED WITHIN A FULLY ANNEALED DOUBLE METAL JACKET- FOR RAISED FACE FLANGES</td> <td style="text-align: center;">3.0</td> <td style="text-align: center;">2.0</td> </tr> <tr> <td></td> <td>CORRUGATED METAL JACKETED GASKET, NON METALLIC FILLER, COMPLETELY ENCLOSED WITHIN A FULLY ANNEALED DOUBLE METAL CORRUGATED JACKET- FOR RAISED FACE FLANGES</td> <td style="text-align: center;">3.2</td> <td style="text-align: center;">1.0</td> </tr> <tr> <td></td> <td>CORRUGATED METAL JACKET - FULLY ANNEALED CORRUGATED METAL WITH FILLER MATERIAL CEMENTED TO THE CORRUGATIONS ON BOTH FACES-FOR RAISED FACE FLANGES</td> <td style="text-align: center;">3.2</td> <td style="text-align: center;">1.0</td> </tr> <tr> <td></td> <td>SOLID METAL FLAT RING FOR SMALL TONGUE AND GROOVE FLANGES</td> <td colspan="2" style="text-align: center;">AS SPECIFIED</td> </tr> <tr> <td></td> <td>SOLID METAL FLAT RING FOR LARGE TONGUE AND GROOVE FLANGES</td> <td colspan="2" style="text-align: center;">AS SPECIFIED</td> </tr> <tr> <td></td> <td>SOLID METAL OCTAGONAL RING FOR R.T.J. FLANGES</td> <td colspan="2" style="text-align: center;">DIMENSIONS SHALL BE AS PER ASME B 16.20 (NOTE-2)</td> </tr> <tr> <td></td> <td>SOLID METAL OVAL RING FOR R.T.J. FLANGES</td> <td colspan="2" style="text-align: center;">DIMENSIONS SHALL BE AS PER ASME B 16.20 (NOTE-2)</td> </tr> <tr> <td></td> <td>FULLY ANNEALED CORRUGATED METAL FOR RAISED FACE FLANGES</td> <td style="text-align: center;">3.2</td> <td style="text-align: center;">1.0</td> </tr> </table>						TYPICAL CROSS SECTION	DESCRIPTION	THICKNESS OF GASKET	COMPRESSED THICKNESS (NOTE-1)		FLAT RING FOR RAISED FACE FLANGES	2.0	2.0		FULL FACE FOR FLAT FACE FLANGES		SPIRAL WOUND METAL FLAT RING GASKET, NON METALLIC FILLER , AND A STEEL SOLID RING TYPE CENTERING DEVICE- FOR RAISED FACE FLANGES	4.4	3.0		FLAT METAL JACKETED GASKET , NON METALLIC FILLER COMPLETELY ENCLOSED WITHIN A FULLY ANNEALED DOUBLE METAL JACKET- FOR RAISED FACE FLANGES	3.0	2.0		CORRUGATED METAL JACKETED GASKET, NON METALLIC FILLER, COMPLETELY ENCLOSED WITHIN A FULLY ANNEALED DOUBLE METAL CORRUGATED JACKET- FOR RAISED FACE FLANGES	3.2	1.0		CORRUGATED METAL JACKET - FULLY ANNEALED CORRUGATED METAL WITH FILLER MATERIAL CEMENTED TO THE CORRUGATIONS ON BOTH FACES-FOR RAISED FACE FLANGES	3.2	1.0		SOLID METAL FLAT RING FOR SMALL TONGUE AND GROOVE FLANGES	AS SPECIFIED			SOLID METAL FLAT RING FOR LARGE TONGUE AND GROOVE FLANGES	AS SPECIFIED			SOLID METAL OCTAGONAL RING FOR R.T.J. FLANGES	DIMENSIONS SHALL BE AS PER ASME B 16.20 (NOTE-2)			SOLID METAL OVAL RING FOR R.T.J. FLANGES	DIMENSIONS SHALL BE AS PER ASME B 16.20 (NOTE-2)			FULLY ANNEALED CORRUGATED METAL FOR RAISED FACE FLANGES	3.2	1.0	C
TYPICAL CROSS SECTION	DESCRIPTION	THICKNESS OF GASKET	COMPRESSED THICKNESS (NOTE-1)																																																	
	FLAT RING FOR RAISED FACE FLANGES	2.0	2.0																																																	
	FULL FACE FOR FLAT FACE FLANGES																																																			
	SPIRAL WOUND METAL FLAT RING GASKET, NON METALLIC FILLER , AND A STEEL SOLID RING TYPE CENTERING DEVICE- FOR RAISED FACE FLANGES	4.4	3.0																																																	
	FLAT METAL JACKETED GASKET , NON METALLIC FILLER COMPLETELY ENCLOSED WITHIN A FULLY ANNEALED DOUBLE METAL JACKET- FOR RAISED FACE FLANGES	3.0	2.0																																																	
	CORRUGATED METAL JACKETED GASKET, NON METALLIC FILLER, COMPLETELY ENCLOSED WITHIN A FULLY ANNEALED DOUBLE METAL CORRUGATED JACKET- FOR RAISED FACE FLANGES	3.2	1.0																																																	
	CORRUGATED METAL JACKET - FULLY ANNEALED CORRUGATED METAL WITH FILLER MATERIAL CEMENTED TO THE CORRUGATIONS ON BOTH FACES-FOR RAISED FACE FLANGES	3.2	1.0																																																	
	SOLID METAL FLAT RING FOR SMALL TONGUE AND GROOVE FLANGES	AS SPECIFIED																																																		
	SOLID METAL FLAT RING FOR LARGE TONGUE AND GROOVE FLANGES	AS SPECIFIED																																																		
	SOLID METAL OCTAGONAL RING FOR R.T.J. FLANGES	DIMENSIONS SHALL BE AS PER ASME B 16.20 (NOTE-2)																																																		
	SOLID METAL OVAL RING FOR R.T.J. FLANGES	DIMENSIONS SHALL BE AS PER ASME B 16.20 (NOTE-2)																																																		
	FULLY ANNEALED CORRUGATED METAL FOR RAISED FACE FLANGES	3.2	1.0																																																	
<p>NOTES:</p> <p>1. COMPRESSED GASKET THICKNESS SHALL BE USED AS GAP BETWEEN FLANGES FOR CALCULATING DIMENSIONS</p>						C																																														
B					B																																															
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th style="width:10%;">REV NO</th> <th style="width:10%;">DATE</th> <th style="width:10%;">ZONE</th> <th style="width:30%;">DESCRIPTIONS</th> <th style="width:10%;">BY</th> <th style="width:10%;">APPRD</th> <th style="width:20%;">REFERENCES</th> <th style="width:10%;">DRG. NO.</th> </tr> <tr> <td colspan="8" style="text-align: center;">REVISIONS</td> </tr> </table>						REV NO	DATE	ZONE	DESCRIPTIONS	BY	APPRD	REFERENCES	DRG. NO.	REVISIONS								B																														
REV NO	DATE	ZONE	DESCRIPTIONS	BY	APPRD	REFERENCES	DRG. NO.																																													
REVISIONS																																																				
<p>© THIS DRAWING IS PROPERTY OF B AND R AND IS ISSUED FOR THE SPECIFIC PROJECT MENTIONED THEREIN. THIS IS NOT TO BE COPIED OR USED FOR OTHER PROJECTS UNLESS EXPRESSLY PERMITTED BY B AND R.</p>								B																																												
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td colspan="5">SECTION: DESIGN DEPT.</td> <td rowspan="4" style="text-align: center; vertical-align: middle;">  </td> <td colspan="2" style="text-align: center;">ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड</td> </tr> <tr> <td></td> <td>NAME</td> <td>DATE</td> <td>CHKD</td> <td>DATE</td> <td colspan="2" rowspan="3" style="text-align: center; vertical-align: middle;">BRIDGE AND ROOF CO.(I) LTD.</td> </tr> <tr> <td>DSGN</td> <td>SK/AM</td> <td></td> <td>ST</td> <td></td> </tr> <tr> <td>DRWN</td> <td>SAA</td> <td></td> <td>ST</td> <td></td> </tr> <tr> <td colspan="5">APPROVED SANDIP TALUKDAR</td> <td colspan="3"> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td colspan="2">SCALE : NTS</td> <td>(SHEET 1 OF 1)</td> <td>REV</td> </tr> <tr> <td colspan="2"></td> <td></td> <td style="text-align: center;">0</td> </tr> </table> </td> </tr> </table>						SECTION: DESIGN DEPT.						ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड			NAME	DATE	CHKD	DATE	BRIDGE AND ROOF CO.(I) LTD.		DSGN	SK/AM		ST		DRWN	SAA		ST		APPROVED SANDIP TALUKDAR					<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td colspan="2">SCALE : NTS</td> <td>(SHEET 1 OF 1)</td> <td>REV</td> </tr> <tr> <td colspan="2"></td> <td></td> <td style="text-align: center;">0</td> </tr> </table>			SCALE : NTS		(SHEET 1 OF 1)	REV				0	A					
SECTION: DESIGN DEPT.						ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड																																														
	NAME	DATE	CHKD	DATE		BRIDGE AND ROOF CO.(I) LTD.																																														
DSGN	SK/AM		ST																																																	
DRWN	SAA		ST																																																	
APPROVED SANDIP TALUKDAR					<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td colspan="2">SCALE : NTS</td> <td>(SHEET 1 OF 1)</td> <td>REV</td> </tr> <tr> <td colspan="2"></td> <td></td> <td style="text-align: center;">0</td> </tr> </table>			SCALE : NTS		(SHEET 1 OF 1)	REV				0																																					
SCALE : NTS		(SHEET 1 OF 1)	REV																																																	
			0																																																	
<p>GASKET THICKNESS</p>								A																																												
<p>Page 1551 of 1596</p>								A																																												
<p>DWG NO.- BR-CGD-STD-DWG-60</p>								A																																												
6	5	4	3	2	1			A																																												

C

H

G

F

E

D

C

NOM PIPE SIZE INCHES		BOLT		BOLT LENGTHS LISTED ELBOW ARE VALID FOR A COMPRESSED GASKET THK. OF UPTO 3.2mm.						
		DIA	NO.	FLANGE TO FLANGE WITH TEMP-STRAINER (R.F.)	WITH TEMP-STRAINER / REST ORIFICE	WITH FIG. 8 FLANGE	WITH 1" DRIP RING TAPPING	WITH 3/4" DRIP RING TAPPING	INLET OF S.V.	
1/2		1/2	4	2 1/4	2 1/2	2 1/2	-	-	-	-
3/4		1/2	4	2 1/2	2 3/4	2 3/4	4 1/2	4	-	-
1		1/2	4	2 1/2	2 3/4	2 3/4	4 3/4	4 1/4	3 1/4	3 1/4
1 1/4		1/2	4	2 3/4	3	3 1/4	4 3/4	4 1/4	-	-
1 1/2		1/2	4	2 3/4	3	3 1/4	5	4 1/2	4 1/4	4 1/4
2		5/8	4	3 1/4	3 1/2	3 3/4	5	4 1/2	4 1/2	4 1/2
2 1/2		5/8	4	3 1/2	3 3/4	4	5 1/2	5	5	5
3		5/8	4	3 1/2	3 3/4	4	5 3/4	5 1/4	5	5
3 1/2		5/8	8	3 1/2	3 3/4	4	5 3/4	5 1/4	5	5
4		5/8	8	3 1/2	3 3/4	4	5 3/4	5 1/4	5	5
5		3/4	8	3 3/4	4	4 1/4	5 3/4	5 1/4	5 3/4	5 3/4
6		3/4	8	4	4 1/4	4 3/4	6	5 1/2	5 3/4	5 3/4
8		3/4	8	4 1/4	4 1/2	5	6 1/4	5 3/4	6	6
10		7/8	12	4 1/2	4 3/4	5 1/4	6 1/2	6	6 1/4	6 1/4
12		7/8	12	4 3/4	5	5 3/4	6 3/4	6 1/4	7	7
14		1	12	6 1/4	6 1/2	7 1/4	8 1/2	8	8 1/2	8 1/2
16		1	16	6 1/4	6 1/2	7 1/4	8 1/2	8	8 1/2	8 1/2
18		1 1/8	16	6 7/8	7 1/8	8 1/8	9 1/8	8 5/8	9 1/8	9 1/8
20		1 1/8	20	7 3/8	7 5/8	8 5/8	9 5/8	9 1/8	9 5/8	9 5/8
22		-	-	-	-	-	-	-	-	-
24		1 1/4	20	8	8 1/4	9 1/2	10 1/4	9 3/4	10 1/4	10 1/4

REV NO

DATE

ZONE

DESCRIPTIONS

BY

APPRD

REVISIONS

REFERENCES

DRG. NO.

THIS DRAWING IS PROPERTY OF BAND R AND IS ISSUED FOR THE SPECIFIC PROJECT MENTIONED THEREIN. THIS IS NOT TO BE COPIED OR USED FOR OTHER PROJECTS UNLESS EXPRESSLY PERMITTED BY BAND R.

SECTION: DESIGN DEPT.

NAME

DATE

CHKD

DATE

DSGN

SK/AM

ST

DRWN

SAA

ST

APPROVED

SANDIP TALUKDAR

STUD BOLTS RF 150#

DIMENSIONS

(ASME B16.5)

Page 152 of 1596

बी एण्ड आर
BAND R

Building Nation Since 1920


ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड


BRIDGE AND ROOF CO.(I) LTD.

SCALE : NTS

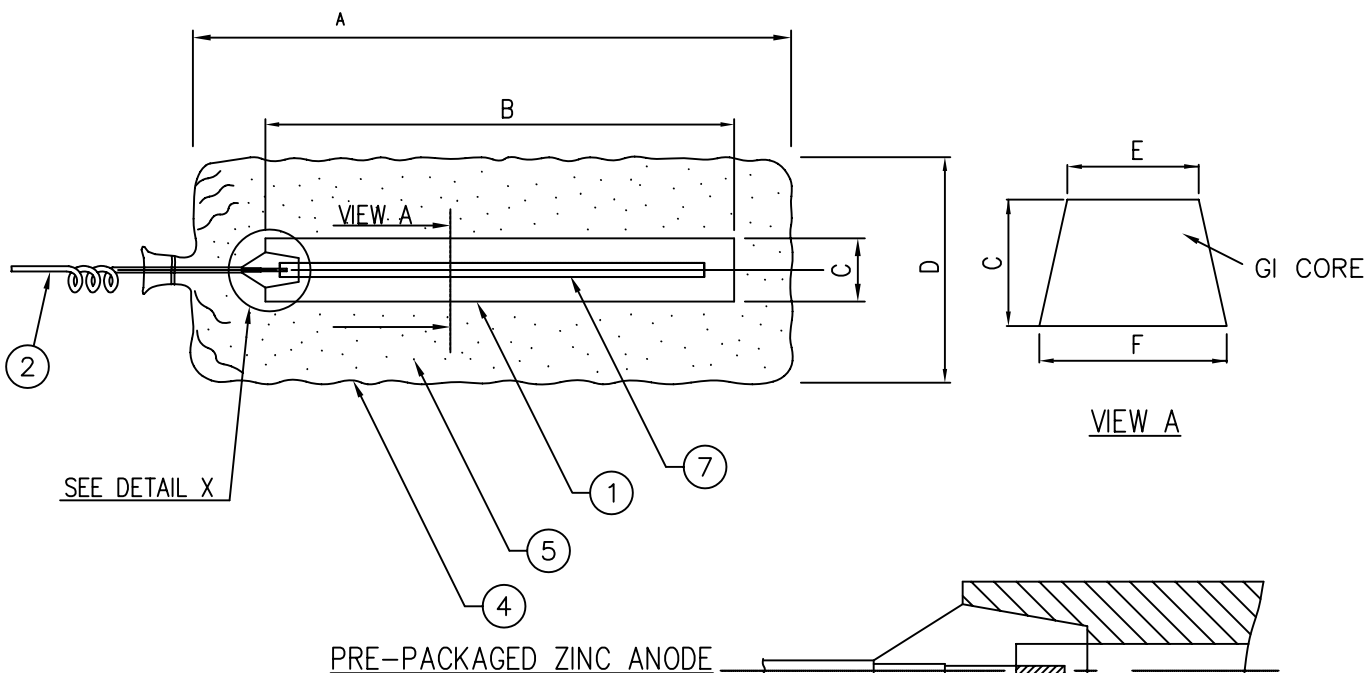
DWG NO.- BR-CGD-STD-DWG-61

(SHEET 1 OF 1)

6		5		4		3		2		1						
BOLT LENGTHS LISTED ELBOW ARE VALID FOR A COMPRESSED GASKET THK. OF UPTO 3.2mm.																
NOM PIPE SIZE INCHES	BOLT		FLANGE TO FLANGE WITH TEMP. STRAINER / REST ORIFICE (R.F.)	WITH FIG. 8 FLANGE	WITH 1" DRIP RING TAPPING	WITH 3/4" DRIP RING TAPPING	INLET OF S.V.									
	DIA	NO.														
1/2	1/2	4	2 1/2	3	-	-	-									
3/4	5/8	4	3	3 1/2	4 3/4	4 1/4	-									
1	5/8	4	3	3 1/2	5 1/4	4 3/4	4 1/4									
1 1/4	5/8	4	3 1/4	3 3/4	5 1/4	4 3/4	-									
1 1/2	3/4	4	3 1/2	4	5 1/2	5	4 3/4									
2	5/8	8	3 1/2	4	5 3/4	5 1/4	4 3/4									
2 1/2	3/4	8	4	4 1/2	5 3/4	5 1/4	5 1/2									
3	3/4	8	4 1/4	4 3/4	6 1/4	5 3/4	5 1/2									
3 1/2	3/4	8	4 1/4	4 1/2	6 1/2	5 3/4	5 1/2									
4	3/4	8	4 1/2	5 1/4	6 1/2	5 3/4	5 3/4									
5	3/4	8	4 3/4	5 1/2	6 3/4	6 1/4	6									
6	3/4	12	4 3/4	5 1/2	7	6 1/2	6									
8	7/8	12	5 1/2	6 1/2	7 3/4	7 1/4	6 3/4									
10	1	16	7 1/4	8 1/2	9 1/2	9	8 1/4									
12	1 1/8	16	7 7/8	9 1/8	10 1/8	9 5/8	10 1/8									
14	1 1/8	20	8 1/8	9 5/8	10 3/8	9 7/8	10 3/8									
16	1 1/4	20	8 3/4	9	10 1/2	10 1/2	11									
18	1 1/4	24	9	9 1/4	11 1/4	10 3/4	11 1/4									
20	1 1/4	24	9 1/4	9 1/2	11 1/4	11 1/2	11 1/2									
22	-	-	-	-	-	-	-									
24	1 1/2	24	10 1/2	12 3/4	12 3/4	12 1/4	12 3/4									
B																
REV NO		DATE		ZONE		DESCRIPTIONS		BY		APPRD						
REVISIONS						REFERENCES			DRG. NO.							
© THIS DRAWING IS PROPERTY OF B AND R AND IS ISSUED FOR THE SPECIFIC PROJECT MENTIONED THEREIN. THIS IS NOT TO BE COPIED OR USED FOR OTHER PROJECTS UNLESS EXPRESSLY PERMITTED BY B AND R.																
SECTION: DESIGN DEPT.						STUD BOLTS RF 300# DIMENSIONS (ASME B16.5)			 ब्री एंड रूफ ऑर B AND R Building Nation Since 1920			ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड BRIDGE AND ROOF CO.(I) LTD.				
NAME		DATE		CHKD											DATE	
DSGN		SK/AM		ST												
DRWN		SAA		ST												
APPROVED						SANDIP TALUKDAR			SCALE : NTS (SHEET 1 OF 1)			REV 0				
									DWG NO.- BR-CGD-STD-DWG-62			0				
6		5		4		3		2		1						

6		5		4		3		2		1				
BOLT LENGTHS LISTED ELBOW ARE VALID FOR A COMPRESSED GASKET THK. OF UPTO 3.2mm.														
NOM PIPE SIZE INCHES	BOLT		FLANGE TO FLANGE WITH TEMP. STRAINER /REST ORIFICE (R.F.)	WITH FIG. 8 FLANGE	WITH DRIP RING 1" TAPPING	WITH DRIP RING 3/4" TAPPING	INLET OF S.V.							
	DIA	NO.												
1/2	1/2	4	3	3 1/4	3 1/2	-	-							
3/4	5/8	4	3 1/2	3 3/4	4	5 3/4	5 1/4							
1	5/8	4	3 1/2	3 3/4	4	5 3/4	5 1/4							
1 1/4	5/8	4	3 3/4	4	4 1/4	6	5 1/2							
1 1/2	3/4	4	4 1/4	4 1/2	4 3/4	6 1/2	6							
2	5/8	8	4 1/4	4 1/2	4 3/4	6 1/2	6							
2 1/2	3/4	8	4 3/4	5	5 1/2	7	6 1/2							
3	3/4	8	5	5 1/4	5 3/4	7 1/4	6 3/4							
3 1/2	7/8	8	5 1/2	5 3/4	6 1/4	7 3/4	7 1/4							
4	7/8	8	5 3/4	6	6 1/2	8	7 1/2							
5	1	8	7 1/2	7 3/4	8 1/2	9 3/4	9 1/4							
6	1	12	7 3/4	8	8 3/4	10	9 1/2							
8	1 1/8	12	8 5/8	8 7/8	9 7/8	10 7/8	10 3/8							
10	1 1/4	16	9 3/4	10	11 1/4	12	11 1/2							
12	1 1/4	20	10	10 1/4	11 3/4	12 1/4	11 3/4							
14	1 3/8	20	10 5/8	10 7/8	12 5/8	12 7/8	12 3/8							
16	1 1/2	20	11 1/2	11 3/4	13 3/4	13 3/4	13 1/4							
18	1 5/8	20	12 3/8	12 5/8	14 5/8	14 5/8	14 1/8							
20	1 5/8	24	12 7/8	13 1/8	15 5/8	15 3/8	14 7/8							
22	-	-	-	-	-	-	-							
24	1 7/8	24	14 7/8	15 1/8	17 7/8	17 1/8	16 5/8							
17 1/8														
B														
REV NO		DATE		ZONE		DESCRIPTIONS		BY		APPRD				
REVISIONS						REFERENCES				DRG. NO.				
© THIS DRAWING IS PROPERTY OF B AND R AND IS ISSUED FOR THE SPECIFIC PROJECT MENTIONED THEREIN. THIS IS NOT TO BE COPIED OR USED FOR OTHER PROJECTS UNLESS EXPRESSLY PERMITTED BY B AND R.														
SECTION: DESIGN DEPT.						STUD BOLTS RF 600# DIMENSIONS (ASME B16.5)					ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड BRIDGE AND ROOF CO.(I) LTD.			
NAME		DATE		CHKD									DATE	
DSGN		SK/AM		ST										
DRWN		SAA		ST										
APPROVED						SANDIP TALUKDAR								
Page 1554 of 1596						SCALE : NTS (SHEET 1 OF 1) REV 0								
DWG NO.- BR-CGD-STD-DWG-63														
6		5		4		3		2		1				

CATHODIC PROTECTION DRAWINGS



CHEMICAL COMPOSITION OF ANODE (% WEIGHT)

ELEMENT	TYPE-I	TYPE-II
Al	: 0.1% - 0.5 %	0.005 %MAX
Cd	: 0.025% - 0.07%	0.003%MAX
Cu	: 0.005% MAX	0.002% MAX
Fe	: 0.005% MAX	0.0014% MAX
Pb	: 0.006% MAX	0.003% MAX
OTHERS	: 0.1%MAX	-
Zn	: REMAINDER	REMAINDER

NOTES: -

1. ANODE COMPOSITION, NET WEIGHT, GROSS WEIGHT DIMENSIONS SHALL BE FURNISHED BY CONTRACTOR.
2. ANODE TAIL CABLE SHALL BE HIGH CONDUCTIVITY, STRANDED, COPPER CONDUCTOR, 600/1100 V GRADE, XLPE INSULATED, PVC SHEATHED & UNARMoured.
3. THICKNESS OF BACKFILL SHALL BE ADEQUATE TO SAFEGUARD THE ANODES AGAINST THE EFFECT OF CARBONATES, BICARBONATES, NITRATES, etc. IN SOIL ANODES SHALL BE PROVIDED WITH MIN. 50MM THICK BACKFILL ON ALL SIDES OF ANODE OR MIN. 20 KG NET WHICHEVER IS HIGHER. TYPE-I & TYPE-II ANODE SHALL BE USED AS PER THEIR APPLICATION DESCRIBED IN ASTM B418-09.


Anode Open Circuit Potential : (-) 1.1 Volts (min.) w.r.t CSE

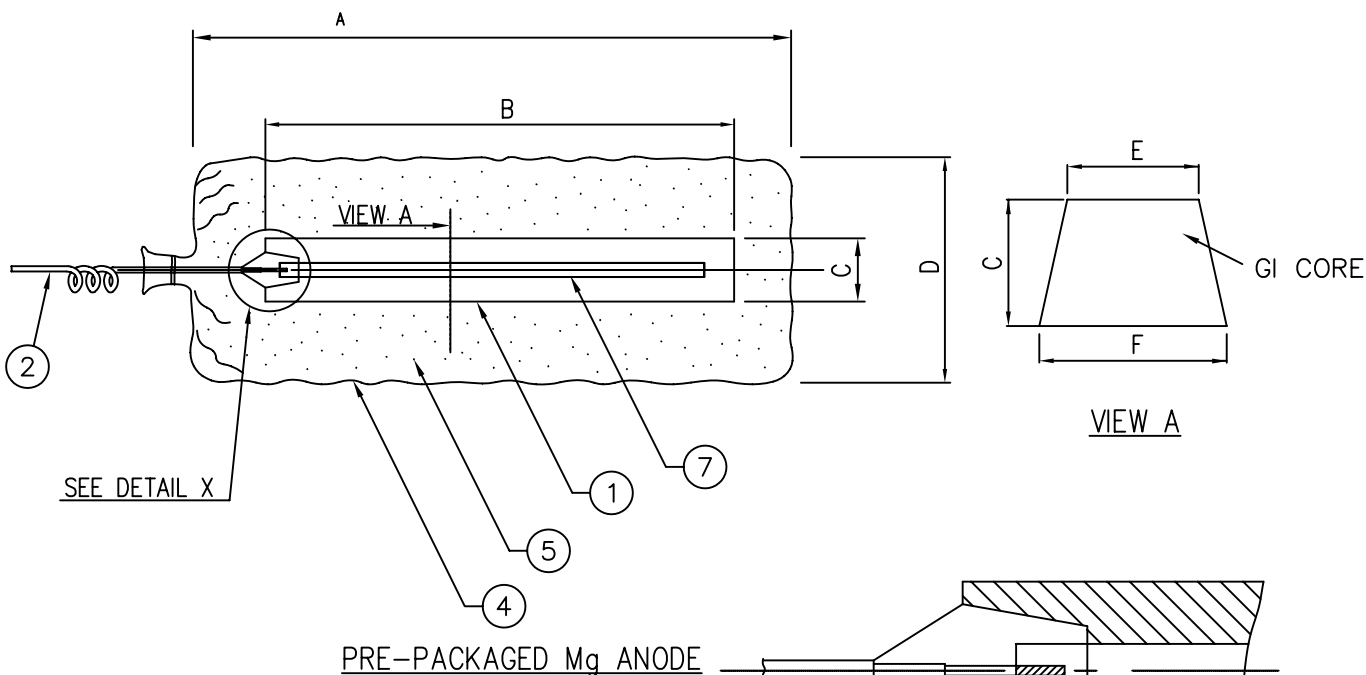
Anode Consumption Rate : 11.2 kg/ (A year) Max.

BACKFILL COMPOSITION

Gypsum : 75%
Bentonite : 20%
Sodium sulphate : 5%

7	2.5 THICK x 15 WIDE GI CORE STRIP (PART OF ZINC ANODE)	1
6	SILVER SOLDER	AS REQD.
5	BACKFILL MATERIAL	AS REQD.
4	COTTON BAG	1
3	M-SEAL COMPOUND	AS REQD.
2	ANODE TAIL CABLE, PE INSULATED, PVC SHEATHED, UNARMoured, SINGLE CORE COPPER, 600/1100 V.	AS REQD.
1	ZINC ANODE	1
ITEM	DESCRIPTION	QTY.
BILL OF MATERIALS		

01	07.09	05/09	REVISED & ISSUED	AM	DG		
REV NO	DATE	ZONE	DESCRIPTIONS	BY	APPRD		
REVISIONS				REFERENCES		DRG. NO.	
SECTION: DESIGN DEPT.				PREPACKAGED ZINC ANODE		 ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड BRIDGE AND ROOF CO. (I) LTD	
NAME	DATE	CHKD	DATE				
DSGN	AM	02.09	SS 05.09				
DRWN	SJ	02.09					
SANDIP TALUKDAR APPROVED				SCALE : N.T.S.		REV 1	
				DWG NO.- BR-CGD-STD.-DWG-CP-01			



CHEMICAL COMPOSITION OF ANODE

ELEMENT	High Potential Type	ELEMENT	Low Potential Type
Al	: 0.010% MAX	Al	: 5.3-6.7% MAX
Mn	: 0.50-1.3% MAX	Mn	: 0.15-0.7% MAX
Cu	: 0.02% MAX	Cu	: 0.02% MAX
Fe	: 0.03% MAX	Fe	: 0.003% MAX
Ni	: 0.001% MAX	Ni	: 0.002% MAX
Zn	: -	Zn	: 2.5-3.5% MAX
Si	: 0.05% MAX	Si	: 0.1% MAX
OTHERS	: 0.3% MAX	OTHERS	: 0.3% MAX
Mg	: REMAINDER	Mg	: REMAINDER

NOTES: -

1. ANODE COMPOSITION, NET WEIGHT, GROSS WEIGHT DIMENSIONS SHALL BE FURNISHED BY CONTRACTOR.
2. ANODE TAIL CABLE SHALL BE HIGH CONDUCTIVITY, STRANDED, COPPER CONDUCTOR, 650V GRADE, PVC INSULATED, PVC SHEATHED & ARMoured. TYPE-I & TYPE-II ANODE SHALL BE USED AS PER THEIR APPLICATION DESCRIBED IN ASTM B843-07.

Anode Open Circuit Potential : (-) 1.5 Volts (min.) w.r.t CSE

Anode Consumption Rate : 7.9 kg/ (A year) Max.

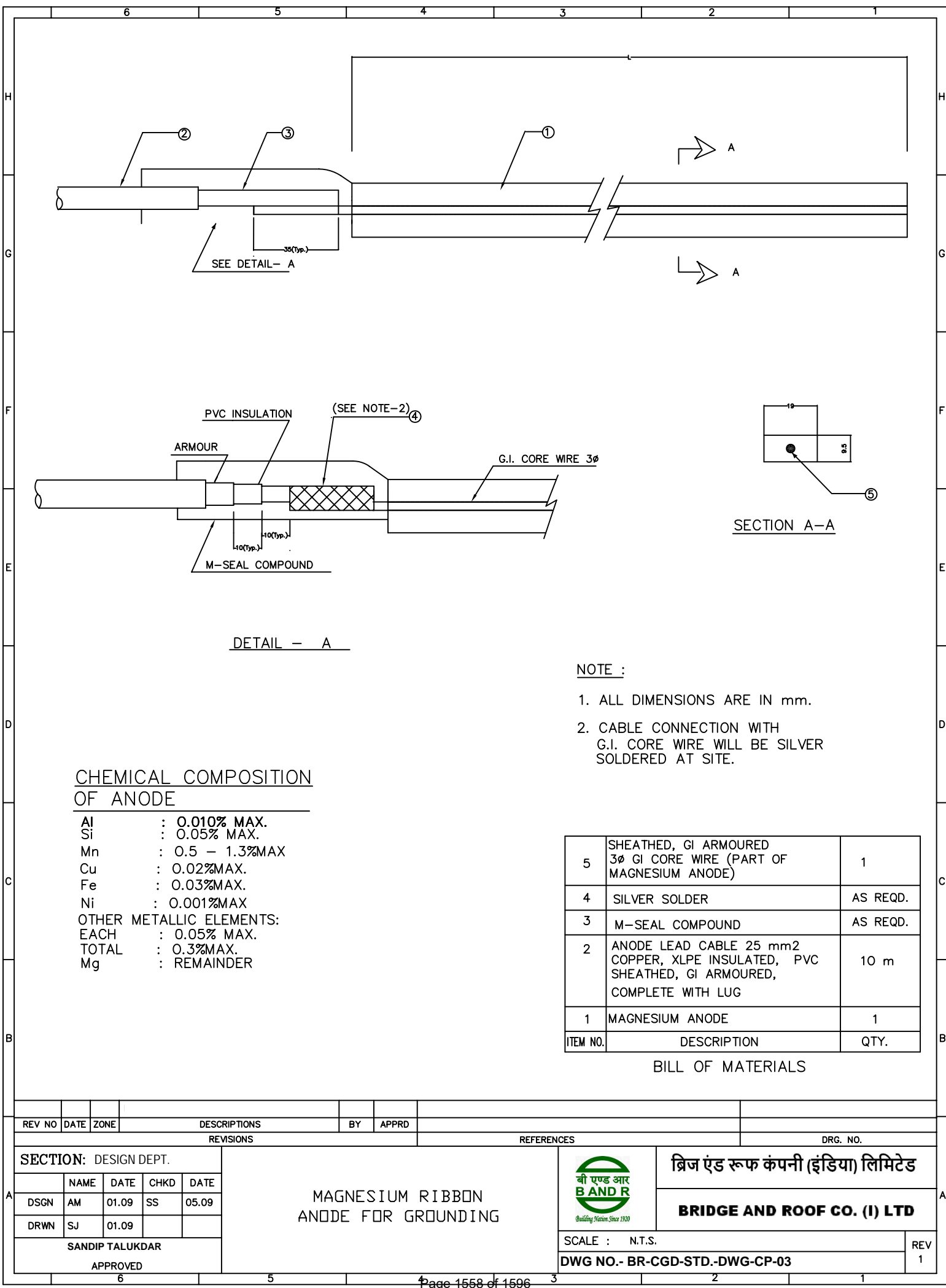
BACKFILL COMPOSITION

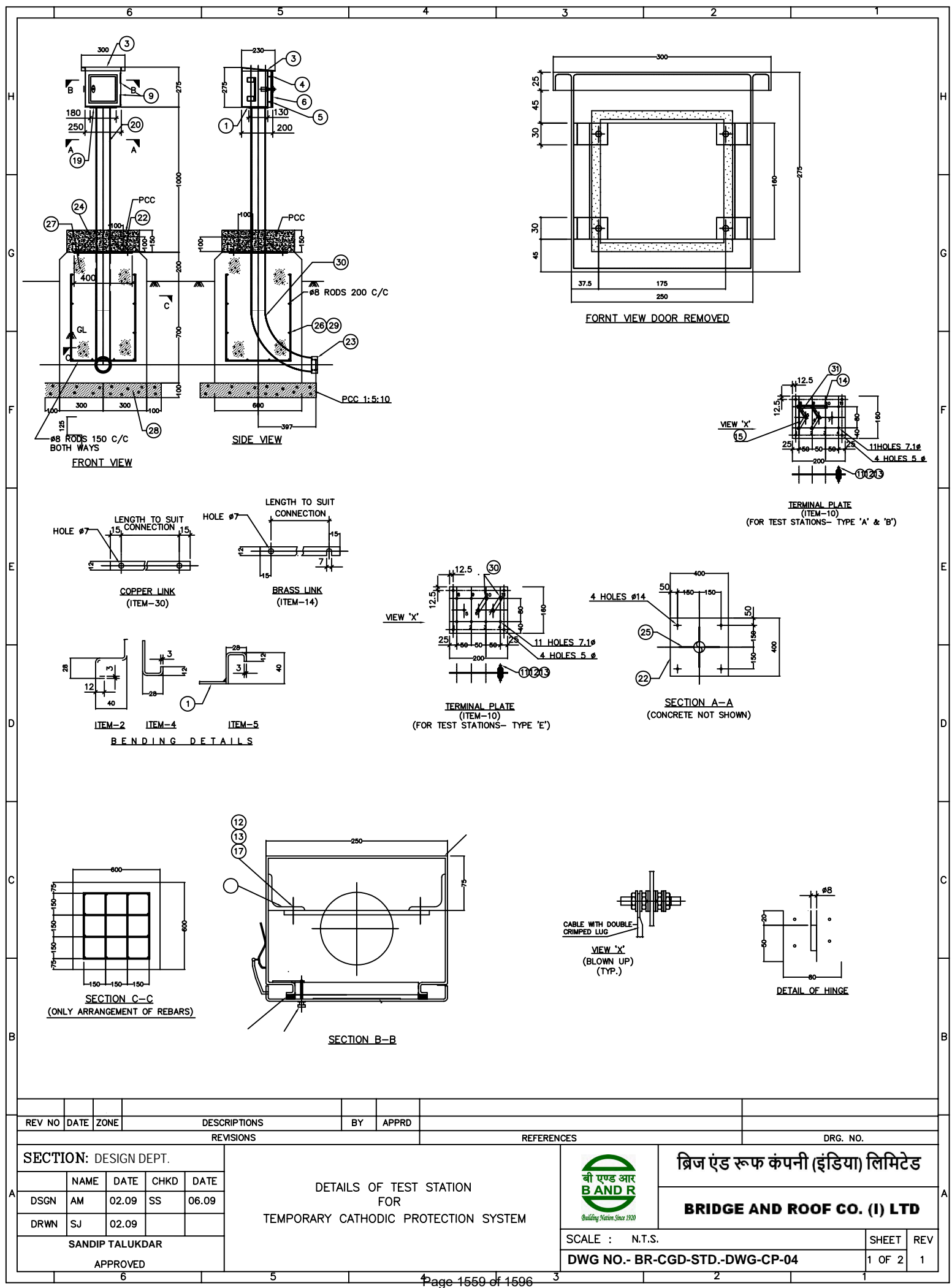
Gypsum : 75%
Bentonite : 20%
Sodium sulphate : 5%

ASTM B418-09

7	2.5 THICK x 15 WIDE GI CORE STRIP (PART OF MAGNESIUM ANODE)	1
6	SILVER SOLDER	AS REQD.
5	BACKFILL MATERIAL	AS REQD.
4	COTTON BAG	1
3	M-SEAL COMPOUND	AS REQD.
2	ANODE TAIL CABLE, PE INSULATED, PVC SHEATHED, ARMoured, SINGLE CORE COPPER, 600/1100 V.	AS REQD.
1	MAGNESIUM ANODE	1
ITEM	DESCRIPTION	QTY.
BILL OF MATERIALS		

REV NO.	DATE	ZONE	DESCRIPTIONS	BY	APPRD	REFERENCES	DRG. NO.												
<div style="display: flex; justify-content: space-between;"> <div> <p>SECTION: DESIGN DEPT.</p> <table border="1"> <tr> <th>NAME</th> <th>DATE</th> <th>CHKD</th> <th>DATE</th> </tr> <tr> <td>DSGN AM</td> <td>02.09</td> <td>SS</td> <td>05.09</td> </tr> <tr> <td>DRWN SJ</td> <td>03.09</td> <td></td> <td></td> </tr> </table> <p>SANDIP TALUKDAR APPROVED</p> </div> <div> <p>PREPACKAGED MAGNESIUM ANODE</p> </div> <div> </div> </div>								NAME	DATE	CHKD	DATE	DSGN AM	02.09	SS	05.09	DRWN SJ	03.09		
NAME	DATE	CHKD	DATE																
DSGN AM	02.09	SS	05.09																
DRWN SJ	03.09																		
SCALE : N.T.S.						REV 1													
DWG NO.- BR-CGD-STD.-DWG-CP-02																			




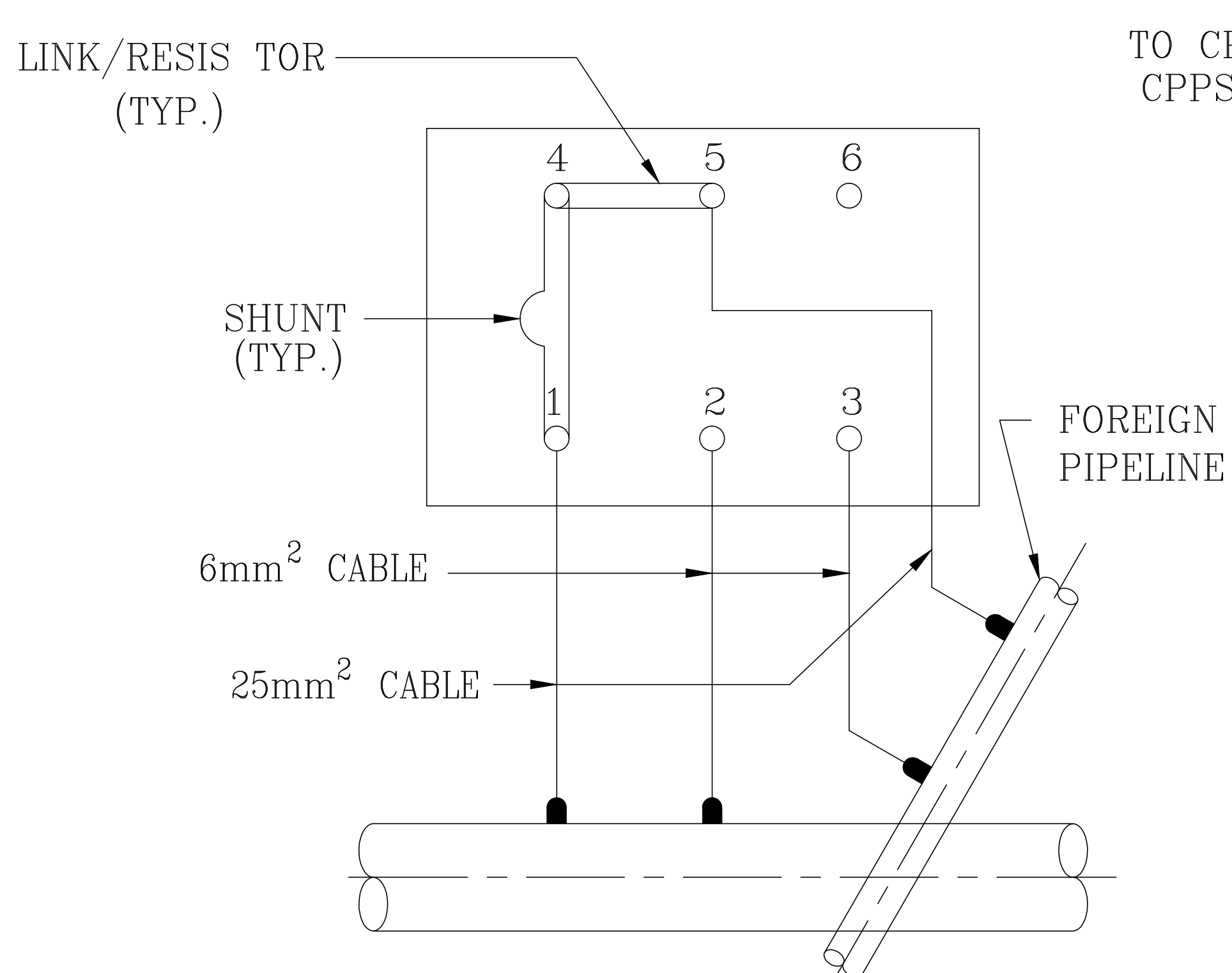


NOTES:-

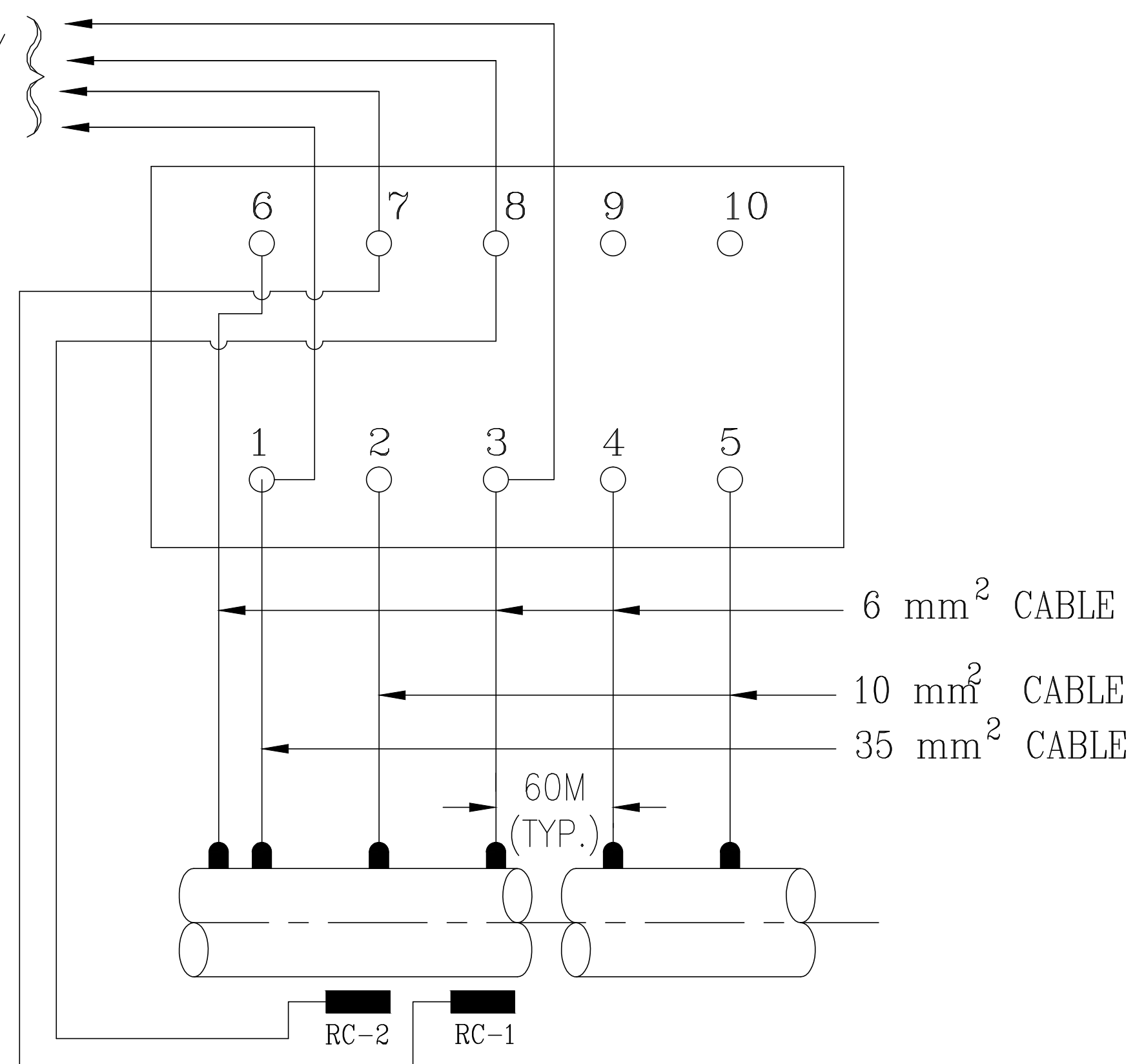
- TEST STATION SHALL HAVE WEATHERPROOF ENCLOSURE HAVING DEGREE OF PROTECTION IP-55, AS DEFINED IN IEC-529(1989)/ IS:2147 (1962) THE SHUTTER SHALL BE HINGED TYPE WITH CONCEALED LOCK AND SHALL HAVE DOOR GASKET.
- THE HINGES SHALL BE WELDED TO THE SHUTTER AND THE BOX SUITABLY.
- THE MS ANGLES SHALL BE WELDED TO THE SIDES. THE ANGLES SHALL HAVE TAPPED HOLES FOR FIXING TERMINAL PLATE.
- THE INNER SURFACE OF THE TEST STATION SHALL BE PAINTED WITH LEAD OXIDE PRIMER GRADE.
- THE OUTSIDE OF THE TEST STATION SHALL BE PAINTED WITH TWO COATS OF ZINC RED EPOXY PRIMER AND THREE COATS OF GREY COLOURED EPOXY PAINT COMPLETE WITH CABLE PIPE & FDN. PLATE.
- THE NAME PLATE SHALL BE OF ANODISED ALUMINIUM WITH BLACK BACKGROUND AND WHITE LETTERS (SIZE 3mm). THE NAME PLATE SHALL BE FIXED TO INNER SIDE OF SHUTTER BY ARALDITE OR EQUIVALENT.
- THE NAME PLATE OF EACH TEST STATION SHALL CARRY THE FOLLOWING INFORMATION.
 - TEST STATION CONNECTION SCHEME TYPE
 - RELEVANT TEST STATION CONNECTION SCHEME DIAGRAM
 - TEST STATION NO.
 - CHAINAGE IN KM
 - DISTANCE FROM PIPE IN m
 - DIRECTION OF GAS FLOW
- WHEN ERECTED, THE TEST STATION SHALL BE IN UPRIGHT POSITION.
- TEST STATION SHALL BE SO ERECTED AS TO SERVE ALSO AS PIPELINE MARKER. AND ANODE GROUND BED MARKER. THEIR SHUTTERS SHALL BE PARALLEL TO THE LINE OF AXIS OF PIPELINE AND FACING IT.
- THE NUMBER OF ALL TEST STATIONS SHALL BE WRITTEN WITH BLACK PAINT USING 40 mm STENCIL BLOCK ON THE OUTER SIDE OF THE SHUTTER IN A UNIFORM MANNER. AN ARROW SHOWING DIRECTION OF FLOW OF GAS SHALL BE MARKED TO UNDERLINE THE TEST STATION NUMBER ON SHUTTER.
- HEIGHT OF THE TEST STATION ABOVE GROUND LEVEL SHOWN IN THE DRAWING IS TYPICAL.
- ALL CABLES COMING TO TEST STATION SHALL BE LABELLED ON BOTH ENDS WITH IDENTIFICATION NUMBERS
- TOTAL NUMBER OF TEST STATIONS AND THEIR TYPES ARE MENTIONED IN CONSOLIDATED B.O.M.
- TEST BETWEEN BRASS TERMINALS AND BODY AT 2KV FOR ONE MINUTE.
- ALL DIMENSIONS ARE APPROXIMATE AND CAN VARY SLIGHTLY.
- ALL DIMENSIONS ARE IN mm.

31	VARIABLE RESISTANCE 0-0.1 Ohm.	01
30	100 MM Ø M.S. SCH.40 90° ELBOW, R=5D	01
29	BINDING WIRE, MS	AS REQD.
28	PCC MIX, 1:5:10	0.064 m ³
27	RCC MIX, M20	0.324 m ³
26	ROD, 8Ø MS	28 m
25	STIFFENER PLATE, 8THK.	04
24	FOUNDATION BOLT M12	04
23	RUBBER BUSH MATCHING WITH PIPE	01
22	FOUNDATION PLATE, 6THKx400x400 MS PLATE	02
21	NEOPRENE RUBBER GASKET, 6THK.	01 SET
20	MS PIPE, 100 Ø, IS: 1239 PT.1(1990)-HEAVY GRADE	01
19	COUPLING PLATE, 5THK.x180x130 MS PLATE, 100Ø HOLE AT CENTRE	01
18	LATCH FOR SHUTTER	01
17	BRASS SCREW, M6x16	04
16	ANGLE, 5THK. x 50 x 50 x 30	04
15	SHUNT, 0.1 OHM, 0.5 A, 50 mV	01
14	COPPER LINK, 2.5 THK.x 12 x LENGTH AS REQD.	01
13	BRASS WASHER 8 mm dia (M8) Cd Coated	AS REQD.
12	BRASS NUT, M6 Brass Nut Bolt washer	AS REQD.
11	BRASS STUD, M6 x 50	AS REQD.
10	TERMINAL PLATE, 6THK.x160 x 200 PHENOLIC LAM. SHT	01
9	HINGE FOR SHUTTER	02
8	CASTLE LOCK WITH ONE KEY PER TEST STATION	01
7	NAME PLATE, 0.9THK.x120x160 ANODISED ALUMINIUM	01
6	SHUTTER, 3 THK.x250x296 MS SHT	01
5	FRONT BOTTOM, 3 THK.x170x74 MS SHT	01
4	FRONT TOP, 3 THK.x170x79 MS SHT	01
3	TOP, 3 THK.x232x300/344 MS SHT	01
2	REAR & SIDES, 3 THK.x275/250x718 MS SHT	01
1	BOTTOM PLATE, 5 THK.x160x244 MS PLATE, 100Ø HOLE AT CENTRE	01
ITEM	DESCRIPTION	QTY.
BILL OF MATERIALS		

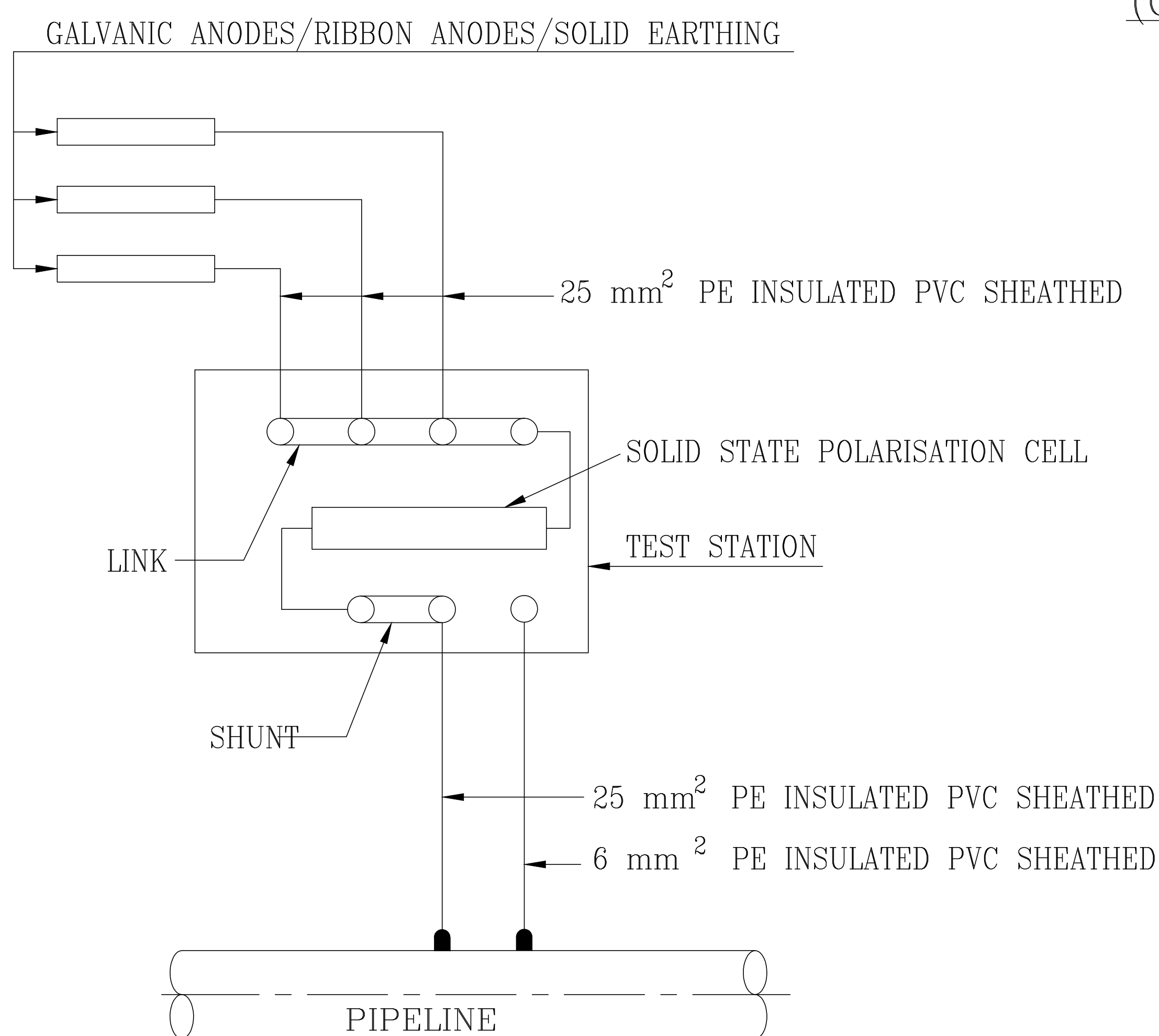
01	07.09	05/09	REVISED & ISSUED	AM	DG			
REV NO	DATE	ZONE	DESCRIPTIONS	BY	APPRD			
REVISIONS				REFERENCES		DRG. NO.		
SECTION: DESIGN DEPT.						ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड		
NAME	DATE	CHKD	DATE			BRIDGE AND ROOF CO. (I) LTD		
DSGN	AM	02.09	SS			05.09		
DRWN	SJ	02.09						
SANDIP TALUKDAR				SCALE : N.T.S.		SHEET	REV	
APPROVED				DWG NO.- BR-CGD-STD.-DWG-CP-04		2 OF 2	1	



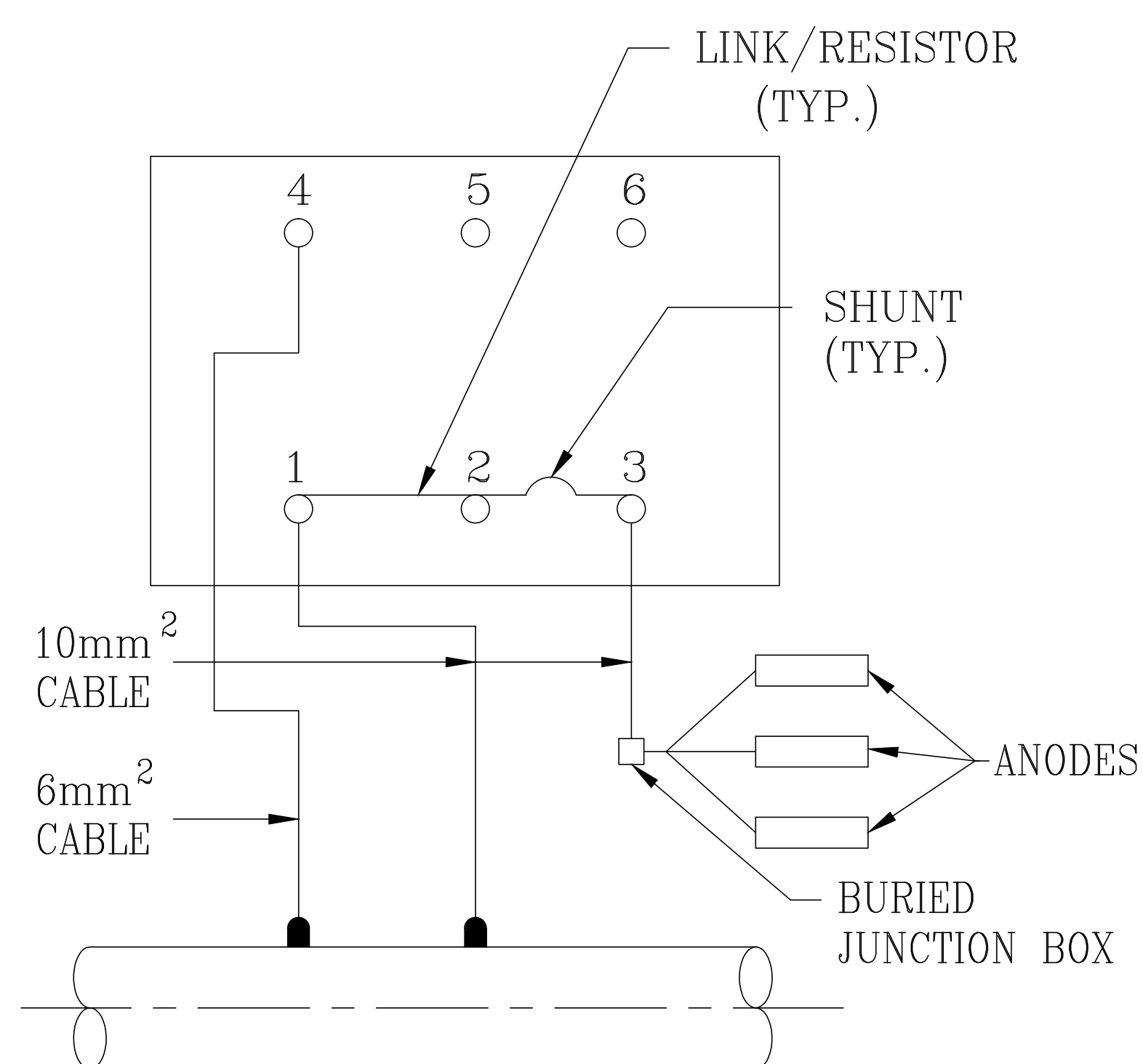
FOREIGN PIPELINE CROSSING
(CONNECTION SCHEME-F)



INTERMEDIATE STATION
IMPRESSED CURRENT DRAINAGE POINT
(CONNECTION SCHEME-G)

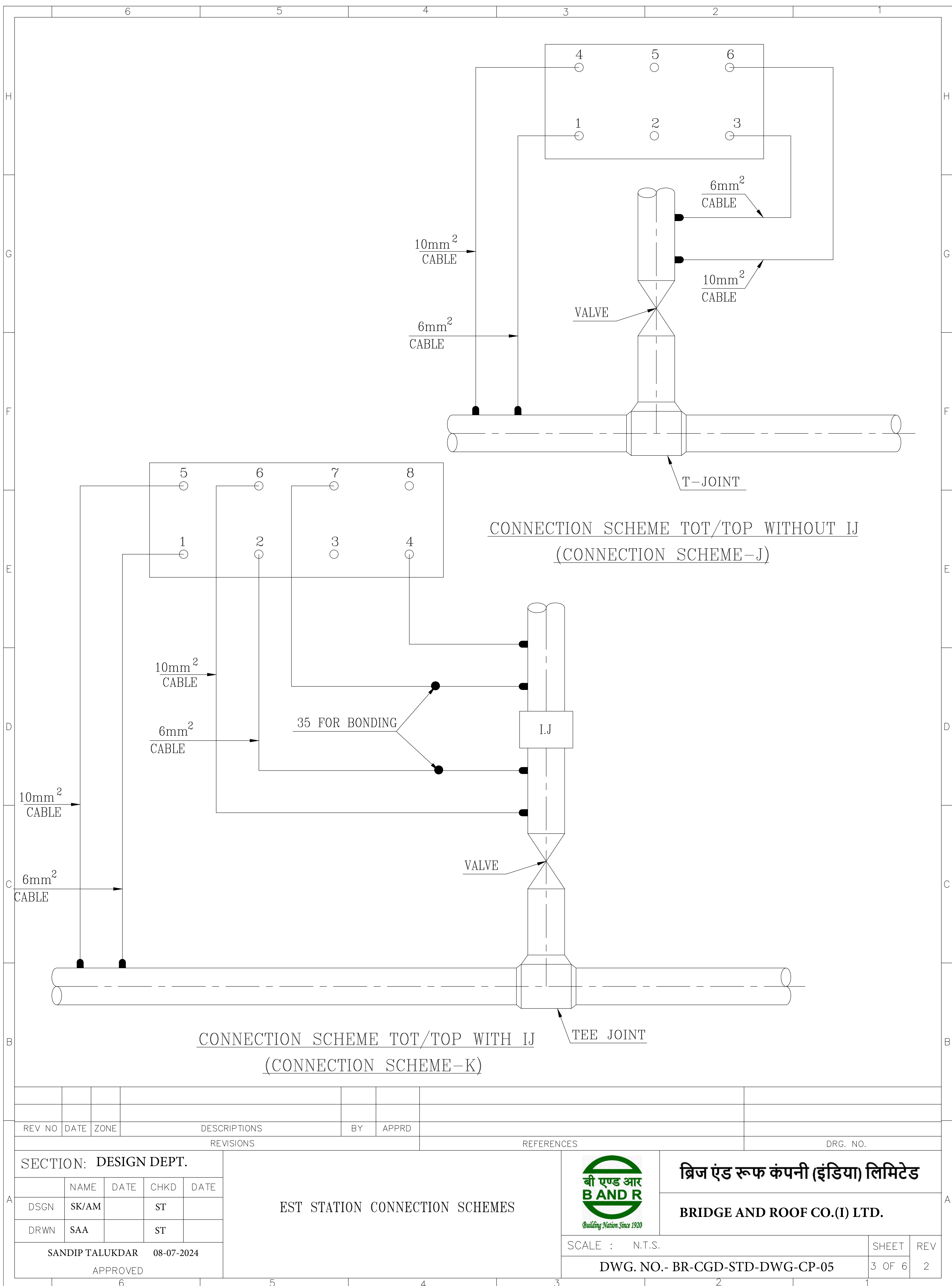


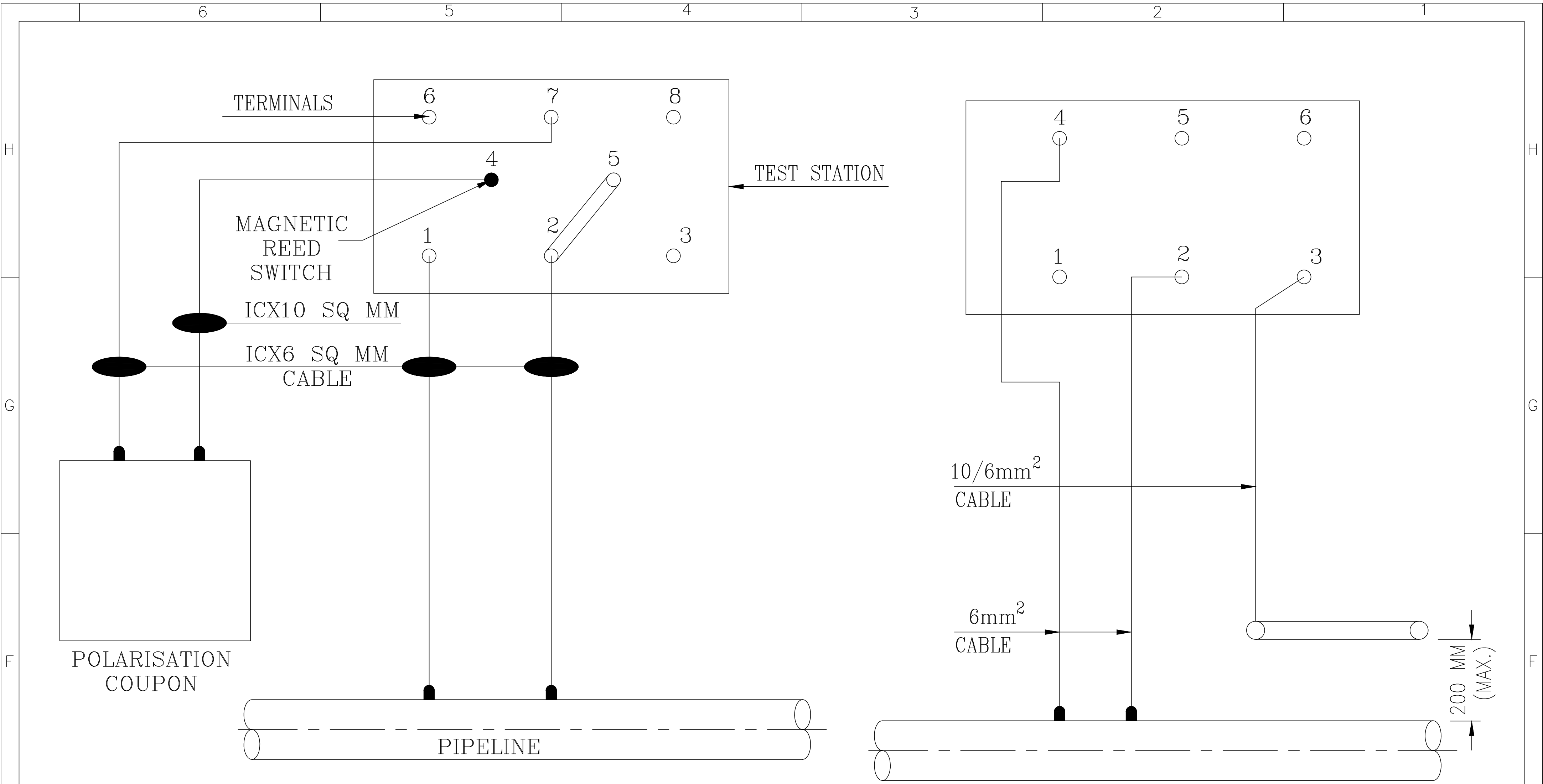
CONNECTION SCHEME PIPELINE GROUNDING THROUGH
POLARISATION CELL WITH GALVANIC ANODE/SOLID
EARTHING (CONNECTION SCHEME-H)



TCP GALVANIC ANODE INSTALLATION
(CONNECTION SCHEME-I)

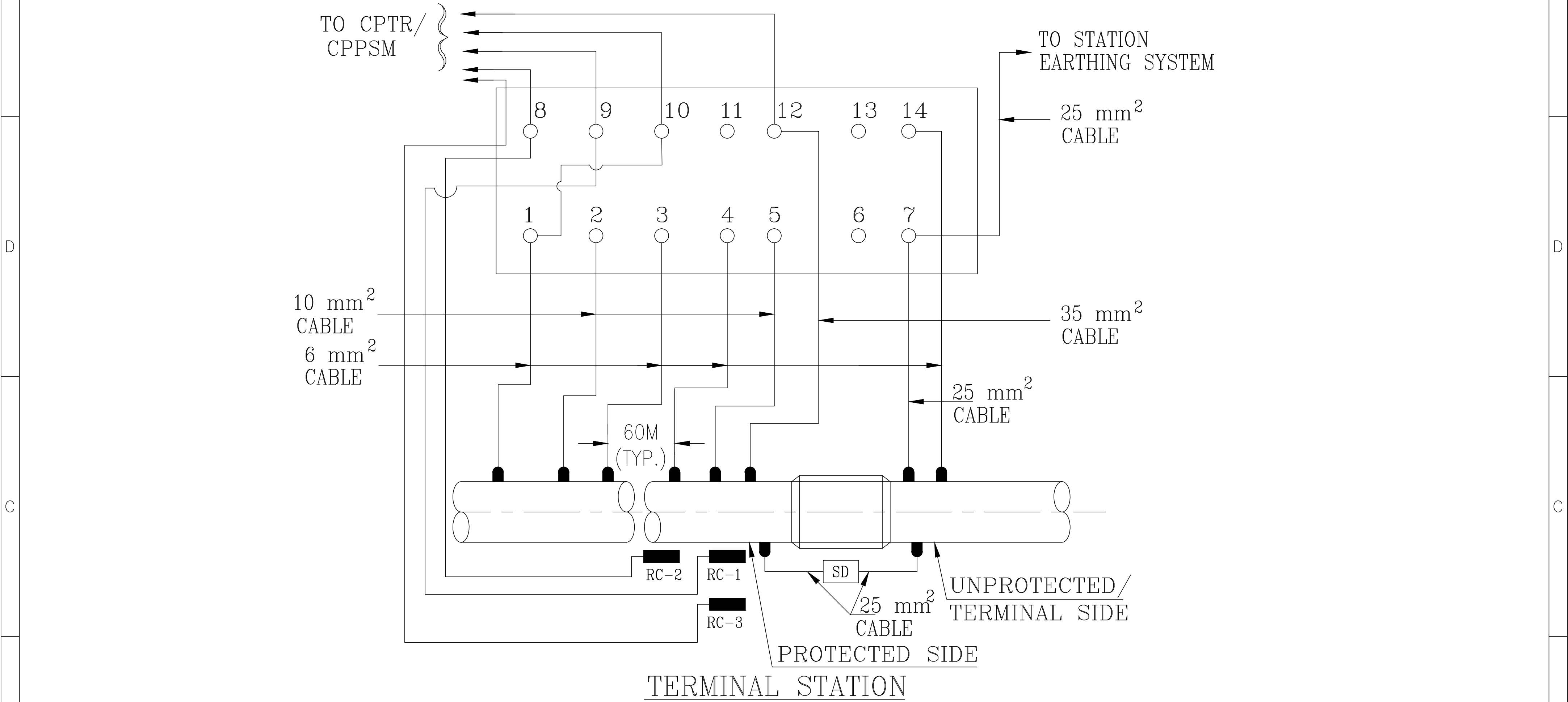
[illegible]





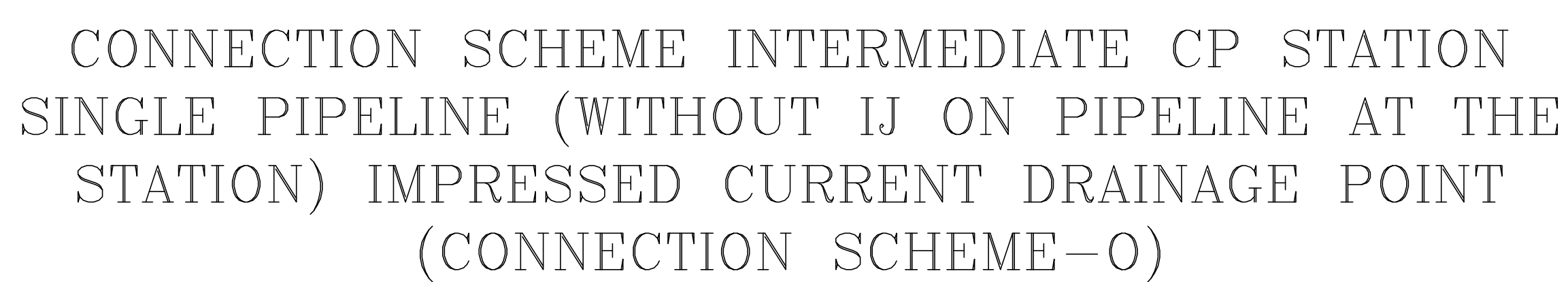
CONNECTION SCHEME POLARISATION
COUPON WITH MAGNETIC REED SWITCH
(CONNECTION SCHEME-L)

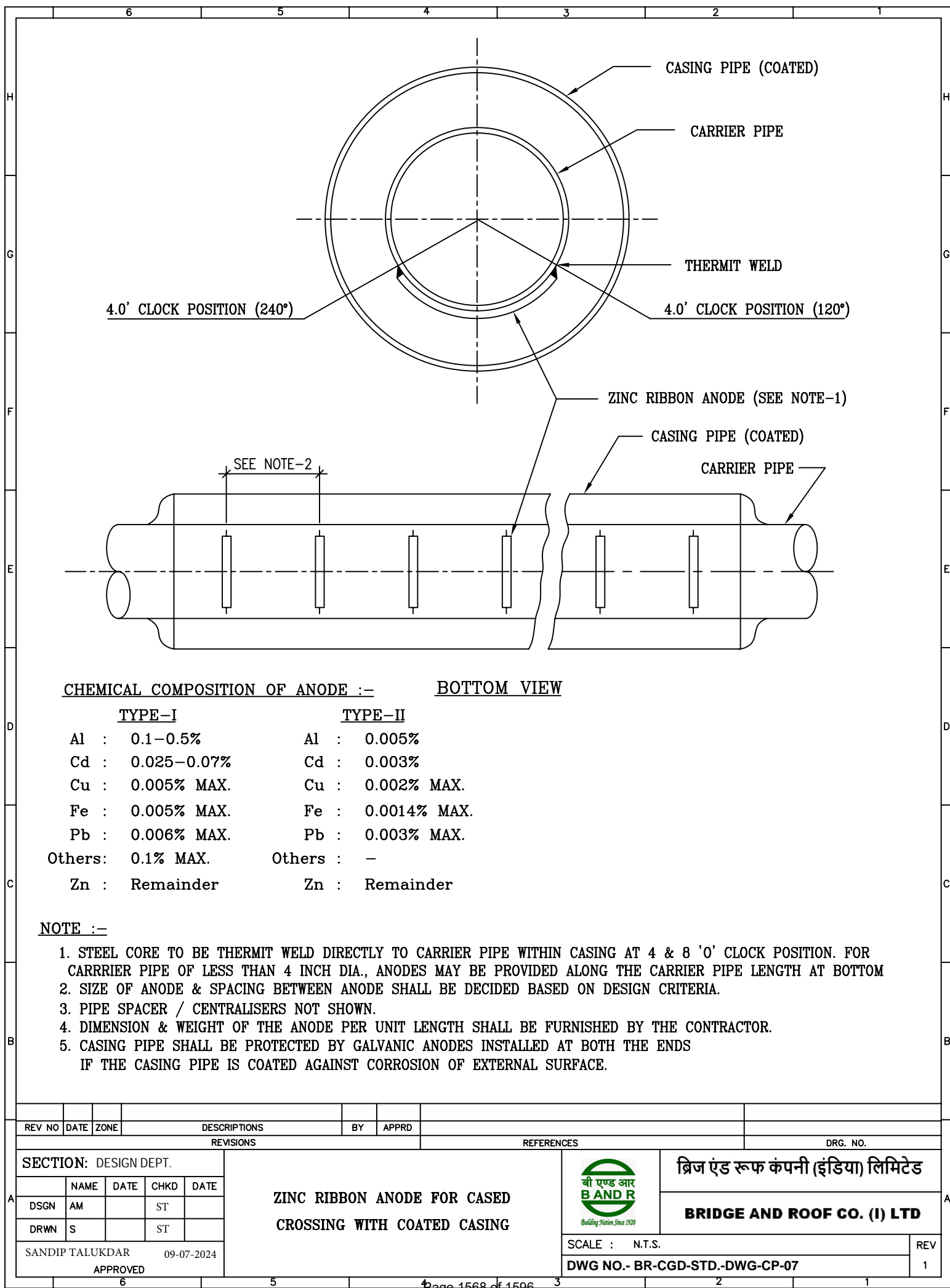
CONNECTION SCHEME EXTERNAL ER PROBE
(CONNECTION SCHEME-M)

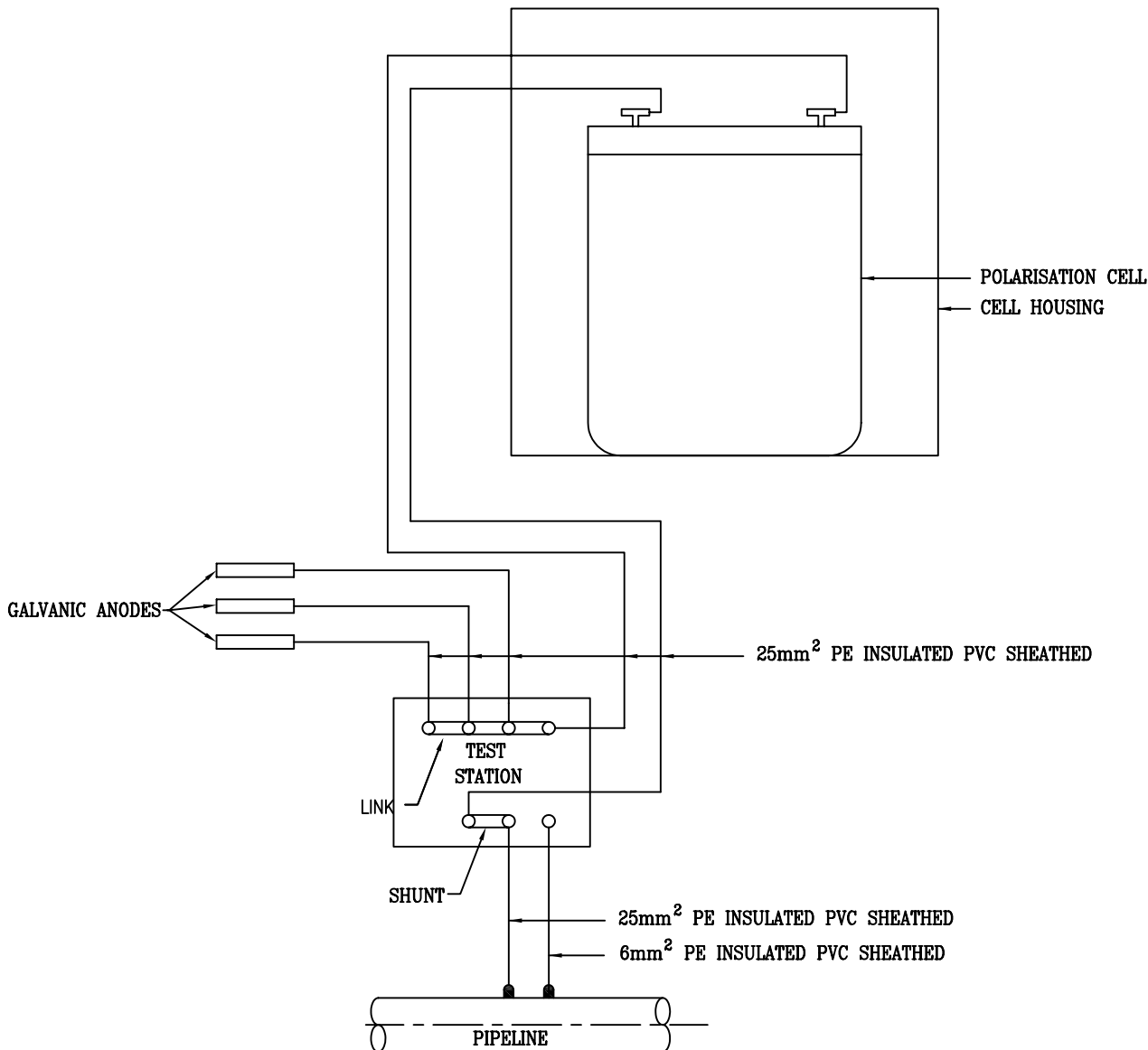


CURRENT DRAINAGE POINT FOR PCP
(CONNECTION SCHEME-N)

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Page 1565 of 1596



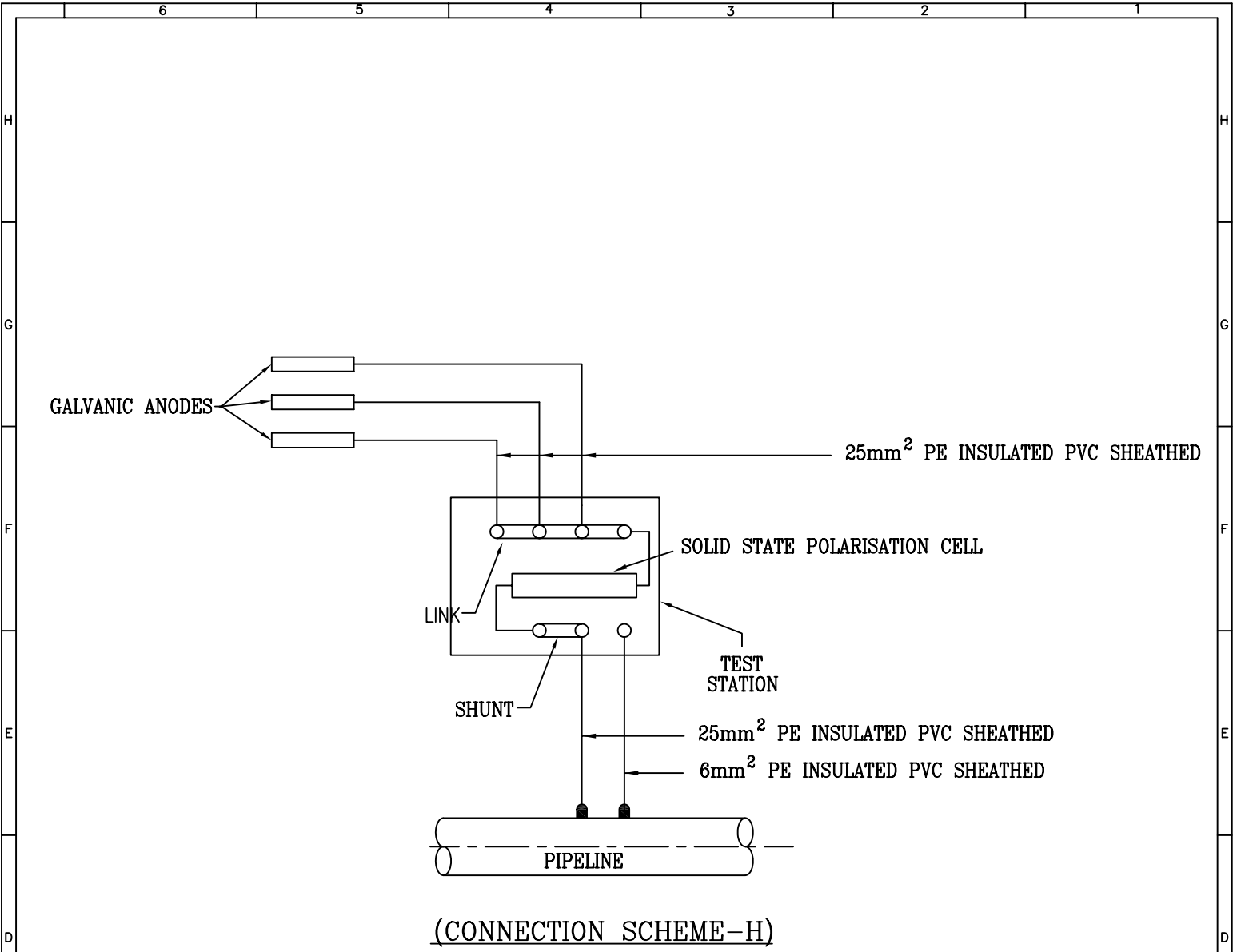


(CONNECTION SCHEME-H)

NOTES:-

1. THE POLARISATION CELL, ANODES, CABLE, CABLE JOINT ETC. SHALL MINIMUM BE RATED FOR THE EXPECTED FAULT CURRENT AT THE LOCATION OF THE INSTALLATION & SIZED FOR PERMANENT C.P. LIFE.
2. THE POLARISATION CELL SHALL BE HOUSED IN A VANDALLISM PROOF HOUSING.
3. CELL SHALL HAVE GOOD VENTILATION TO ATMOSPHERE & SHALL BE PROTECTED AGAINST DIRECT SUN LIGHT & RAIN/ WATER.
4. ANODE TAIL CABLES OF EACH ANODE SHALL BE TERMINATED INDIVIDUALLY IN TEST STATION.
5. CONTRACTOR SHALL FURNISHED DRAWING WITH ACTUAL DIMENSIONS & RATING.
6. EASY ACCESS TO CELL SHALL BE PROVIDED FOR PERIODIC INSPECTION.
4. 20% EXTRA TERMINALS SHALL BE PROVIDED.

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

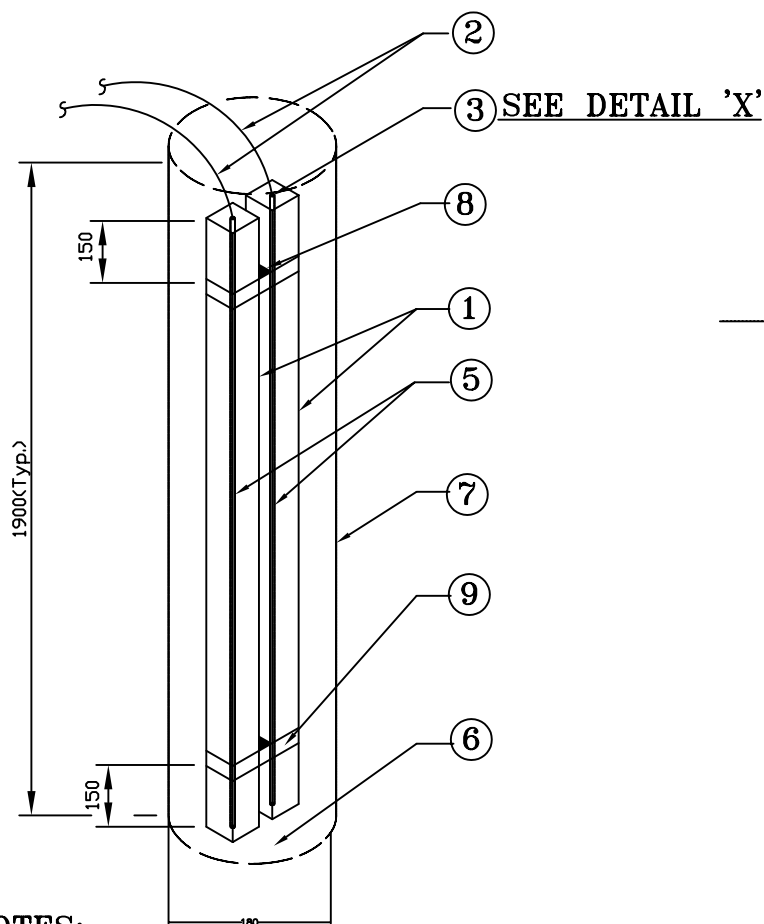


(CONNECTION SCHEME-H)

NOTES:-

- 1. THE POLARISATION CELL, ANODES, CABLE, CABLE JOINT ETC. SHALL MINIMUM BE RATED FOR THE EXPECTED FAULT CURRENT AT THE LOCATION OF THE INSTALLATION & SIZED FOR PERMANENT C.P. LIFE.
- 2. ANODE TAIL CABLES OF EACH ANODE SHALL BE TERMINATED INDIVIDUALLY IN TEST STATION.
- 3. CONTRACTOR SHALL FURNISHED DRAWING WITH ACTUAL DIMENSIONS & RATING.
- 4. EASY ACCESS TO CELL SHALL BE PROVIDED FOR PERIODIC INSPECTION.
- 4. EASY ACCESS TO CELL SHALL BE PROVIDED FOR PERIODIC INSPECTION.
- 5. 20% EXTRA TERMINALS SHALL BE PROVIDED.

REV NO	DATE	ZONE	DESCRIPTIONS	BY	APPRD	REFERENCES	DRG. NO.
SECTION: DESIGN DEPT.			PIPELINE GROUNDING THROUGH POLARISATION CELL & GALVANIC ANODE				DRG. NO.
DSGN	AM	02.09	SS	05.09	SCALE : N.T.S.		
DRWN	SJ	02.09			DWG NO.- BR-CGD-STD.-DWG-CP-08		
SANDIP TALUKDAR			APPROVED				SHEET
09-07-2024							REV
							2 OF 2
							1



DETAIL 'X'


NOTES:-

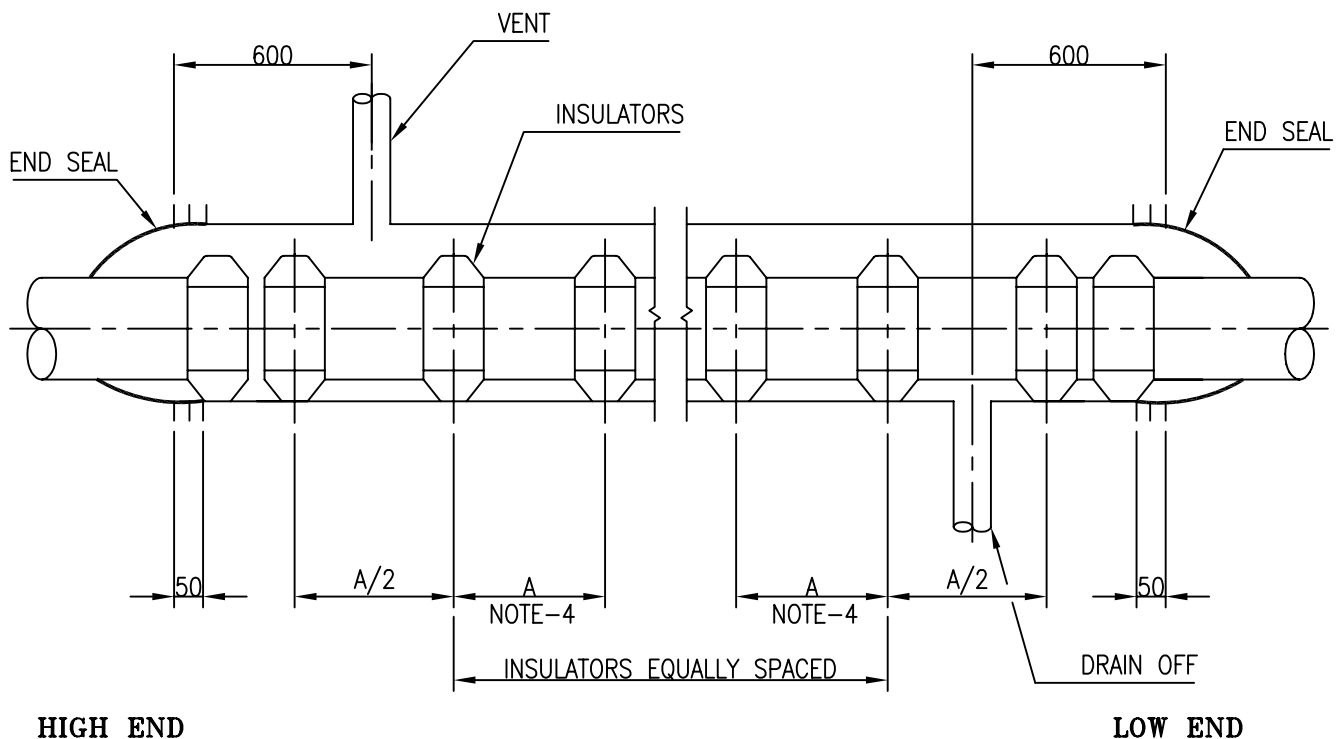
ZINC ANODE COMPOSITION (%WEIGHT)

ZINC ALLOY CONFORMING TO ASTM-B-418-67

GYPSUM	75%
BENTONITE	20%
SODIUM SULPHATE	5%

9	TAPE STRAP	AS REQD.
8	BAKELITE INSULATING SPACER 25X36X50	2 NOS.
7	COTTON BAG 180Ø.	1 NO.
6	BACK FILL MAT.	AS REQD.
5	6mmØ GALVANISED STEEL CORE	AS REQD.
4	HEAT SHRINK SLEEVE.	2 NOS.
3	SILVER BRAZED CONNECTION	2 NOS.
2	ANODE TAIL CABLE 25mm Sq. 1C Cu XLPE/ PVC SHEATHED ARMOURED 600/1000V.	30 mt.
1	ZINC ANODE	2 NOS.
ITEM NO.	DESCRIPTION	QTY.
BILL OF MATERIALS		

REV NO	DATE	ZONE	DESCRIPTIONS				BY	APPRD	
REVISIONS							REFERENCES		DRG. NO.
SECTION: DESIGN DEPT.					<div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: center; flex: 1;">  <p>ब्री एण्ड रूफ BR AND R <small>Building Nation Since 1920</small></p> </div> <div style="text-align: center; flex: 2;"> <p>ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड</p> <p>BRIDGE AND ROOF CO. (I) LTD</p> </div> </div>				
	NAME	DATE	CHKD	DATE					
DSGN	AM	03.09	SS	05.09					
DRWN	SJ	03.09							
SANDIP TALUKDAR					<div style="display: flex; justify-content: space-between;"> <div>09-07-2024</div> <div>SCALE : N.T.S.</div> <div>REV</div> </div>				
APPROVED					DWG NO.- BR-CGD-STD.-DWG-CP-09				
					1				



NOTES:-

1. THE CASING PIPE SHALL BE DESIGNED IN ACCORDANCE WITH API RP 1102.
2. CASING PIPE IS NOT BE COATED NORMALLY BUT IN HIGHLY CORROSIVE AREAS THE CASING SHALL BE COATED, WRAPPED AND CATHODIC PROTECTION PROVIDED WITH SACRIFICIAL ANODES.
3. AT BOTH ENDS OF CASING PIPE A DOUBLE SET OF INSULATORS SHALL BE INSTALLED.
4. THE MAXIMUM SPACING OF THE INSULATORS SHALL BE AS PER MANUFACTURERS RECOMMENDATIONS BUT IN NO CASE MORE THAN 2500 MM.
5. ELECTRICAL INSULATION BETWEEN THE CASING AND CARRIER PIPE SHALL BE CHECKED WITH A SUITABLE MEGGER.
6. CASING INSULATORS AND END SEALS SHALL AS PER THE SPECIFICATION ISSUED FOR THE SAME.
7. END SEALS SHOWN HERE ARE ONLY INDICATIVE, POSSIBILITY OF PROVIDING OTHER TYPES OF FLEXIBLE END SEALS MAY BE CONSIDERED.
8. IN CASE OF BORED/JACKED CROSSING IN ORDER TO PREVENT DAMAGE TO COATING AND WRAPPING. (IF APPROX.) A PROTECTIVE COATING OF CONCRETE OR SUITABLE MATERIAL SHALL BE PROVIDED ON CASING PIPE.

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

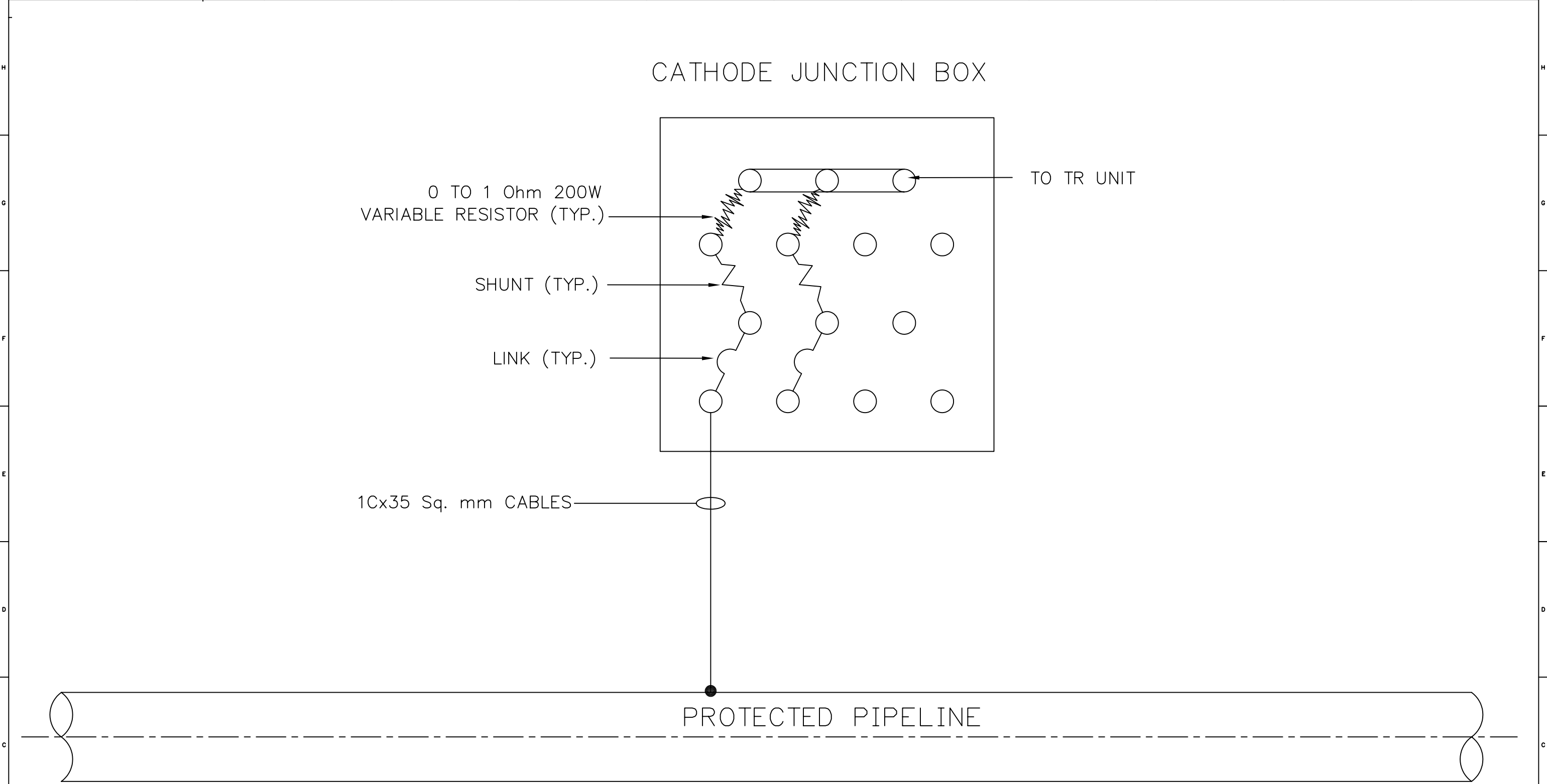
NOTES:-

1. TEST STATION SHALL HAVE WEATHERPROOF ENCLOSURE HAVING DEGREE OF PROTECTION IP-55, AS DEFINED IN IEC-529(1989)/ IS:2147 (1962) THE SHUTTER SHALL BE HINGED TYPE WITH CONCEALED LOCK AND SHALL HAVE DOOR GASKET.
2. THE HINGES SHALL BE WELDED TO THE SHUTTER AND THE BOX SUITABLY.
3. THE MS ANGLES SHALL BE WELDED TO THE SIDES. THE ANGLES SHALL HAVE TAPPED HOLES FOR FIXING TERMINAL PLATE.
4. THE INNER SURFACE OF THE TEST STATION SHALL BE PAINTED WITH LEAD OXIDE PRIMER GRADE.
5. THE OUTSIDE OF THE TEST STATION SHALL BE PAINTED WITH TWO COATS OF ZINC RED EPOXY PRIMER AND THREE COATS OF GREY COLOURED EPOXY PAINT COMPLETE WITH CABLE PIPE & FDN. PLATE.
6. THE NAME PLATE SHALL BE OF ANODISED ALUMINIUM WITH BLACK BACKGROUND AND WHITE LETTERS (SIZE 3mm). THE NAME PLATE SHALL BE FIXED TO INNER SIDE OF SHUTTER BY ARALDITE OR EQUIVALENT.
7. THE NAME PLATE OF EACH TEST STATION SHALL CARRY THE FOLLOWING INFORMATION.
 - A) TEST STATION CONNECTION SCHEME TYPE
 - B) RELEVANT TEST STATION CONNECTION SCHEME DIAGRAM
 - C) TEST STATION NO.
 - D) CHAINAGE IN KM
 - E) DISTANCE FROM PIPE IN m
 - F) DIRECTION OF GAS FLOW
8. WHEN ERECTED, THE TEST STATION SHALL BE IN UPRIGHT POSITION.
9. TEST STATION SHALL BE SO ERECTED AS TO SERVE ALSO AS PIPELINE MARKER. AND ANODE GROUNDBED MARKER. THEIR SHUTTERS SHALL BE PARALLEL TO THE LINE OF AXIS OF PIPELINE AND FACING IT.
10. THE NUMBER OF ALL TEST STATIONS SHALL BE WRITTEN WITH BLACK PAINT USING 40 mm STENCIL BLOCK ON THE OUTER SIDE OF THE SHUTTER IN A UNIFORM MANNER. AN ARROW SHOWING DIRECTION OF FLOW OF GAS SHALL BE MARKED TO UNDERLINE THE TEST STATION NUMBER ON SHUTTER.
11. HEIGHT OF THE TEST STATION ABOVE GROUND LEVEL SHOWN IN THE DRAWING IS TYPICAL.
12. ALL CABLES COMING TO TEST STATION SHALL BE LABELLED ON BOTH ENDS WITH IDENTIFICATION NUMBERS
13. TOTAL NUMBER OF TEST STATIONS AND THEIR TYPES ARE MENTIONED IN CONSOLIDATED B.O.M.
14. TEST BETWEEN BRASS TERMINALS AND BODY AT 2kV FOR ONE MINUTE.
15. ALL DIMENSIONS ARE APPROXIMATE AND CAN VARY SLIGHTLY.
16. ALL DIMENSIONS ARE IN mm.
17. THE ENTRY SHALL BE SEALED WITH BITUMEN COMPOUND AFTER CABLE LAYING TO PREVENT WATER ENTRY.

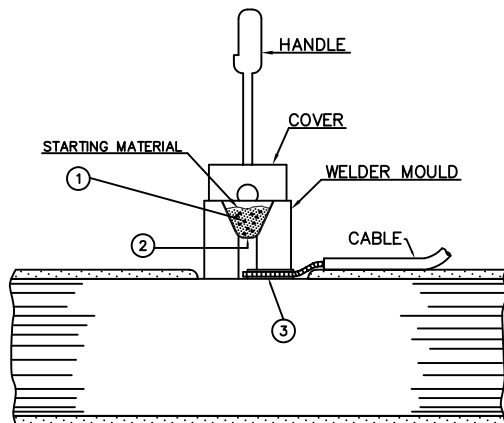
30	VARIABLE RESISTANCE 0-0.1 Ohm.	01
29	100 MM ϕ M.S. SCH.40 90° ELBOW, R=5D	01
28	BINDING WIRE, MS	AS REQD.
27	PCC MIX, 1:5:10	0.064 m ³
26	RCC MIX, M20	0.324 m ³
25	ROD, 8 ϕ MS	28 m
24	STIFFENER PLATE, 8THK.	04
23	FOUNDATION BOLT M12	04
22	RUBBER BUSH MATCHING WITH PIPE	01
21	FOUNDATION PLATE, 6THK x 400 x 400 MS PLATE	02
20	NEOPRENE RUBBER GASKET, 6THK.	01 SET
19	MS PIPE, 100 ϕ , IS: 1239 P.T.1(1990)-HEAVY GRADE	01
18	COUPLING PLATE, 5THK x 180 x 130 MS PLATE, 100 ϕ HOLE AT CENTRE	01
17	LATCH FOR SHUTTER	01
16	BRASS SCREW, M6 x 16	04
15	ANGLE, 5THK. x 50 x 50 x 30	04
14	SHUNT, 0.1 OHM, 0.5 A, 50 mV	01
13	COPPER LINK, 2.5 THK. x 12 x LENGTH AS REQD.	01
12	BRASS WASHER 8 mm dia (M8) Cd Coated	AS REQD.
11	BRASS NUT, M6 Brass Nut Bolt washer	AS REQD.
10	BRASS STUD, M6 x 50	AS REQD.
9	TERMINAL PLATE, 6THK x 160 x 200 PHENOLIC LAM. SHT	01
8	HINGE FOR SHUTTER	02
7	CASTLE LOCK WITH ONE KEY PER TEST STATION	01
6	NAME PLATE, 0.9THK x 120 x 160 ANODISED ALUMINIUM	01
5	SHUTTER, 3mm THK MS SHT	01
4	TOP, 475 x 350 x 3mm THK. MS SHT	01
3	SIDE PLATE 300 x 420 x 300 x 400 x 3mm THK MS SHT	01
2	REAR PLATE 425 x 420 x 3mm THK. MS SHT	01
1	BOTTOM PLATE, 250 x 175 x 3mm THK MS PLATE, 100 ϕ HOLE AT CENTRE	01
ITEM	DESCRIPTION	QTY.
BILL OF MATERIALS		

REV NO.	DATE	ZONE	DESCRIPTIONS	BY	APPRD	REFERENCES	DRG. NO.
SECTION: DESIGN DEPT.							
DSGN	AM	05.09	SS	06.09	DETAILS OF TEST STATION FOR POLARISATION CELL		
DRWN	SJ	05.09			SCALE : N.T.S.		
SANDIP TALUKDAR 10-07-2024					DWG NO.- BR-CGD-STD.-DWG-CP-12		
APPROVED					SHEET REV		
					2 OF 2 1		

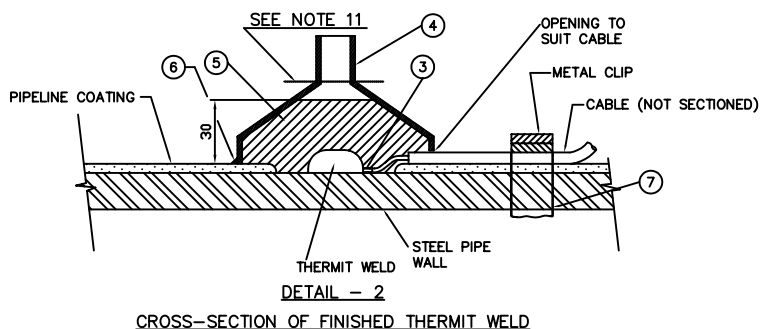
12	11	10	9	8	7	6	5	4	3	2	1
----	----	----	---	---	---	---	---	---	---	---	---



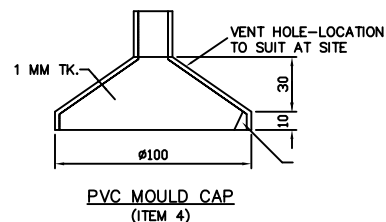
REV					
SEC	CONCURRED BY				



DETAIL - 1
WELDER-CABLE ASSEMBLY



DETAIL - 2
CROSS-SECTION OF FINISHED THERMIT WELD

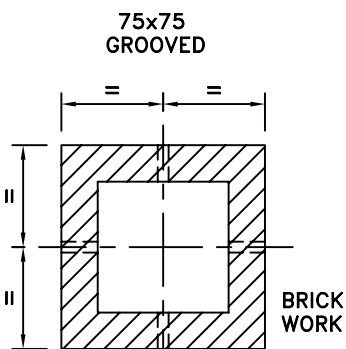
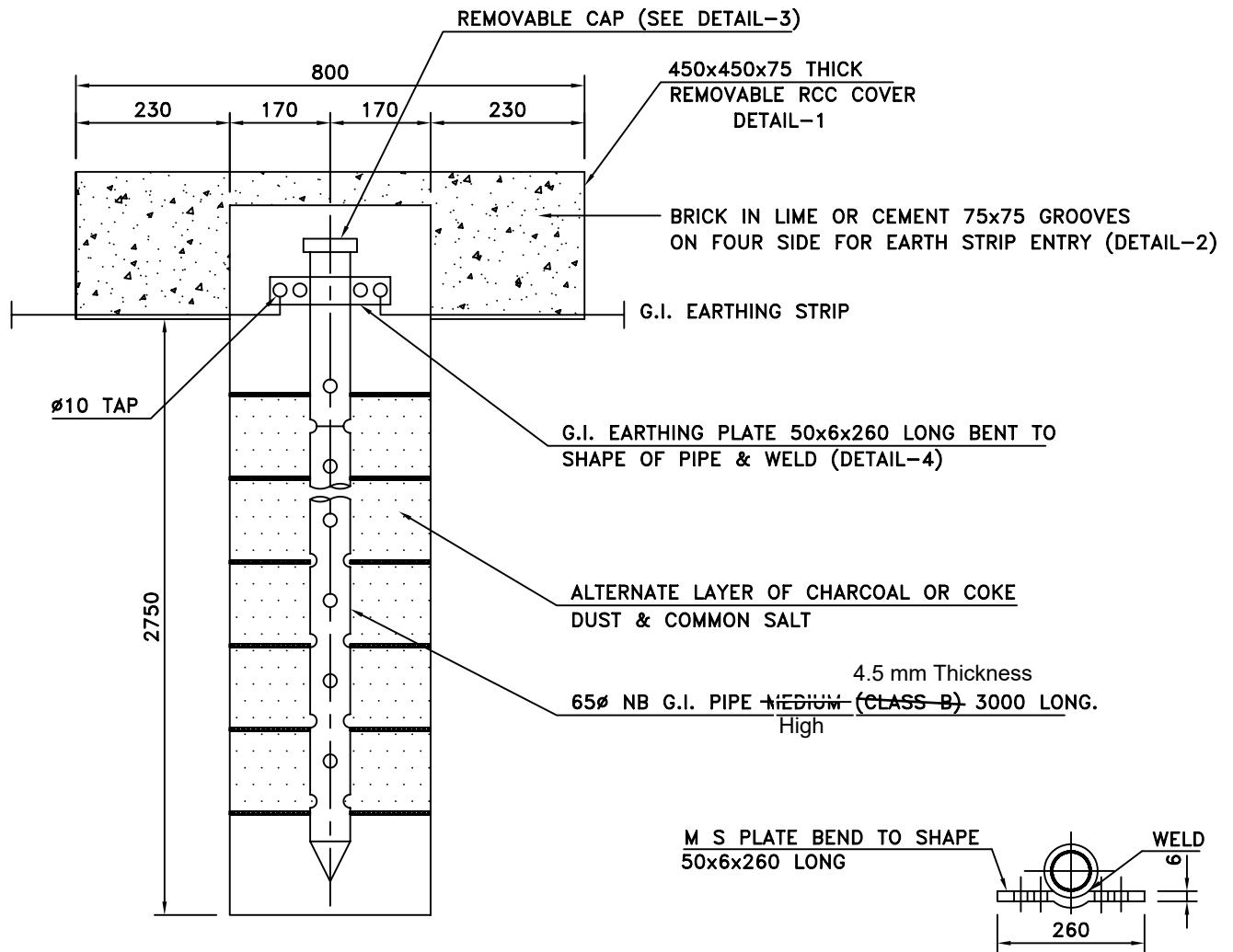


7	PLASTIC STRAPPING BAND, 12 WIDE WITH METALLIC CLIP	AS REQD.
6	12 WIDE PROTECTIVE ADHESIVE TAPE OR M-SEAL COMPOUND	AS REQD.
5	EPOXY COATING COMPOUND WITH HARDENER	AS REQD.
4	PVC MOULD CAP	1
3	COPPER SLEEVE, ID 5 x OD 6	1
2	METAL DISC	1
1	THERMIT WELD CHARGE	1
ITEM NO.	DESCRIPTION	QTY.
BILL OF MATERIALS		

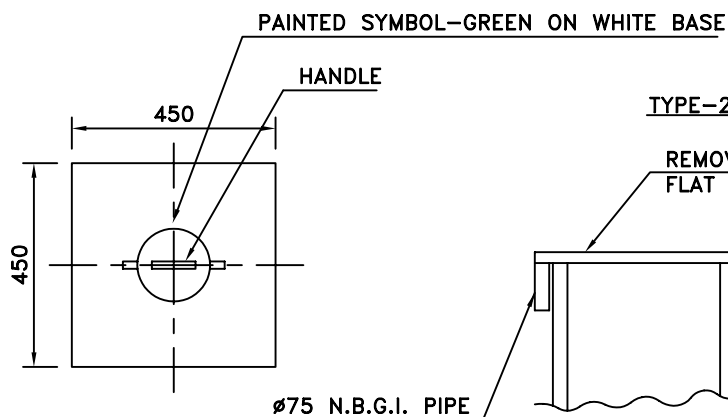
NOTES:-

- REMOVE PIPELINE COATING 45mm X 65mm OR ANY SUITABLE SIZE AS REQUIRED WITH A CUTTING TOOL HAVING CUTTING SURFACE CONTOUR MATCHING THAT OF THE PIPE. EXPOSED AREA OF PIPELINE SHALL BE CLEANED WITH FILE TO BRIGHT STEEL, FREE OF RUST, PAINT, DIRT, GREASE AND MOISTURE.
- REMOVE APPROXIMATELY 40mm OF INSULATION FROM END OF CABLE. INSTALL COPPER SLEEVE TO SUIT THE CABLE.
- HOLD MOULD IN A VERTICAL POSITION AND INSERT METAL DISC IN THE BOTTOM OF THE MOULD CAVITY.
- DUMP THERMIT WELD CHARGE WEIGHING 15g MAX. OR AS SPECIFIED BY MANUFACTURER INTO MOULD, BEING CAREFUL NOT TO UPSET THE METAL DISC. TAP THE MOULD TO LOOSEN STARTING MATERIAL.
- POSITION WELDER OVER EXPOSED AREA OF PIPELINE AND INSERT CABLE UNDER MOULD. PACK CABLE AND MOULD WITH PACKING MATERIAL, IF NECESSARY.
- PLACE IGNITOR AT OPENING OF MOULD AND APPLY SPARK WHICH WILL IGNITE WELD CHARGE. WITHDRAW IGNITOR QUICKLY TO PREVENT FOULING.
- AFTER WELDER HAS BEEN IGNITED, HOLD WELDER IN PLACE FOR 15 SECONDS. THEN REMOVE WELDER.
- LIGHTLY TAP THERMIT WELD WITH HAMMER TO REMOVE SLAG AND TEST WELD FOR GOOD BOND. CLEAN THE WELD.
- REMAKE THE THERMIT WELD, IF FOUND DEFECTIVE.
- PLACE PVC MOULD CAP OVER THE THERMIT WELD. SEAL CAP WITH ADHESIVE TAPE AROUND PVC MOULD. FILL THE MOULD WITH EPOXY COATING COMPOUND.
- CUT OFF THE STEM OF PVC MOULD CAP.
- ANY OTHER SUITABLE COATING MATERIAL TO COVER THERMIT WELD AND ALL EXPOSED COPPER WITHOUT ANY VOID MAY BE USED IN PLACE OF ITEMS 4, 5 & 6 OF BILL OF MATERIALS. THE COATING PATCH MUST OVERLAP EXISTING PIPELINE COATING AND INSULATION ON WIRE.
- ALL DIMENSIONS ARE APPROXIMATE AND CAN VARY SLIGHTLY.
- ALL DIMENSIONS ARE IN mm.

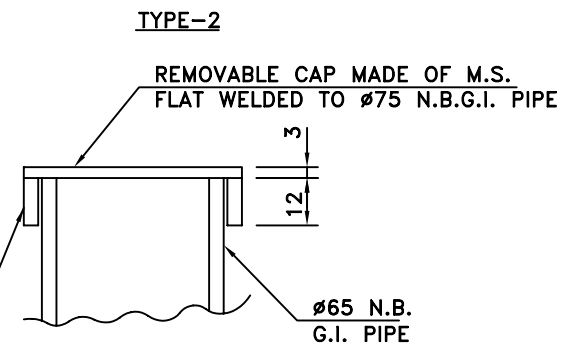
01	07.09	05/23	REVISED & ISSUED	AM	DG			
REV NO	DATE	ZONE	DESCRIPTIONS	BY	APPRD			
REVISIONS				REFERENCES		DRG. NO.		
SECTION: DESIGN DEPT.						ब्रीज एंड रूफ कंपनी (इंडिया) लिमिटेड BRIDGE AND ROOF CO. (I) LTD		
NAME	DATE	CHKD	DATE					
DSGN	AM	05.09	SS					06.09
DRWN	SJ	05.09						
SANDIP TALUKDAR 11-07-2024				SCALE : N.T.S.		REV		
APPROVED				DWG NO.- BR-CGD-STD.-DWG-CP-14		1		



DETAIL-2



DETAIL-1



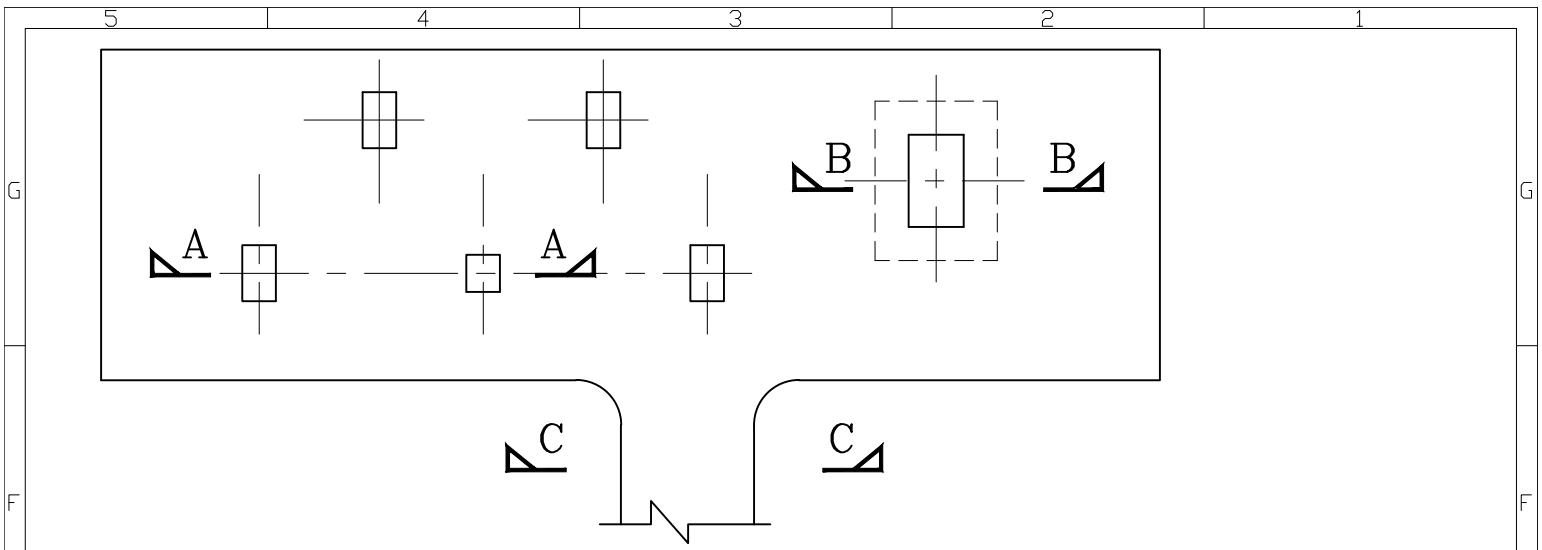
DETAIL-3

NOTES:-

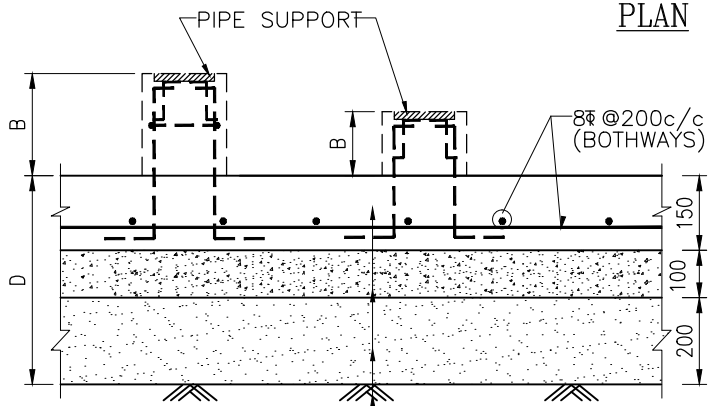
- PIPE ASSEMBLY SHALL BE HOT DIP GALVANISED AFTER FABRICATION.

																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	</
--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	----

CIVIL DRAWINGS

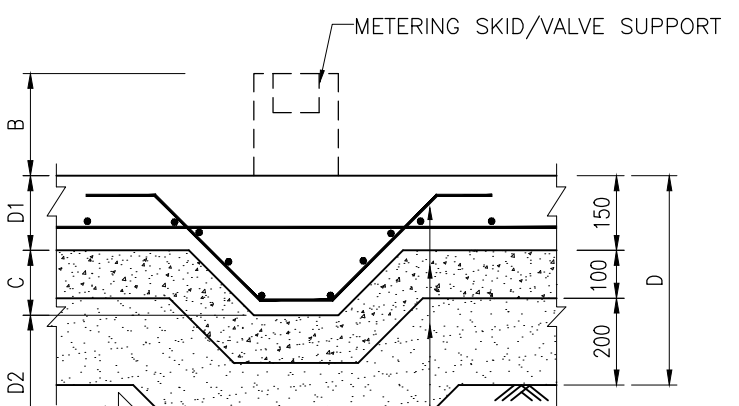


PLAN



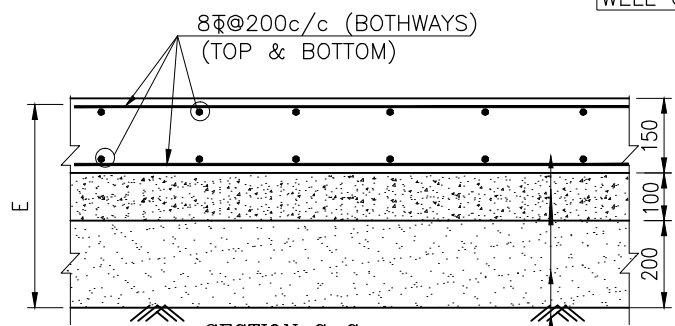
SECTION A-A
PAVEMENT TYPE - I

RCC (M-25)
PCC 100 THK. (M-10)
200THK COMPACTED SAND
WELL COMPACTED EARTH



SECTION B-B
PAVEMENT TYPE - I

RCC (M-25)
PCC 100 THK. (M-10)
200THK COMPACTED SAND
WELL COMPACTED EARTH



SECTION C-C
PAVEMENT TYPE - II

RCC (M-25)
PCC 100 THK. (M-10)
200THK COMPACTED SAND
WELL COMPACTED EARTH

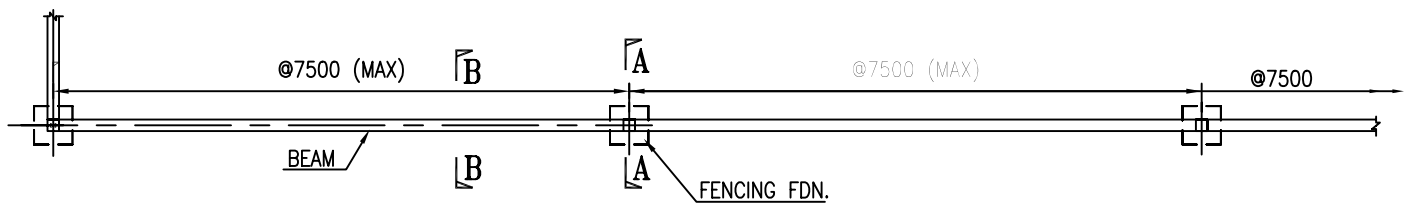
- B - UPTO 300mm TO BE PAID UNDER ITEM "REINFORCEMENT CONCRETE-SUB STRUCTURE" IN SOR
AND ABOVE 300mm TO BE PAID UNDER ITEM "REINFORCEMENT CONCRETE-SUPER STRUCTURE" IN SOR
C - TO BE MEASURED AND PAID UNDER ITEM "REINFORCED CEMENT CONCRETE" IN SUB STRUCTURE
D, (D1+D2) - TO BE MEASURED AND PAID UNDER ITEM "CONCRETE PAVEMENT"
E - TO BE MEASURED AND PAID UNDER ITEM "CONCRETE PAVEMENT"

NOTES:-

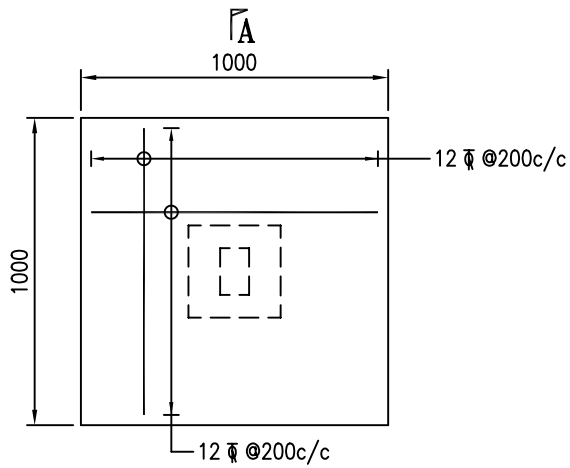
1. CASTING OF PAVEMENT TO BE DONE IN PANELS (>3x3m) & JOINTS BE FILLED WITH APPROVED GR. BITUMENIOUS FILLER COMPOUND.
2. PAVEMENT TYPE-I TO BE USED IN EQUIPMENT/ PIPE SUPPORTS AREA.
3. PAVEMENT TYPE-II TO BE USED FOR WALKWAY.

FOR TENDER PURPOSE ONLY

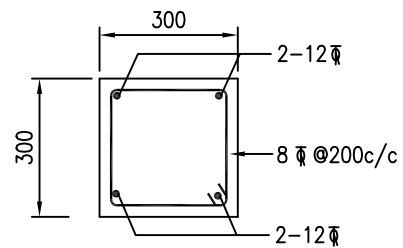
REV NO	DATE	ZONE	DESCRIPTIONS	BY	APPRD	REFERENCES	DRG. NO.
THIS DRAWING IS PROPERTY OF BAND R AND IS ISSUED FOR THE SPECIFIC PROJECT MENTIONED THEREIN. THIS IS NOT TO BE COPIED OR USED FOR OTHER PROJECTS UNLESS EXPRESSLY PERMITTED BY BAND R.							
SECTION		DESIGN DEPT.		CIVIL STANDARD FOR TERMINALS			
		NAME	SIG.	DATE			
DSGN.		SK/AM		12.07.2024			
DRWN		SAA		12.07.2024			
CHKD. & VERIFIED		ST		12.07.2024			
APPROVED		ST		12.07.2024			
TYPICAL DETAILS OF RCC PAVEMENT & PIPE SUPPORTS					SCALE : NTS		REV 0
DWG. NO.- BR-CGD-STD.-DWG-64							



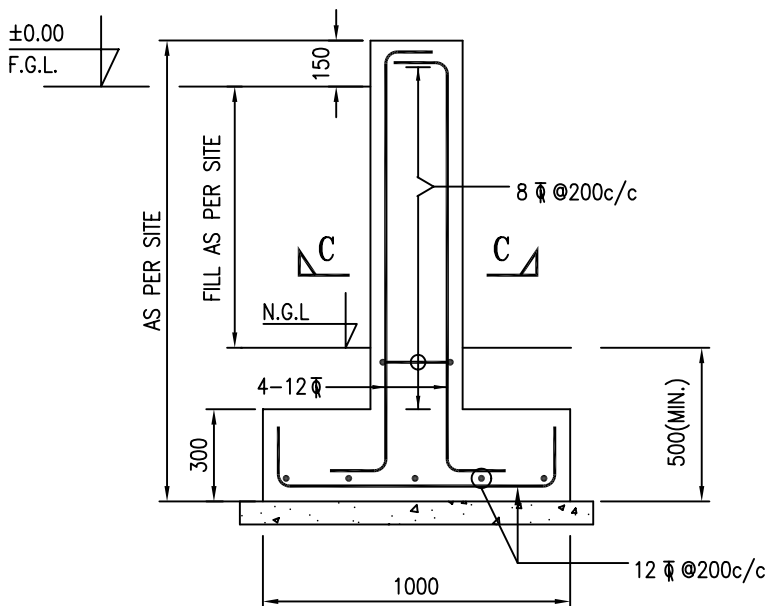
LAYOUT



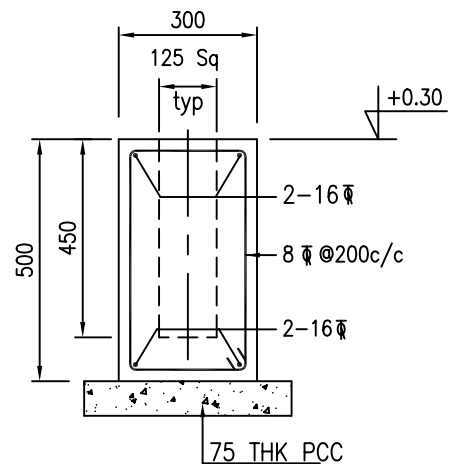
PLAN




SECTION C-C

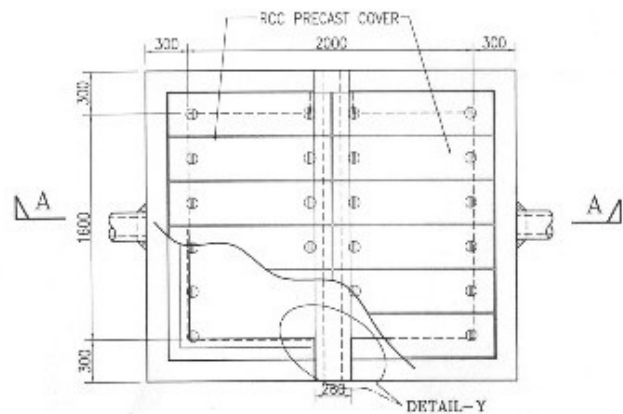


SECTION A-A

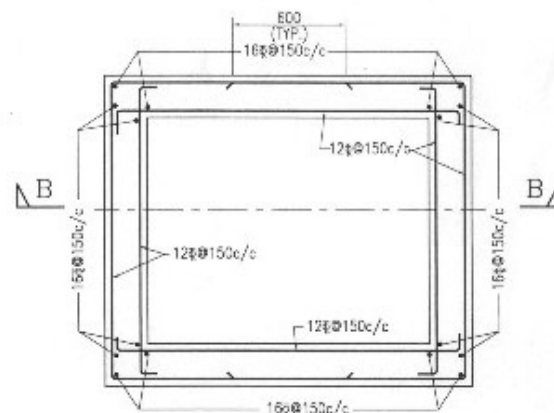


SECTION B-B

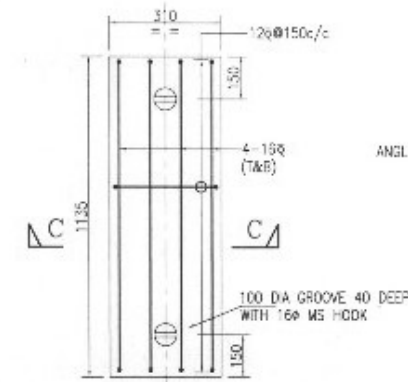
REV NO	DATE	ZONE	DESCRIPTIONS	BY	APPRD		
REVISIONS					REFERENCES		DRG. NO.
THIS DRAWING IS PROPERTY OF B AND R AND IS ISSUED FOR THE SPECIFIC PROJECT MENTIONED THEREIN. THIS IS NOT TO BE COPIED OR USED FOR OTHER PROJECTS UNLESS EXPRESSLY PERMITTED BY B AND R.							
SECTION		DESIGN DEPT.		CIVIL STANDARD FOR TERMINALS			ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड
	NAME	SIG.	DATE				BRIDGE AND ROOF CO. (I) LTD
DSGN.	DPN			TYPICAL DETAILS OF FENCING FOUNDATIONS		SCALE : NTS	REV 0
DRWN	MINJ						
CHKD. & VERIFIED	HC						
APPROVED	AKT						
Page 1562 of 1596						DWG NO.- BR-CGD-STD.-DWG-65	



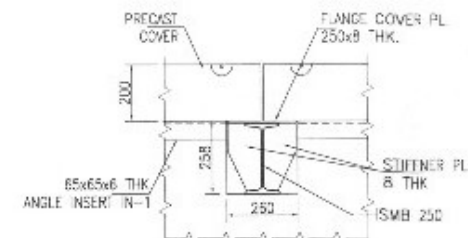
PLAN OF VALVE PIT VP-1A



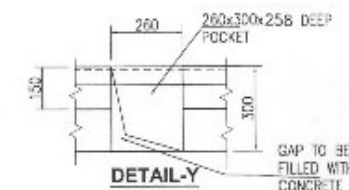
REINF. DETAIL OF VALVE PIT



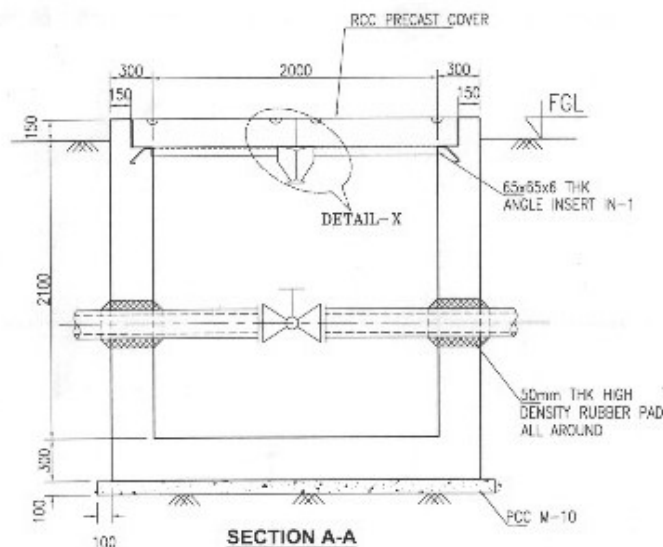
RCC DETAIL OF PRECAST SLAB



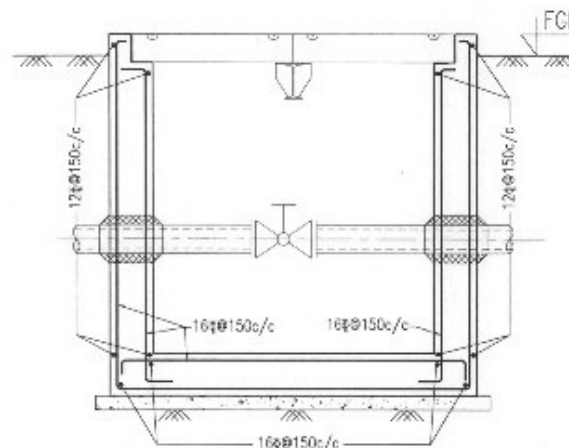
DETAIL-X



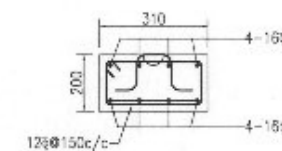
DETAIL-Y



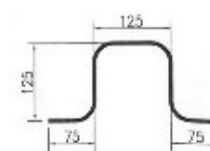
SECTION A-A



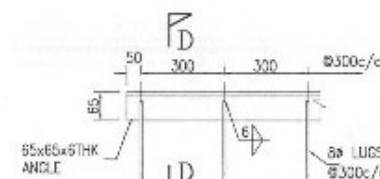
SECTION B-B



SECTION C-C



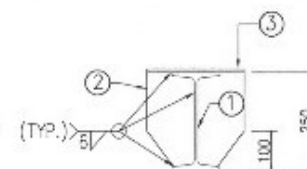
DETAIL OF 16φ MS LIFTING HOOK



DETAIL OF INSERT IN-1



SECTION D-D



DETAIL OF ISMB 250

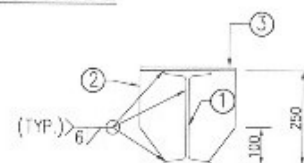
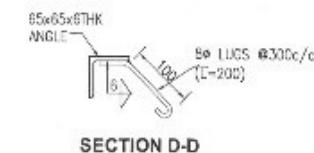
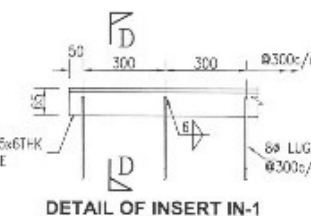
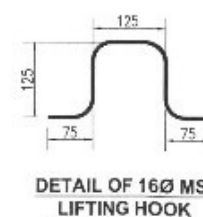
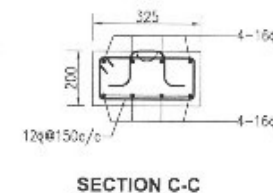
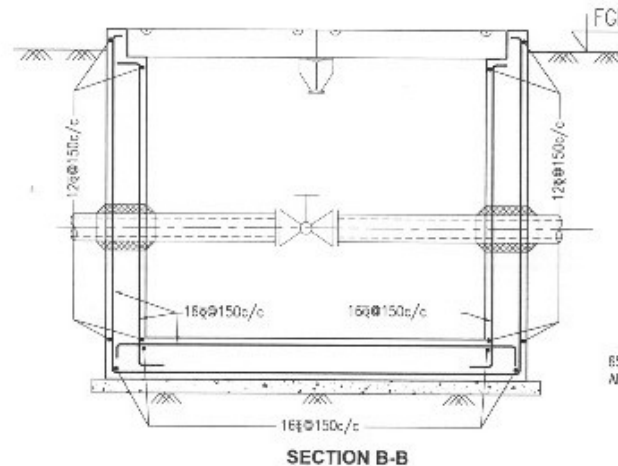
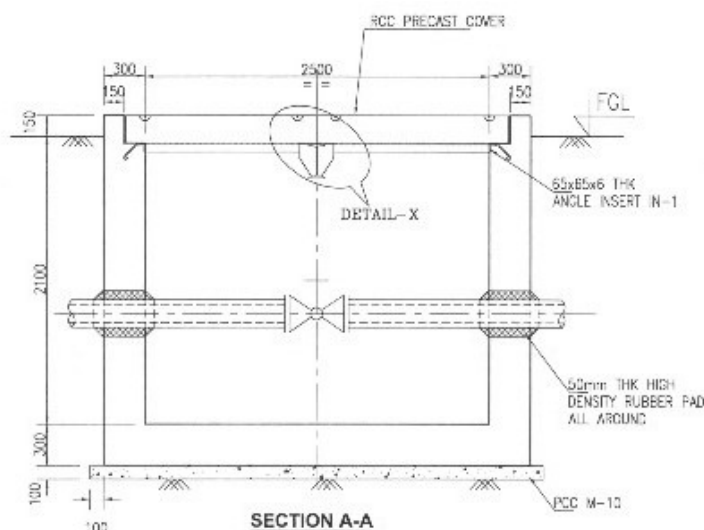
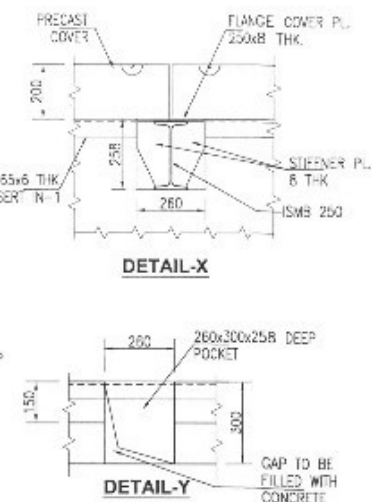
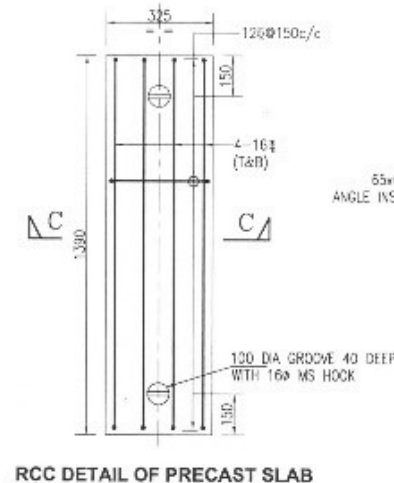
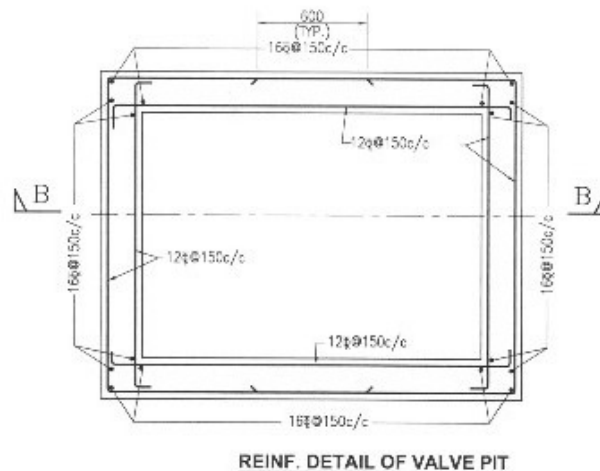
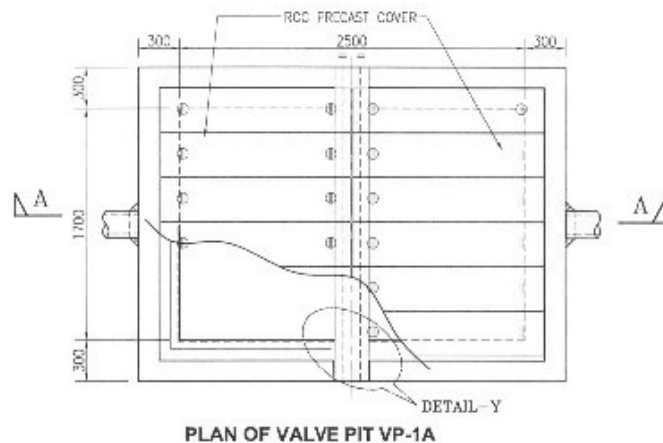
- ① ISMB 250
- ② STIFFNER PL. 8 THK B/S @500 C/C
- ③ FLANGE COVER PL. 250x8 THK

NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. ONLY FIGURED DIMENSIONS ARE TO BE FOLLOWED.
3. ALL R.C.C. USED SHALL BE OF GRADE M25 AS PER IS:456-2000. UNLESS OTHERWISE SPECIFIED.
4. ALL R/F STEEL SHALL BE TMT Fe 500D CONFORMING TO IS: 1786.
5. CLEAR COVER TO MAIN R/F SHALL BE 40mm FOR VALVE PIT & 25mm FOR PRECAST COVER.
6. FOR EXACT LOCATION & ORIENTATION OF VALVE PIT REFER LAYOUT DRAWING.
7. DEVELOPMENT LENGTH SHALL BE 50 TIMES DIA OF BAR.
8. THE VALVE PTS ARE DESIGNED AS PER IRC-8 CODE, ANNEXURE A (CLAUSE NO 201.2), VEHICLE CLASS 40R, MAX SINGLE AXIAL LOAD 16 MT. CARRIAGE WEIGHT 25 MT AND ACCORDINGLY DESIGNED THE SLAB COVER FOR VALVE PIT'S. RCC GRADE M25 IS CONSIDERED AS PER IS 456 FOR DESIGN.

CLIENT:	GAIL INDIA LIMITED
CONSULTANT:	BRIDGE AND ROOF CO. (INDIA) LTD. A GOVERNMENT OF INDIA ENTERPRISE. 427/1, GRAND TRUNK ROAD, HOWRAH-711101
PROJECT:	CITY GAS DISTRIBUTION NETWORK IN SIX GEOGRAPHICAL AREAS (GA)
TITLE:	TYPICAL DETAILS OF VALVE PIT

0	ISSUED FOR CONSTRUCTION	SK	20/25	AB	20/25	ST	20/25	SCALE	JOB NO.	DRAWING NO.	SHEET NO.	REV
REV	DESCRIPTION	BY	ON	BY	ON	BY	ON	N.T.S	71150	N/A	1 OF 4	0
		DRAWN	CHECKED				APPROVED					

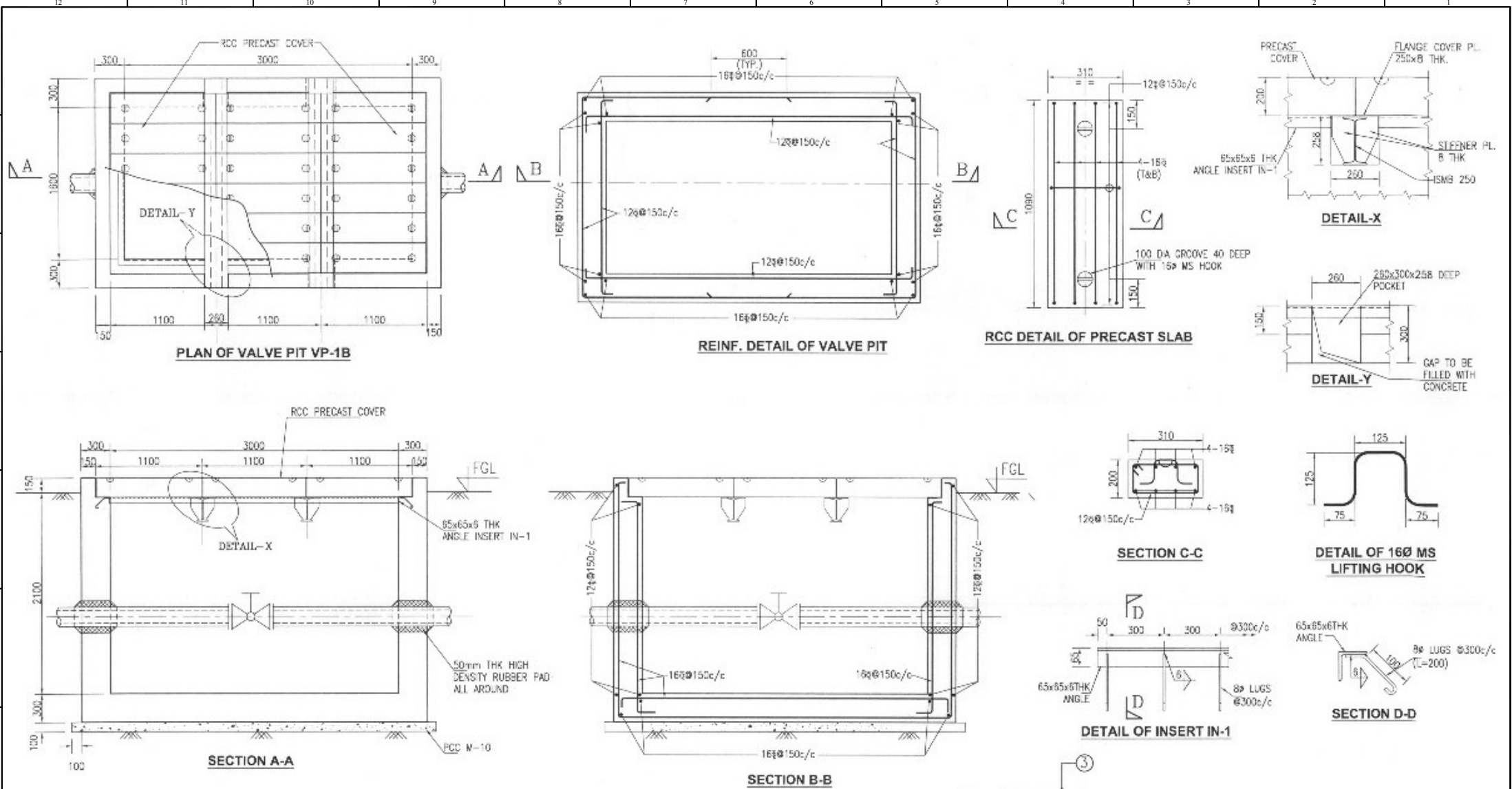


NOTES:-

1. ALL DIMENSIONS ARE IN mm.
2. ONLY FIGURED DIMENSIONS ARE TO BE FOLLOWED.
3. ALL R.C.C. USED SHALL BE OF GRADE M25 AS PER IS:456-2000, UNLESS OTHERWISE SPECIFIED.
4. ALL R/F STEEL SHALL BE TMT Fe 500S CONFORMING TO IS: 1786.
5. CLEAR COVER TO MAIN R/F SHALL BE 40mm FOR VALVE PIT & 25mm FOR PRECAST COVER.
6. FOR EXACT LOCATION & ORIENTATION OF VALVE PIT REFER LAYOUT DRAWING.
7. DEVELOPMENT LENGTH SHALL BE 50 TIMES DIA OF BAR.
8. THE VALVE PITS ARE DESIGNED AS PER IRC-8 CODE, ANNEXURE A (CLAUSE NO 201.2), VEHICLE CLASS 40R, MAX SINGLE AXIAL LOAD 16 MT, CARRIAGE WEIGHT 25 MT AND ACCORDINGLY DESIGNED THE SLAB COVER FOR VALVE PITS. RCC GRADE M25 IS CONSIDERED AS PER IS 456 FOR DESIGN.

0	ISSUED FOR CONSTRUCTION	SK	20/25	AB	20/25	ST	20/25	SCALE	JOB NO.	DRAWING NO.	SHEET NO.	REV
REV	DESCRIPTION	BY	ON	BY	ON	BY	ON	N.T.S	71150	N/A	2 OF 4	0
		DRAWN	CHECKED	APPROVED								

CLIENT:	GAIL INDIA LIMITED
CONSULTANT:	BRIDGE AND ROOF CO. (INDIA) LTD. A GOVERNMENT OF INDIA ENTERPRISE. 427/1, GRAND TRUNK ROAD, HOWRAH-711101
PROJECT :	CITY GAS DISTRIBUTION NETWORK IN SIX GEOGRAPHICAL AREAS (GA)
TITLE :	TYPICAL DETAILS OF VALVE PIT

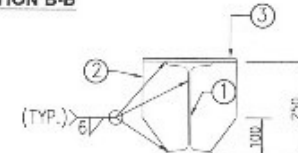
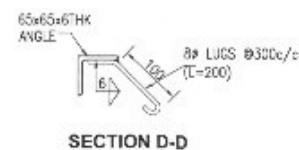
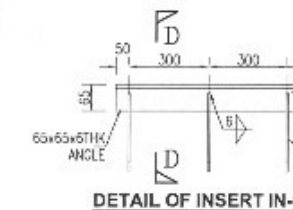
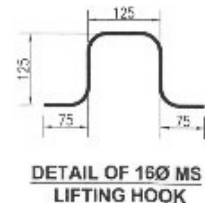
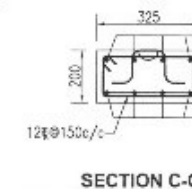
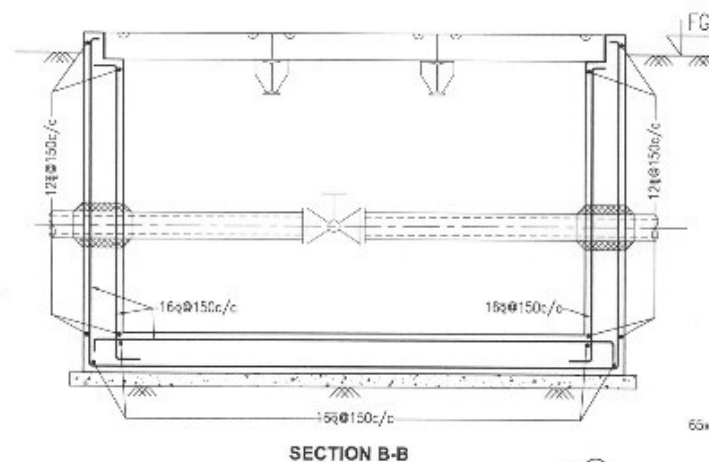
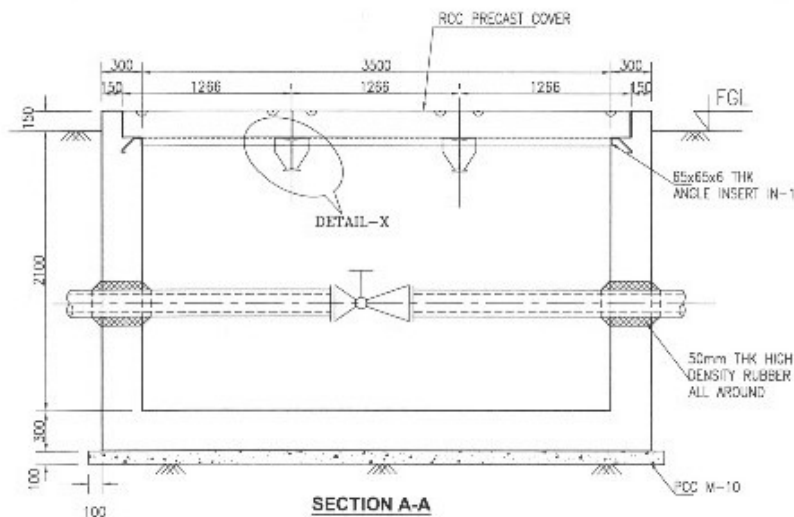
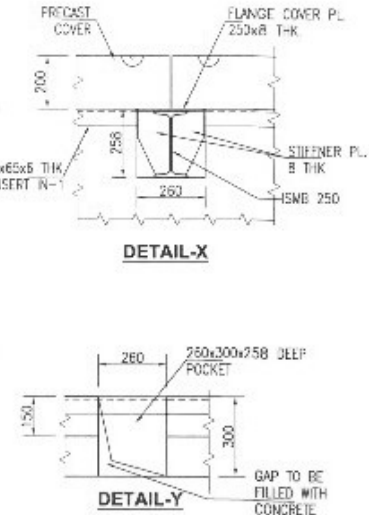
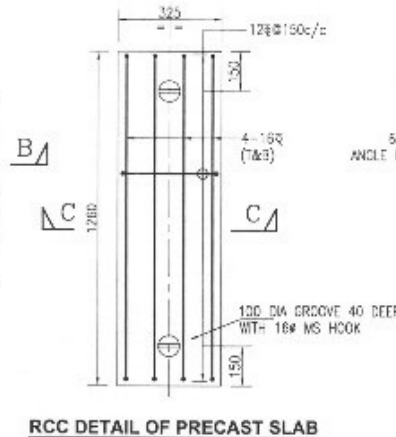
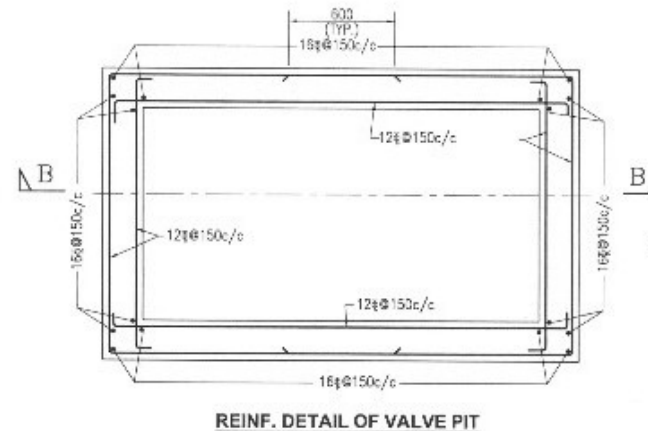
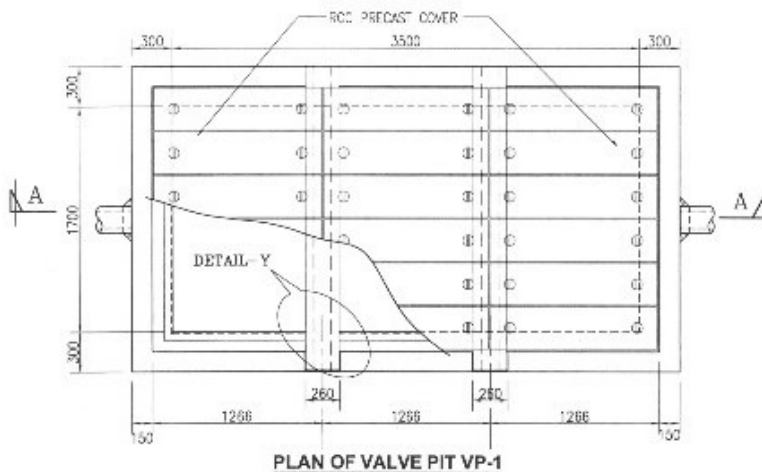


NOTES:-

1. ALL DIMENSIONS ARE IN MM.
2. ONLY FIGURED DIMENSIONS ARE TO BE FOLLOWED.
3. ALL R.C.C. USED SHALL BE OF GRADE M25 AS PER IS:456-2000, UNLESS OTHERWISE SPECIFIED.
4. ALL R/F STEEL SHALL BE TMT Fe 500D CONFORMING TO IS: 1786.
5. CLEAR COVER TO MAIN R/F SHALL BE 40mm FOR VALVE PIT & 25mm FOR PRECAST COVER.
6. FOR EXACT LOCATION & ORIENTATION OF VALVE PIT REFER LAYOUT DRAWING.
7. DEVELOPMENT LENGTH SHALL BE 50 TIMES DIA OF BAR.
8. THE VALVE PITS ARE DESIGNED AS PER IRC-6 CODE, ANNEXURE A (CLAUSE NO 201.2), VEHICLE CLASS 40R, MAX SINGLE AXIAL LOAD 16 MT. CARRIAGE WEIGHT 25 MT AND ACCORDINGLY DESIGNED THE SLAB COVER FOR VALVE PITS. RCC GRADE M25 IS CONSIDERED AS PER IS 456 FOR DESIGN.

0	ISSUED FOR CONSTRUCTION	SK	20/25	AB	20/25	ST	20/25	SCALE	JOB NO.	DRAWING NO.	SHEET NO.	REV
REV	DESCRIPTION	BY	ON	BY	ON	BY	ON	N.T.S.	71150	N/A	3 OF 4	0
		DRAWN	CHECKED				APPROVED					

CLIENT:	GAIL INDIA LIMITED
CONSULTANT:	BRIDGE AND ROOF CO. (INDIA) LTD. A GOVERNMENT OF INDIA ENTERPRISE. 427/1, GRAND TRUNK ROAD, HOWRAH-711101
PROJECT:	CITY GAS DISTRIBUTION NETWORK IN SIX GEOGRAPHICAL AREAS (GA)
TITLE:	TYPICAL DETAILS OF VALVE PIT

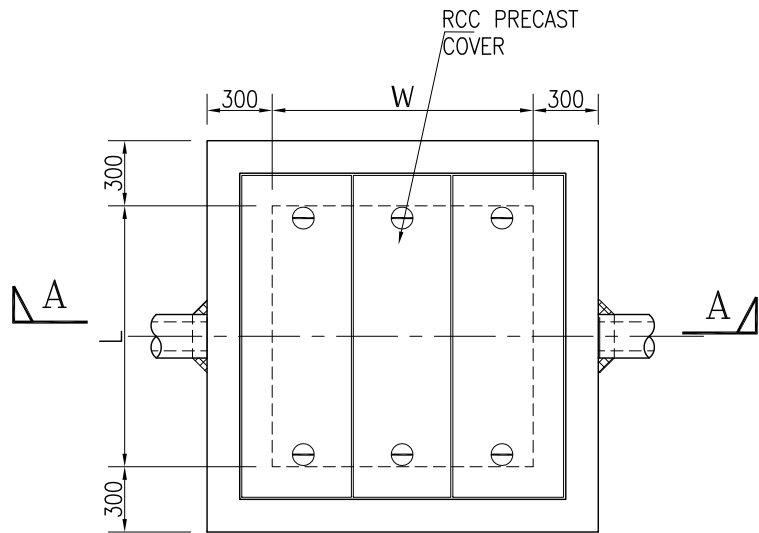


NOTES:-

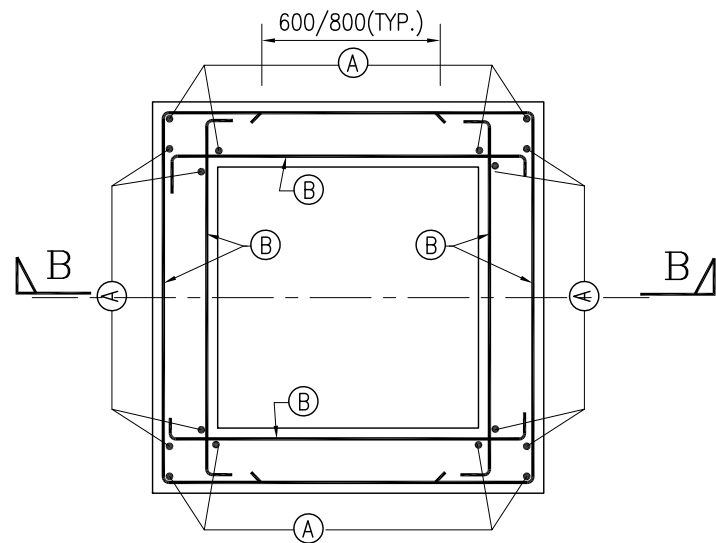
1. ALL DIMENSIONS ARE IN mm.
2. ONLY FIGURED DIMENSIONS ARE TO BE FOLLOWED.
3. ALL R.C.C. USED SHALL BE OF GRADE M25 AS PER IS:456-2000. UNLESS OTHERWISE SPECIFIED.
4. ALL R/F STEEL SHALL BE TMT Fe 500D CONFORMING TO IS: 1786.
5. CLEAR COVER TO MAIN R/F SHALL BE 40mm FOR VALVE PIT & 25mm FOR PRECAST COVER.
6. FOR EXACT LOCATION & ORIENTATION OF VALVE PIT REFER LAYOUT DRAWING.
7. DEVELOPMENT LENGTH SHALL BE 50 TIMES DIA OF BAR.
8. THE VALVE PITS ARE DESIGNED AS PER IRC-6 CODE, ANNEXURE A (CLAUSE NO 201.2), VEHICLE CLASS 40R, MAX SINGLE AXIAL LOAD 16 MT, CARRIAGE WEIGHT 25 MT AND ACCORDINGLY DESIGNED THE SLAB COVER FOR VALVE PITS. RCC GRADE M25 IS CONSIDERED AS PER IS 456 FOR DESIGN.

0	ISSUED FOR CONSTRUCTION	SK	20/25	AB	20/25	ST	20/25	SCALE	JOB NO.	DRAWING NO.	SHEET NO.	REV
REV	DESCRIPTION	BY	ON	BY	ON	BY	ON	N.T.S	71150	N/A	4 OF 4	0
		DRAWN	CHECKED	APPROVED								

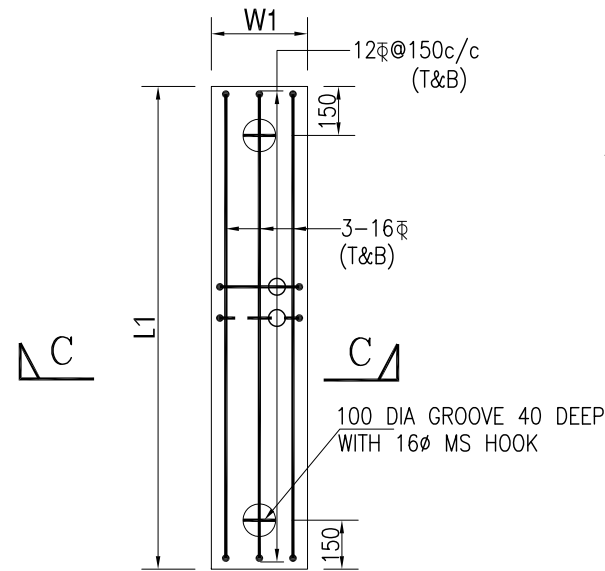
CLIENT:	GAIL INDIA LIMITED
CONSULTANT:	BRIDGE AND ROOF CO. (INDIA) LTD. A GOVERNMENT OF INDIA ENTERPRISE. 427/1, GRAND TRUNK ROAD, HOWRAH-711101
PROJECT:	CITY GAS DISTRIBUTION NETWORK IN SIX GEOGRAPHICAL AREAS (GA)
TITLE:	TYPICAL DETAILS OF VALVE PIT



PLAN OF VALVE PIT VP-1



REINF. DETAIL OF VALVE PIT



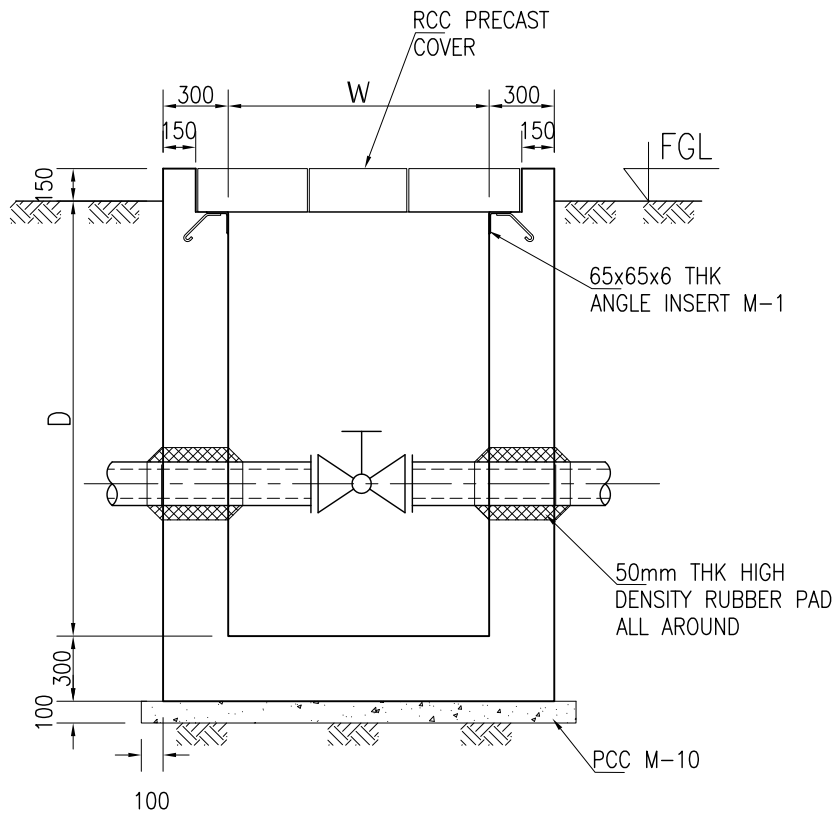
RCC DETAIL OF PRECAST SLAB

SCHEDULE OF VALVE PIT

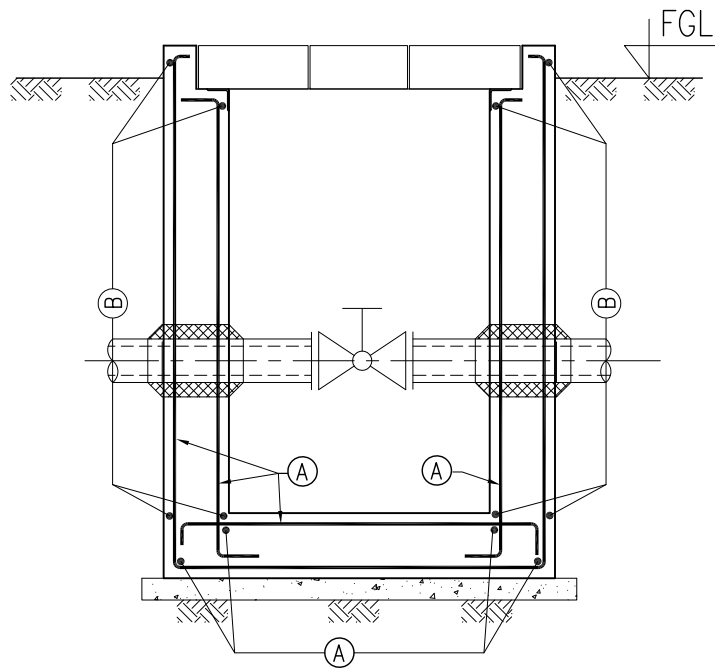
TYPE	LENGTH "L"	WIDTH "W"	DEPTH "D"	REINF.	
				A	B
I	1200	1200	2000	12@150c/c	12@150c/c
II	1800	1800	2000	16@150c/c	16@150c/c
III	2000	2000	2000	16@150c/c	16@150c/c

SCHEDULE OF PRECAST COVER

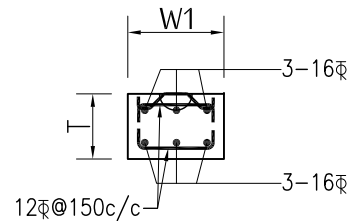
FOR PIT TYPE	LENGTH "L1"	WIDTH "W1"	THICKNESS "T"
I	1480	290	200
II	2080	290	200
III	2280	280	200



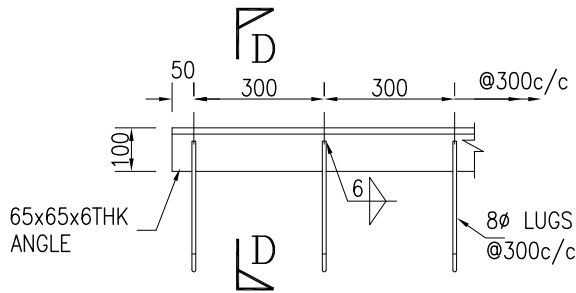
SECTION A-A



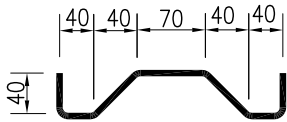
SECTION B-B



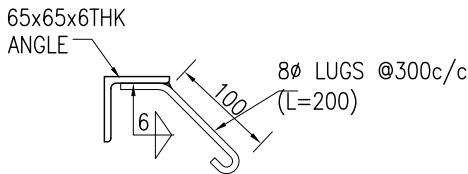
SECTION C-C



DETAIL OF INSERT IN-1



DETAIL OF 16Ø MS LIFTING HOOK



SECTION D-D

- NOTES:-
1. ALL DIMENSIONS ARE IN mm.
 2. ONLY FIGURED DIMENSIONS ARE TO BE FOLLOWED.
 3. ALL R.C.C. USED SHALL BE OF GRADE M25 AS PER IS:456-2000. UNLESS OTHERWISE SPECIFIED.
 4. ALL R/F STEEL SHALL BE HYSD (Fe 415) CONFORMING TO IS: 1786.
 5. CLEAR COVER TO MAIN R/F SHALL BE 40mm.
 6. FOR EXACT LOCATION & ORIENTATION OF VALVE PIT REFER LAYOUT DRAWING.
 7. DEVELOPMENT LENGTH SHALL BE 50 TIMES DIA OF BAR.

CONCURRED BY

REV	NO	DATE	ZONE	DESCRIPTIONS	BY	APPRD
REVISIONS						

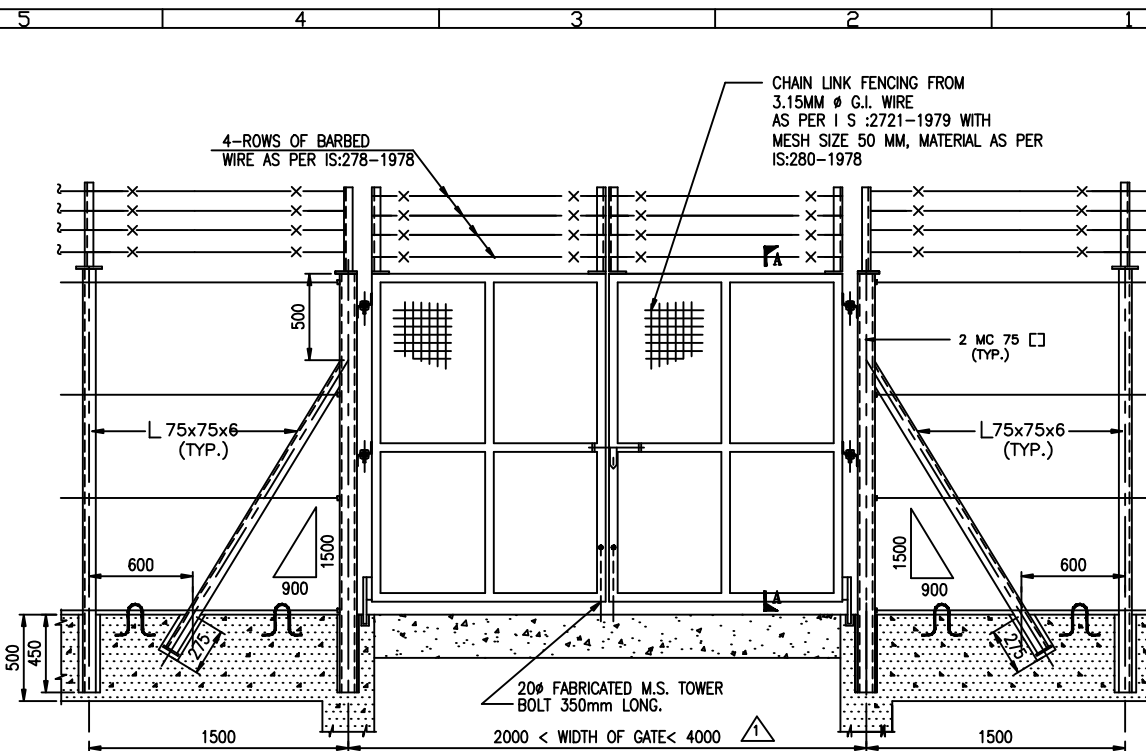
THIS DRAWING IS PROPERTY OF BANDR AND IS ISSUED FOR THE SPECIFIC PROJECT MENTIONED THEREIN. THIS IS NOT TO BE COPIED OR USED FOR OTHER PROJECTS UNLESS EXPRESSLY PERMITTED BY BANDR.

SECTION I- DESIGN DEPT.					
DSGN	SK/AM	DATE	CHKD	DATE	
DRWN	SAA		ST		
APPROVED					
12.07.2024					

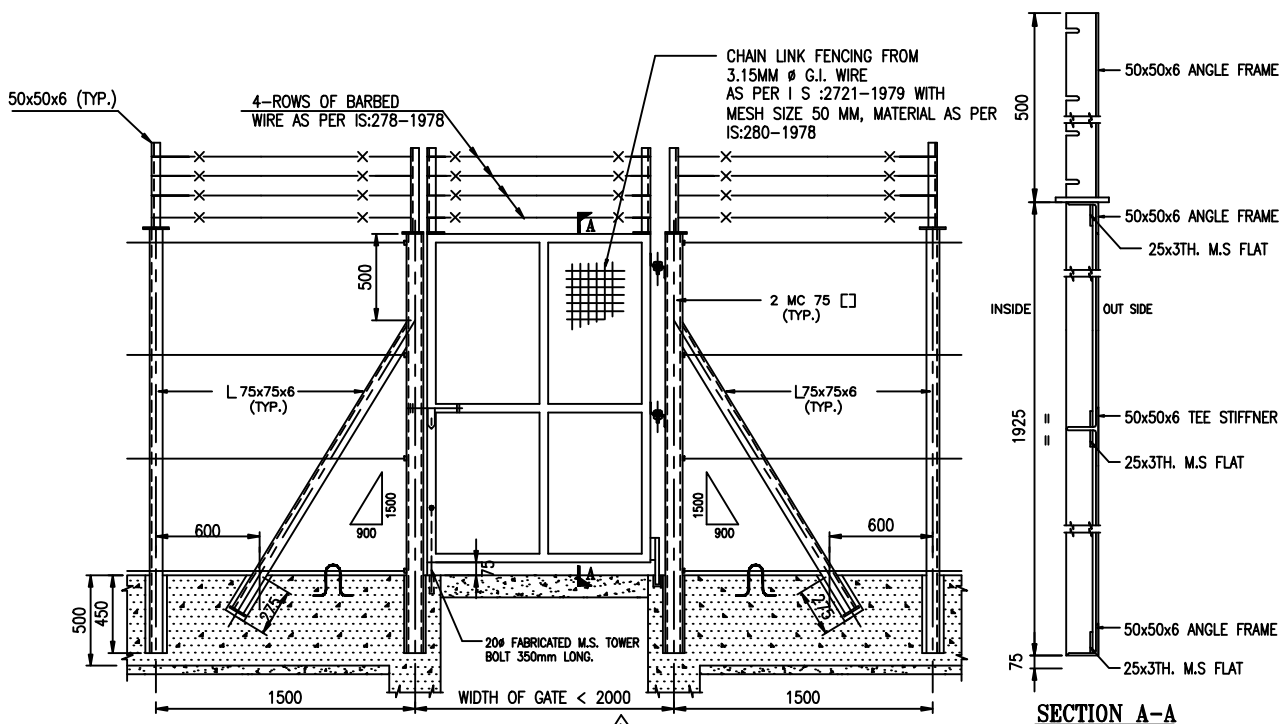
CUSTOMER	
NATURAL GAS PIPELINE PROJECT	
CNG & CITY GAS DISTRIBUTION NETWORK	
DETAILS OF VALVE PIT	

FOR TENDER PURPOSE ONLY			
ब्रीज एंड रूफ कंपनी (इंडिया) लिमिटेड			
BRIDGE AND ROOF CO. (I) LTD			
SCALE :- N.T.S.			SHEET
DWG NO.- BR-CGD-STD-DWG-66			REV
			1 0

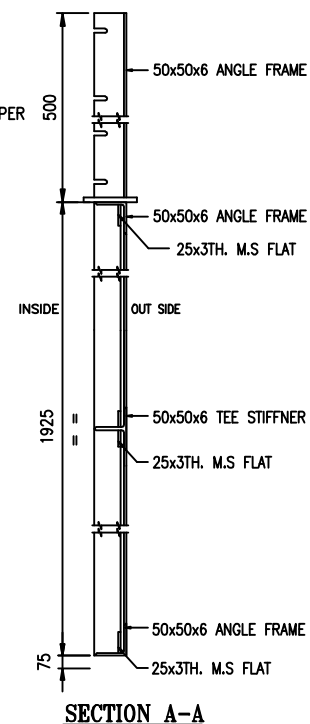
STRUCTURAL DRAWINGS



GATE DETAIL

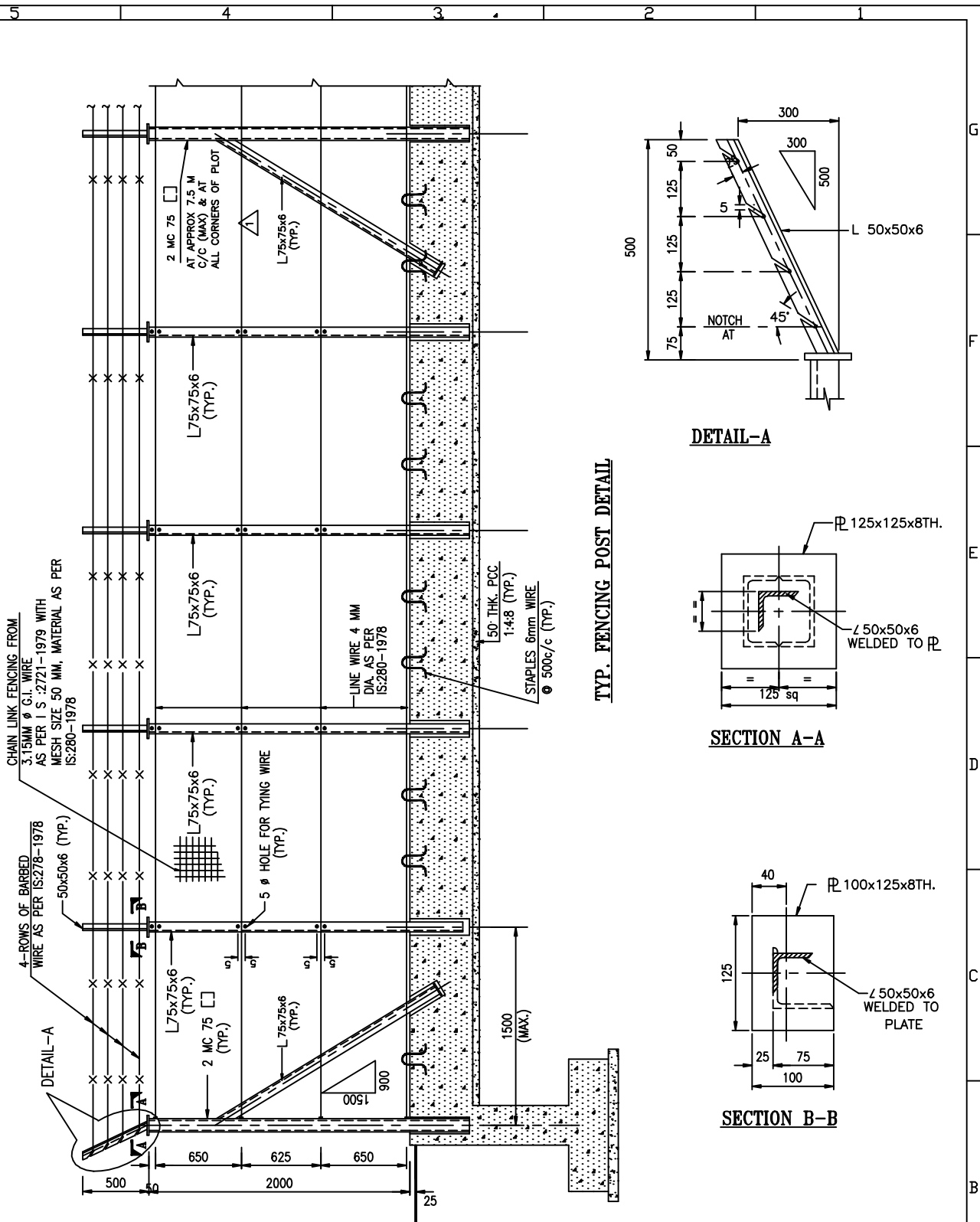


GATE DETAIL



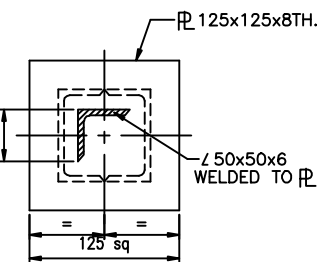
SECTION A-A

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

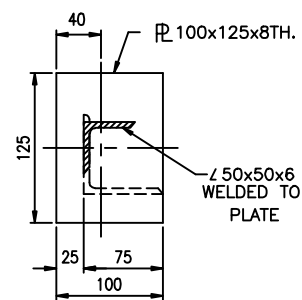


TYP. FENCING POST DETAIL



DETAIL-A

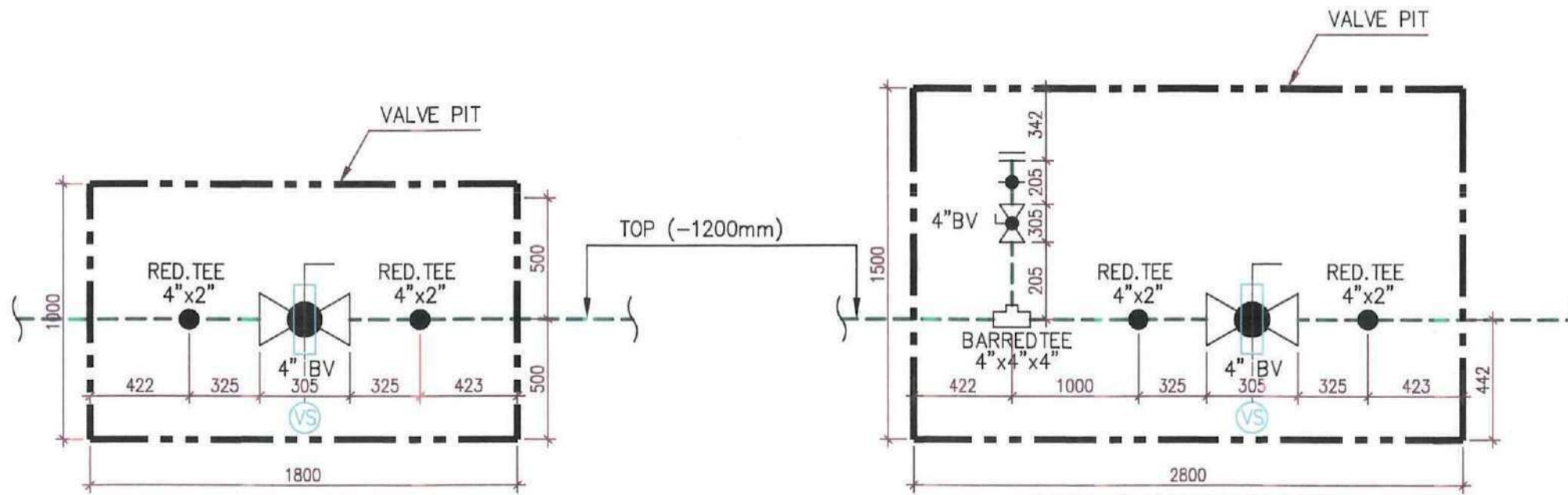


SECTION A-A



SECTION B-B

REV NO	DATE	ZONE	DESCRIPTIONS	BY	APPRD	REFERENCES	DRG. NO.
REVISIONS							
THIS DRAWING IS PROPERTY OF B AND R AND IS ISSUED FOR THE SPECIFIC PROJECT MENTIONED THEREIN. THIS IS NOT TO BE COPIED OR USED FOR OTHER PROJECTS UNLESS EXPRESSLY PERMITTED BY B AND R.							
SECTION	DESIGN DEPT.			GAIL INDIA LIMITED			
	NAME	SIG.	DATE	 GAIL INDIA LIMITED  ब्रीज एंड रूफ कंपनी (इंडिया) लिमिटेड BRIDGE AND ROOF CO. (I) LTD			
DSGN.	SK/AM		12.07.2024				
DRWN	SAA		12.07.2024				
CHKD. & VERIFIED	ST		12.07.2024				
APPROVED	ST		12.07.2024				
TYPICAL DETAILS OF CHAINLINK FENCING				Page	1590 of 1596	DWG NO.- BR-CGD-STD-DWG-68	
						REV	0

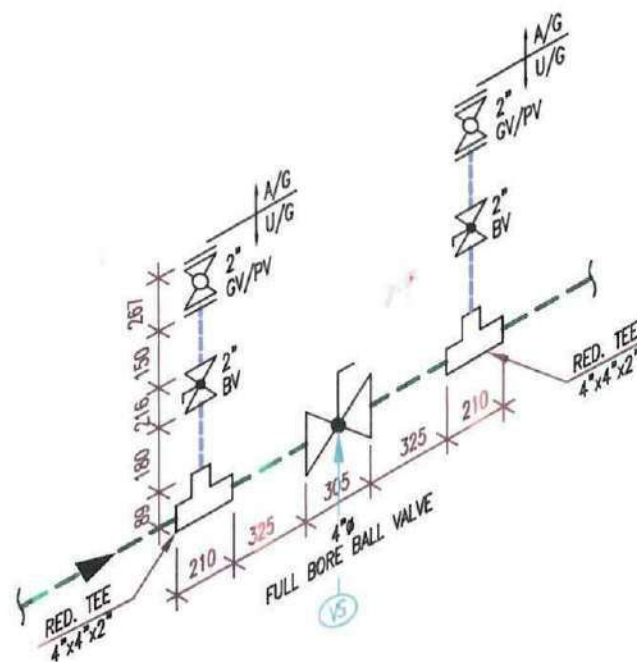


DETAIL OF 4"SV STATION (WITHOUT FUTURE TAP-OFF)

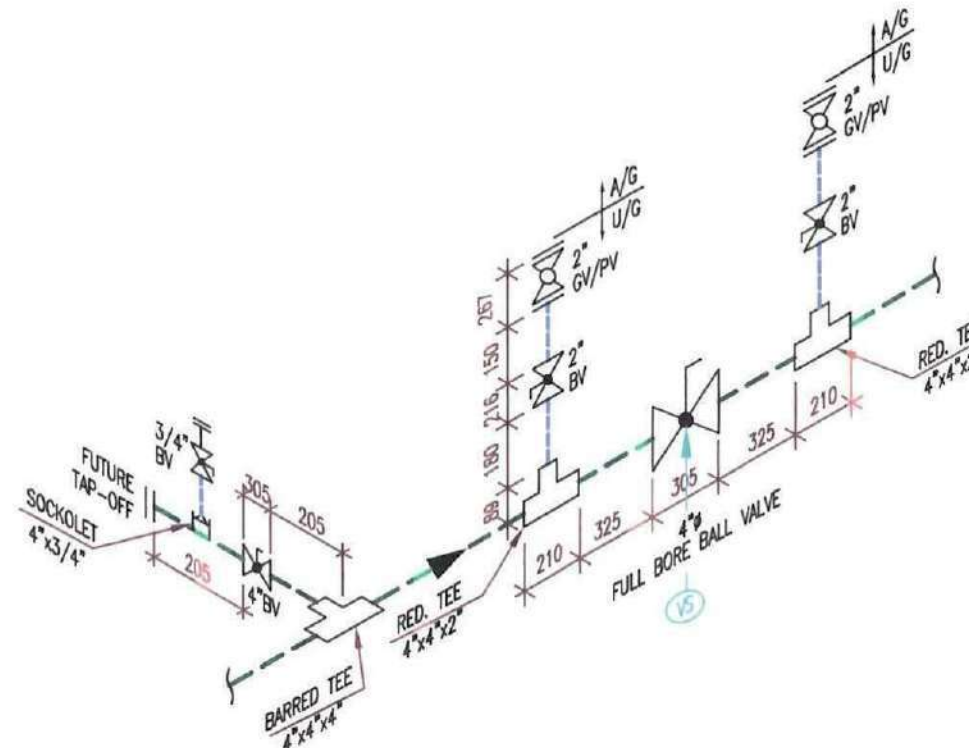
DETAIL OF 4"SV STATION (WITH FUTURE TAP-OFF)

BILL OF MATERIAL-4" SV STATION WITH FUTURE TAP OFF					
SR. NO.	DESCRIPTION	SIZE	RATING	MATERIAL	QUANTITY
1	BALL VALVE	3/4"	800#	AS PER DATA SHEET	1
		2"	300#		2
		4"	300#		2
2	PLUG VALVE/ GLOBE VALVE	2"	300#	AS PER DATA SHEET	2
					2
3	FLANGE	4"	300#	ASTM A-105(CHARPY) WNRF, 125 AARH, B-16.5/AS PER PMS	1
		2"	300#		2
		3/4"	300#		1
4	BLIND FLANGE	4"	300#	ASTM A-105(CHARPY) RF, 125 AARH, B-16.5/AS PER PMS	1
		2"	300#		2
		3/4"	300#		1
5	BARRED TEE	4"x4"	300#	AS PER DATA SHEET	1
6	RED. TEE	4"x2"	300#	ASTM A-234, Gr.WPB (CHARPY)/ AS PER PMS	2
7	PIPE	4"	MAIN LINE	AS PER SOR	~2800mm
		4"	300#	SCH. 40 ASTM A 106 GR.B (CHARPY)/AS PER PMS	~500mm
		2"	300#	XS ASTM A 106 GR.B (CHARPY)/AS PER PMS	~2800mm
		3/4"	300#	S 160 ASTM A 106 GR.B/AS PER PMS	~300mm
8	SOCKOLET	4"x3/4"	6000#	ASTM A-105/AS PER PMS	1

BILL OF MATERIAL-4" SV STATION WITHOUT FUTURE TAP OFF					
SR. NO.	DESCRIPTION	SIZE	RATING	MATERIAL	QUANTITY
1	BARRED TEE	4"x2"	300#	AS PER DATA SHEET	2
2	BALL VALVE	2"	300#	AS PER DATA SHEET	2
		4"	300#		1
3	PLUG VALVE/ GLOBE VALVE	2"	300#	AS PER DATA SHEET	2
4	FLANGE	2"	300#	ASTM A-105(CHARPY) WNRF, 125 AARH, B-16.5/AS PER PMS	1
5	BLIND FLANGE	2"	300#	ASTM A-105(CHARPY) RF, 125 AARH, B-16.5/AS PER PMS	1
6	PIPE	4"	MAIN LINE	AS PER SOR	~1800mm
		2"	300#	XS ASTM A 106 GR.B (CHARPY)/AS PER PMS	~2800mm



ISOMETRIC DETAIL OF 4"SV STATION WITHOUT TAP-OFF



ISOMETRIC DETAIL OF 4"SV STATION WITH TAP-OFF

LEGEND	
---	4"Ø PIPELINE
---	2"Ø PIPELINE

NOTES :-

1. ALL DIMENSION ARE IN MM, UNLESS OTHERWISE MENTIONED.
2. THE DIMENSION SHOWN IN THE TYPICAL SCHEMATIC DIAGRAM IS TENTATIVE & ACTUAL DIMENSION SHALL BE AS PER THE SITE CONDITION/ DIRECTION OF EIC.
3. ALL DIMENSIONS OF PIT ARE FROM INSIDE TO INSIDE.
4. THE ABOVE SCHEMATIC DIAGRAMS ARE FOR ALL SV STATION INSTALLED IN VALVE PIT.
5. USE OF PLUG VALVE OR GLOBE VALVE ONLY ONE WILL BE TAKEN DEPENDING ON AVAILABILITY AT SITE.
6. QUANTITY MENTIONED AT SITE IN ABOVE TABLE ARE TENTATIVE, FURTHER MAY INCREASE / DECREASE AND BASED ON DECISION OF EIC/OWNR DEPENDING ON SITE CONDITIONS.



GAIL INDIA LTD.

ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड

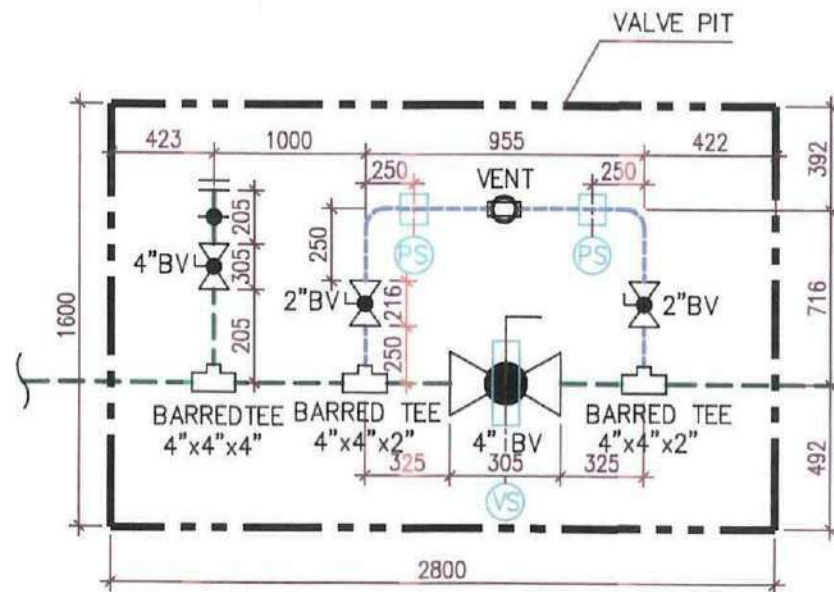
BRIDGE AND ROOF CO. (I) LTD.

CITY GAS DISTRIBUTION NETWORK

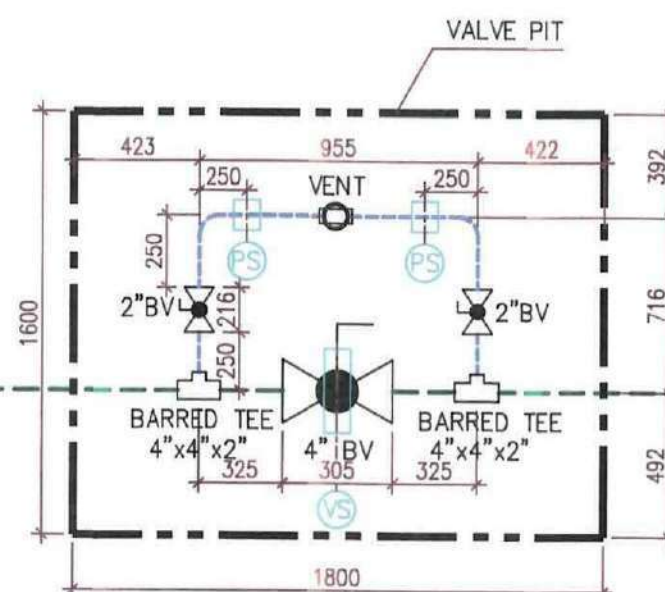
SCHEMATIC DRAWING FOR 4"Ø SV STATION (TYPE-2A)

SCALE : NTS (SH 1 OF 1) REV

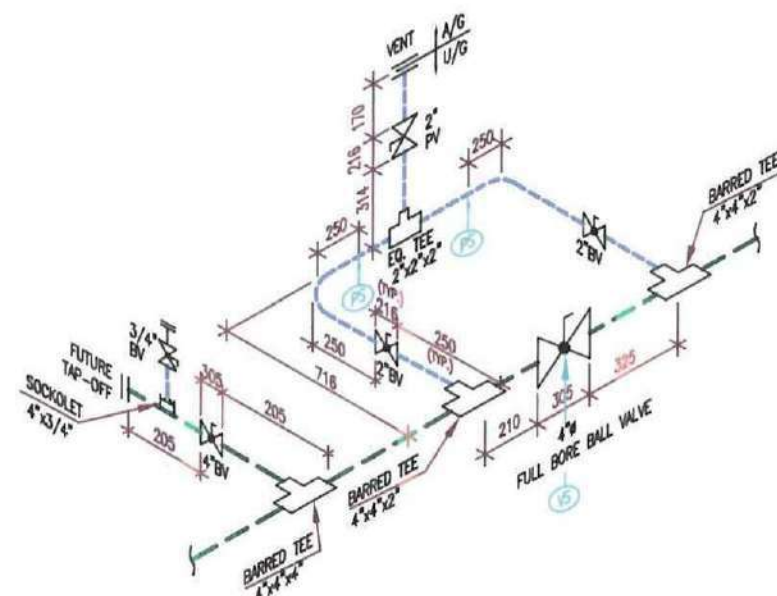
DWG. NO. - BR-CGD-STD.-DWG-106 0



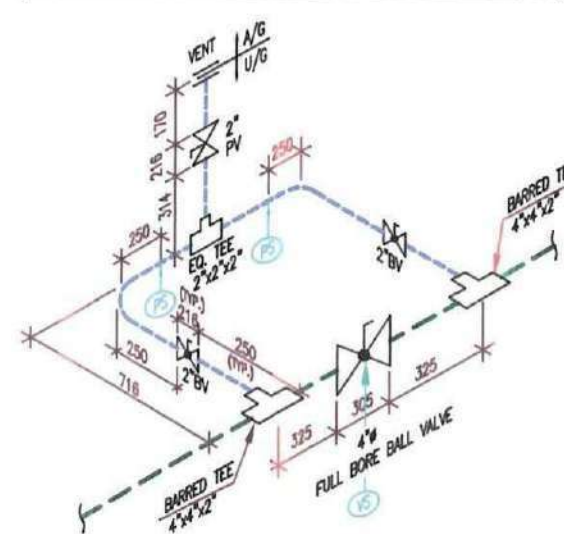
DETAIL OF 4"SV STATION
(WITH FUTURE TAP-OFF)



DETAIL OF 4"SV STATION
(WITHOUT FUTURE TAP-OFF)



ISOMETRIC DETAIL OF 4"SV STATION
(WITH FUTURE TAP-OFF)



ISOMETRIC DETAIL OF 4"SV STATION
(WITHOUT FUTURE TAP-OFF)

BILL OF MATERIAL-4" SV STATION WITH FUTURE TAP OFF					
SR. NO.	DESCRIPTION	SIZE	RATING	MATERIAL	QUANTITY
1	EQUAL TEE	2"	300#	XS ASTM A 234 GR.WPB (CHARPY) BW, B-16.9/AS PER PMS	1
2	BALL VALVE	3/4"	800#	AS PER DATA SHEET	1
		2"	300#		2
		4"	300#		2
3	PLUG VALVE	2"	300#		1
4	FLANGE	4"	300#	ASTM A-105(CHARPY) WNRF, 125 AARH, B-16.5/AS PER PMS	1
		2"	300#		1
		3/4"	300#	ASTM A-105 SWRF, 125 AARH, B-16.5/AS PER PMS	1
5	BLIND FLANGE	4"	300#	ASTM A-105(CHARPY) RF, 125 AARH, B-16.5/AS PER PMS	1
		2"	300#		1
		3/4"	300#	ASTM A-105 RF, 125 AARH, B-16.5/AS PER PMS	1
6	90° ELBOW	2"	300#	ASTM A-234 GR.WPB (CHARPY) BW, 1.5D, B-16.9/AS PER PMS	2
7	BARRED TEE	4"x4"	300#	AS PER DATA SHEET	1
		4"x2"	300#	AS PER DATA SHEET	2
8	PIPE	4"	MAIN LINE	AS PER SOR	~2800mm
		4"	300#	SCH. 40 ASTM A 106 GR.B (CHARPY)/AS PER PMS	~500mm
		2"	300#	XS ASTM A 106 GR.B (CHARPY)/AS PER PMS	~2800mm
		3/4"	300#	S 160 ASTM A 106 GR.B/AS PER PMS	~300mm
9	SOCKET	4"x3/4"	6000#	ASTM A-105/AS PER PMS	1

BILL OF MATERIAL-4" SV STATION WITHOUT FUTURE TAP OFF					
SR. NO.	DESCRIPTION	SIZE	RATING	MATERIAL	QUANTITY
1	BARRED TEE	4"x2"	300#	AS PER DATA SHEET	2
2	EQUAL TEE	2"	300#	XS ASTM A 234 GR.WPB (CHARPY) BW, B-16.9/AS PER PMS	1
3	BALL VALVE	2"	300#	AS PER DATA SHEET	2
		4"	300#		1
4	PLUG VALVE	2"	300#		1
5	FLANGE	2"	300#	ASTM A-105(CHARPY) WNRF, 125 AARH, B-16.5/AS PER PMS	1
6	BLIND FLANGE	2"	300#	ASTM A-105(CHARPY) RF, 125 AARH, B-16.5/AS PER PMS	1
7	90° ELBOW	2"	300#	ASTM A-234 GR.WPB (CHARPY) BW, 1.5D, B-16.9/AS PER PMS	2
8	PIPE	4"	MAIN LINE	AS PER SOR	~1800mm
		2"	300#	XS ASTM A 106 GR.B (CHARPY)/AS PER PMS	~2800mm

LEGEND

4"Ø PIPELINE
2"Ø PIPELINE

NOTES :-

- ALL DIMENSION ARE IN MM, UNLESS OTHERWISE MENTIONED.
- THE DIMENSION SHOWN IN THE TYPICAL SCHEMATIC DIAGRAM IS TENTATIVE & ACTUAL DIMENSION SHALL BE AS PER THE SITE CONDITION/ DIRECTION OF EIC.
- ALL DIMENSIONS OF PIT ARE FROM INSIDE TO INSIDE.
- THE ABOVE SCHEMATIC DIAGRAMS ARE FOR ALL SV STATION INSTALLED IN VALVE PIT.
- USE OF PLUG VALVE OR GLOBE VALVE ONLY ONE WILL BE TAKEN DEPENDING ON AVAILABILITY AT SITE.
- QUANTITY MENTIONED AT SITE IN ABOVE TABLE ARE TENTATIVE, FURTHER MAY INCREASE / DECREASE BASED ON DECISION OF EIC/OWNER DEPENDING ON SITE CONDITIONS.



GAIL INDIA LTD.



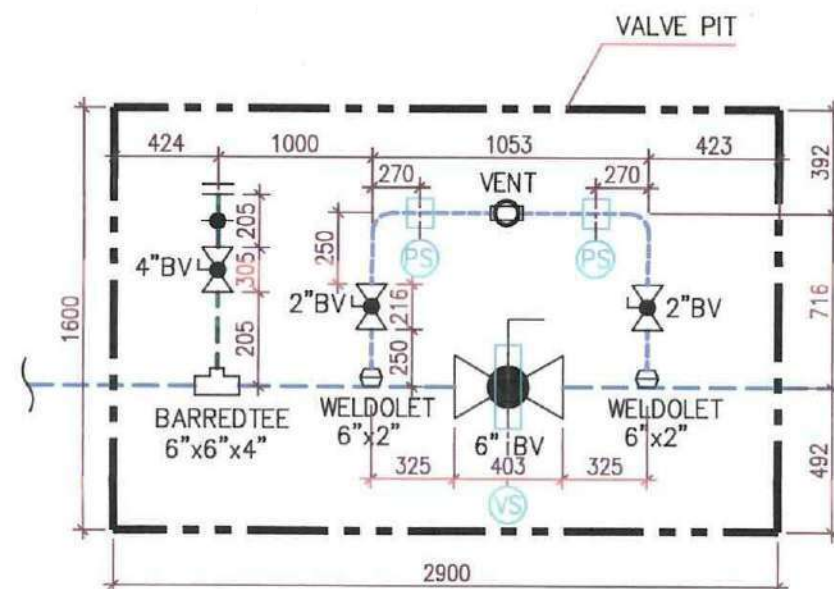
ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड

BRIDGE AND ROOF CO.(I) LTD.

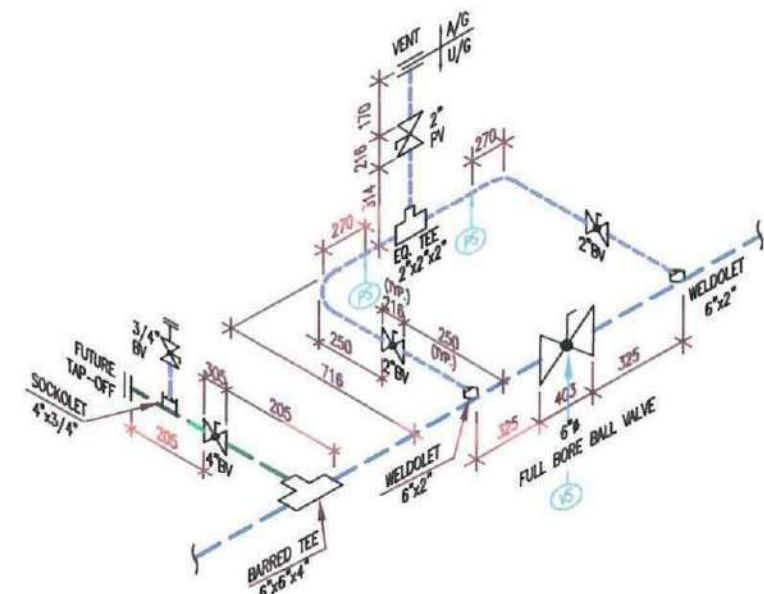
CITY GAS DISTRIBUTION NETWORK

SCHEMATIC DRAWING FOR 4"Ø SV STATION (TYPE-2)

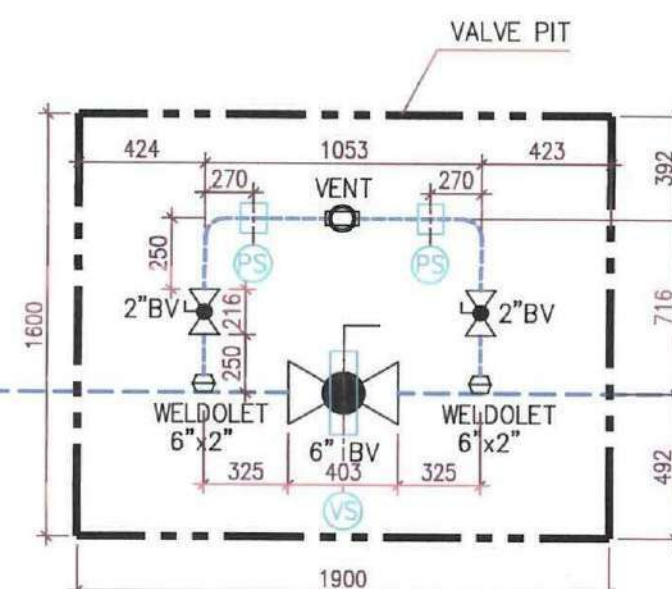
SCALE : NTS (SH 1 OF 1)
DWG. NO. - BR-CGD-STD-DWG-107



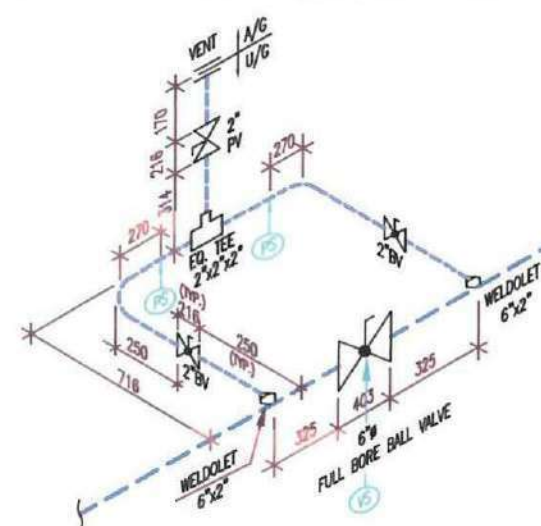
**DETAIL OF 6"SV STATION
(WITH FUTURE TAP-OFF)**



**ISOMETRIC DETAIL OF 6"SV STATION
(WITH FUTURE TAP-OFF)**



**DETAIL OF 6"SV STATION
(WITHOUT FUTURE TAP-OFF)**



**ISOMETRIC DETAIL OF 6"SV STATION
(WITHOUT FUTURE TAP-OFF)**

BILL OF MATERIAL-6" SV STATION WITH FUTURE TAP OFF					
SR. NO.	DESCRIPTION	SIZE	RATING	MATERIAL	QUANTITY
1	BARRED TEE	6"x4"	300#	AS PER DATA SHEET	1
2	WELDOLET	6"x2"	300#	ASTM A-105(CHARPY) BW, MSSSP-97/AS PER PMS	2
3	EQUAL TEE	2"	300#	XS ASTM A 234 GR.WPB (CHARPY) BW, B-16.9/AS PER PMS	1
4	BALL VALVE	3/4"	800#	AS PER DATA SHEET	1
		2"	300#		2
		4"	300#		1
		6"	300#		1
5	PLUG VALVE	2"	300#		1
6	FLANGE	4"	300#	ASTM A-105(CHARPY) WNR, 125 AARH, B-16.5/AS PER PMS	1
7		2"	300#		1
		3/4"	300#		1
8	BLIND FLANGE	4"	300#	ASTM A-105(CHARPY) RF, 125 AARH, B-16.5/AS PER PMS	1
9		2"	300#		1
		3/4"	300#		1
10	90° ELBOW	2"	300#	ASTM A-234 GR.WPB (CHARPY) BW, 1.5D, B-16.9/AS PER PMS	2
11	PIPE	6"	MAIN LINE	AS PER SOR	~3000mm
		4"	300#	SCH. 40 ASTM A 106 GR.B (CHARPY)/AS PER PMS	~500mm
		2"	300#	XS ASTM A 106 GR.B (CHARPY)	~3000mm
		3/4"	300#	S 180 ASTM A 106 GR.B/AS PER PMS	~300mm
12	SOCKLE	4"x3/4"	6000#	ASTM A-105/AS PER PMS	1

BILL OF MATERIAL-6" SV STATION WITHOUT FUTURE TAP OFF					
SR. NO.	DESCRIPTION	SIZE	RATING	MATERIAL	QUANTITY
1	WELDOLET	6"x2"	300#	ASTM A-105(CHARPY) BW, MSSSP-97	2
2	EQUAL TEE	2"	300#	XS ASTM A 234 GR.WPB (CHARPY) BW, B-16.9/AS PER PMS	1
3	BALL VALVE	2"	300#	AS PER DATA SHEET	2
		6"	300#		1
4	PLUG VALVE	2"	300#		1
5	FLANGE	2"	300#	ASTM A-105(CHARPY) WNR, 125 AARH, B-16.5/AS PER PMS	1
6	BLIND FLANGE	2"	300#	ASTM A-105(CHARPY) RF, 125 AARH, B-16.5/AS PER PMS	1
7	90° ELBOW	2"	300#	ASTM A-234 GR.WPB (CHARPY) BW, 1.5D, B-16.9/AS PER PMS	2
8	PIPE	6"	MAIN LINE	AS PER SOR	~2000mm
		2"	300#	XS ASTM A 106 GR.B (CHARPY)/AS PER PMS	~3000mm

LEGEND	
---	6"Ø PIPELINE
---	4"Ø PIPELINE
---	2"Ø PIPELINE



GAIL INDIA LTD.

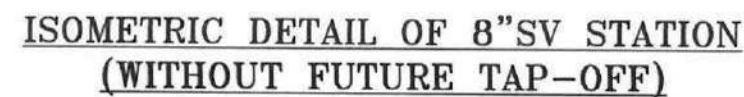
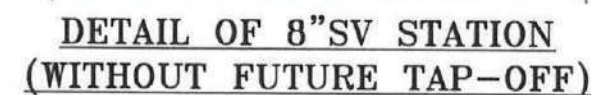
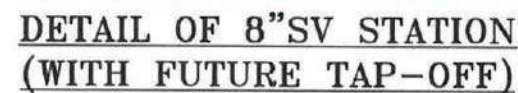
ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड

BRIDGE AND ROOF CO.(I) LTD.

NOTES :-

1. ALL DIMENSION ARE IN MM, UNLESS OTHERWISE MENTIONED.
2. THE DIMENSION SHOWN IN THE TYPICAL SCHEMATIC DIAGRAM IS TENTATIVE & ACTUAL DIMENSION SHALL BE AS PER THE SITE CONDITION/ DIRECTION OF EIC.
3. ALL DIMENSIONS OF PIT ARE FROM INSIDE TO INSIDE.
4. THE ABOVE SCHEMATIC DIAGRAMS ARE FOR ALL SV STATION INSTALLED IN VALVE PIT.
5. USE OF PLUG VALVE OR GLOBE VALVE ONLY ONE WILL BE TAKEN DEPENDING ON AVAILABILITY AT SITE.
6. QUANTITY MENTIONED AT SITE IN ABOVE TABLE ARE TENTATIVE, FURTHER MAY INCREASE / DECREASE AND BASED ON DECISION OF EIC/OWNER DEPENDING ON SITE CONDITIONS.

SECTION		CITY GAS DISTRIBUTION NETWORK
LOCATION		
DESIGNED		
DRAWN		
CHECKED		
APPROVED		
DATE		
SCALE : NTS	(SH 1 OF 1)	REV
DWG. NO. - BR-CGD-STD.-DWG-108		0



BILL OF MATERIAL - B" SV STATION WITH FUTURE TAP OFF					
SR. NO.	DESCRIPTION	SIZE	RATING	MATERIAL	QUANTITY
1	BARRED TEE	8"x4"	300#	AS PER DATA SHEET	1
2	WELDOLET	8"x2"	300#	ASTM A-105(CHАРY) BW, MSSSP-97/AS PER PMS	2
3	EQUAL TEE	2"	300#	XS ASTM A 234 GR.WPB (CHARPY) BW, B-16.9/AS PER PMS	1
4	BALL VALVE	3/4"	800#	AS PER DATA SHEET	1
		2"	300#		2
		4"	300#		1
		8"	300#		1
5	PLUG VALVE	2"	300#		1
6	FLANGE	4"	300#	ASTM A-105(CHАРY) WNRФ, 125 AARH, B-16.5/AS PER PMS	1
		2"	300#		1
		3/4"	300#	ASTM A-105 SWRF, 125 AARH, B-16.5/AS PER PMS	1
7	BLIND FLANGE	4"	300#	ASTM A-105(CHАРY) RF, 125 AARH, B-16.5/AS PER PMS	1
		2"	300#		1
		3/4"	300#	ASTM A-105 RF, 125 AARH, B-16.5/AS PER PMS	1
8	90° ELBOW	2"	300#	ASTM A-234 GR.WPB (CHARPY) BW, 1.5D, B-16.9/AS PER PMS	2
9	SOCKOLET	4"x3/4"	6000#	ASTM A105/AS PER PMS	1
10	PIPE	8"	MAIN LINE	AS PER SOR	~2800mm
		4"	300#	SCH. 40 ASTM A 106 GR.B (CHARPY)/AS PER PMS	~500mm
		2"	300#	XS ASTM A 106 GR.B (CHARPY)/AS PER PMS	~3200mm
		3/4"	300#	S 160 ASTM A 106 GR.B/AS PER PMS	~300mm

BILL OF MATERIAL-8" SY STATION WITHOUT FUTURE TAP OFF					
SR. NO.	DESCRIPTION	SIZE	RATING	MATERIAL	QUANTITY
1	WELDOLET	8"x2"	300#	ASTM A-105(CHARPY) BW, MSSSP-97/AS PER PMS	2
2	EQUAL TEE	2"	300#	XS ASTM A 234 GR.WPB (CHARPY) BW, B-16.9/AS PER PMS	1
3	BALL VALVE	2"	300#	AS PER DATA SHEET	2
		8"	300#		1
4	PLUG VALVE	2"	300#		1
5	FLANGE	2"	300#	ASTM A-105(CHARPY) WNRF, 125 AARH, B-16.5/AS PER PMS	1
6	BLIND FLANGE	2"	300#	ASTM A-105(CHARPY) RF, 125 AARH, B-16.5/AS PER PMS	
7	90° ELBOW	2"	300#	ASTM A-234 GR.WPB (CHARPY) BW, 1.5D, B-16.9/AS PER PMS	2
8	PIPE	8"	MAIN LINE	AS PER SOR	~2400mm
		2"	300#	XS ASTM A 106 GR.B (CHARPY)/AS PER PMS	~3200mm

 8"Ø PIPELINE
 4"Ø PIPELINE
 2"Ø PIPELINE



GAIL INDIA LTD.

ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड

BRIDGE AND ROOF CO.(I) LTD.

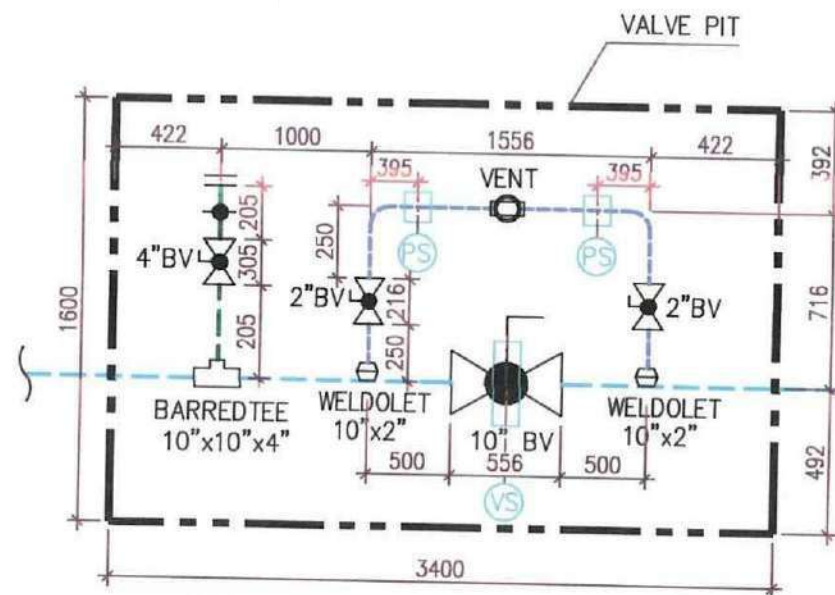
CITY GAS DISTRIBUTION NETWORK

SCHEMATIC DRAWING FOR 8"Ø SV
STATION (TYPE-2)

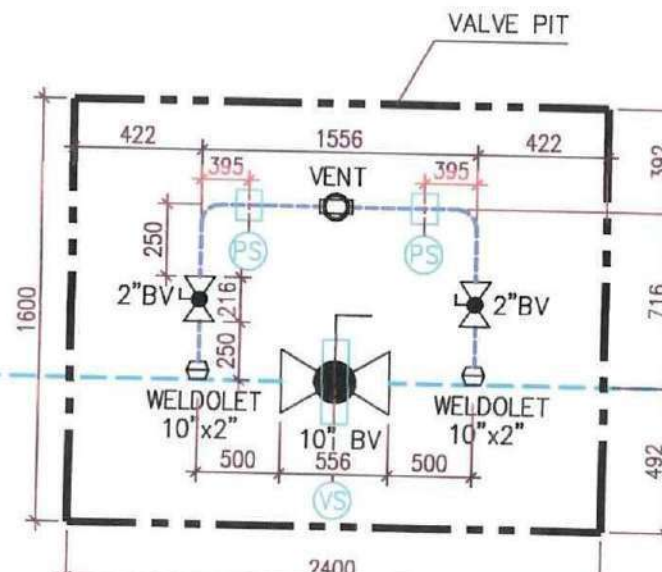
SCALE : NTS	(SH 1 OF 1)
DWG. NO. - BR-CGD-STD.-DWG-109	

NOTES :-

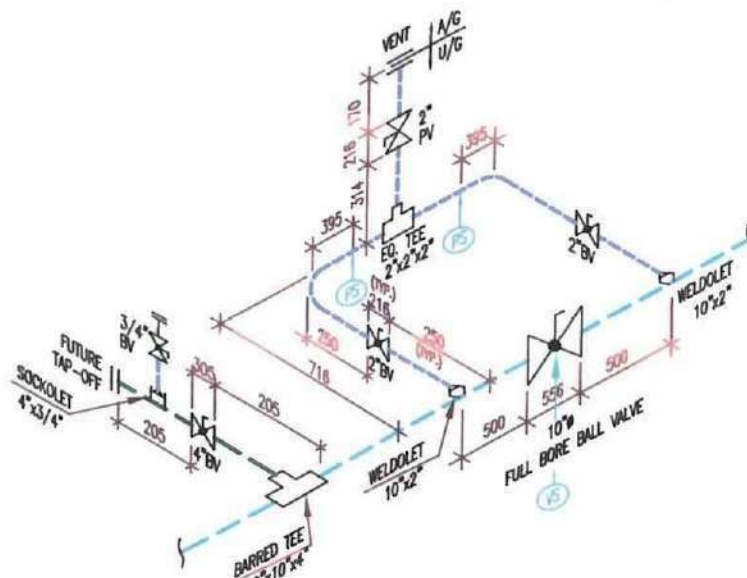
1. ALL DIMENSION ARE IN MM, UNLESS OTHERWISE MENTIONED.
2. THE DIMENSION SHOWN IN THE TYPICAL SCHEMATIC DIAGRAM IS TENTATIVE & ACTUAL DIMENSION SHALL BE AS PER THE SITE CONDITION/ DIRECTION OF FLOW.
3. ALL DIMENSIONS OF PIT ARE FROM INSIDE TO INSIDE.
4. THE ABOVE SCHEMATIC DIAGRAMS ARE FOR ALL SV STATION INSTALLED IN VALVE PIT.
5. USE OF PLUG VALVE OR GLOBE VALVE ONLY ONE WILL BE TAKEN DEPENDING ON AVAILABILITY AT SITE.
6. QUANTITY MENTIONED AT SITE IN ABOVE TABLE ARE TENTATIVE, FURTHER MAY INCREASE / DECREASE BASED ON DECISION OF E/C/OWNER DEPENDING ON SITE CONDITIONS.



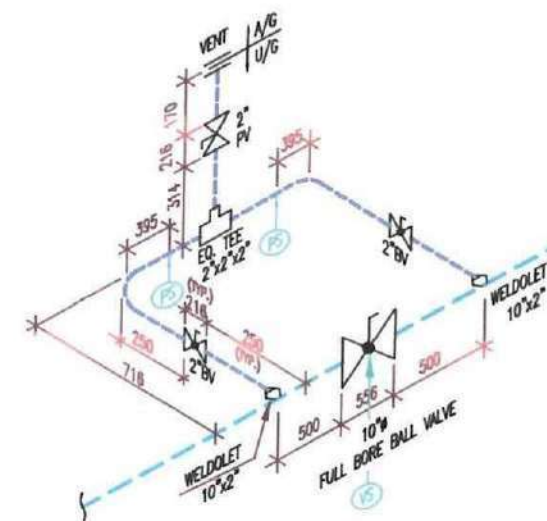
**DETAIL OF 10"SV STATION
(WITH FUTURE TAP-OFF)**



**DETAIL OF 10"SV STATION
(WITHOUT FUTURE TAP-OFF)**



**ISOMETRIC DETAIL OF 10"SV STATION
(WITH FUTURE TAP-OFF)**



**ISOMETRIC DETAIL OF 10"SV STATION
(WITHOUT FUTURE TAP-OFF)**

BILL OF MATERIAL-10" SV STATION WITH FUTURE TAP OFF				
SR. NO.	DESCRIPTION	SIZE	RATING	QUANTITY
1	BARRED TEE	10"x4"	300#	1
2	WELDOLET	10"x2"	300#	2
3	SOCKOLET	4"x3/4"	6000#	1
4	EQUAL TEE	2"	300#	1
5	BALL VALVE	3/4"	800#	1
		2"	300#	2
		4"	300#	1
		10"	300#	1
6	PLUG VALVE	2"	300#	1
7	FLANGE	4"	300#	1
		2"	300#	1
		3/4"	300#	1
8	BLIND FLANGE	4"	300#	1
		2"	300#	1
		3/4"	300#	1
9	90° ELBOW	2"	300#	2
11	PIPE	10"	MAIN LINE	~3300mm
		4"	SCH. 40 ASTM A 106 GR.B (CHARPY)/AS PER PMS	~500mm
		2"	XS ASTM A 106 GR.B (CHARPY)/AS PER PMS	~3600mm
		3/4"	S 160 ASTM A 106 GR.B/AS PER PMS	~300mm

BILL OF MATERIAL-10" SV STATION WITHOUT FUTURE TAP OFF				
SR. NO.	DESCRIPTION	SIZE	RATING	QUANTITY
1	WELDOLET	10"x2"	300#	2
2	EQUAL TEE	2"	300#	1
3	BALL VALVE	2"	300#	2
4		10"	300#	1
5	FLANGE	2"	300#	1
6	BLIND FLANGE	2"	300#	1
7	90° ELBOW	2"	300#	2
8	PIPE	10"	MAIN LINE	~2400mm
		2"	XS ASTM A 106 GR.B (CHARPY)/AS PER PMS	~2800mm

LEGEND	
	10"Ø PIPELINE
	4"Ø PIPELINE
	2"Ø PIPELINE



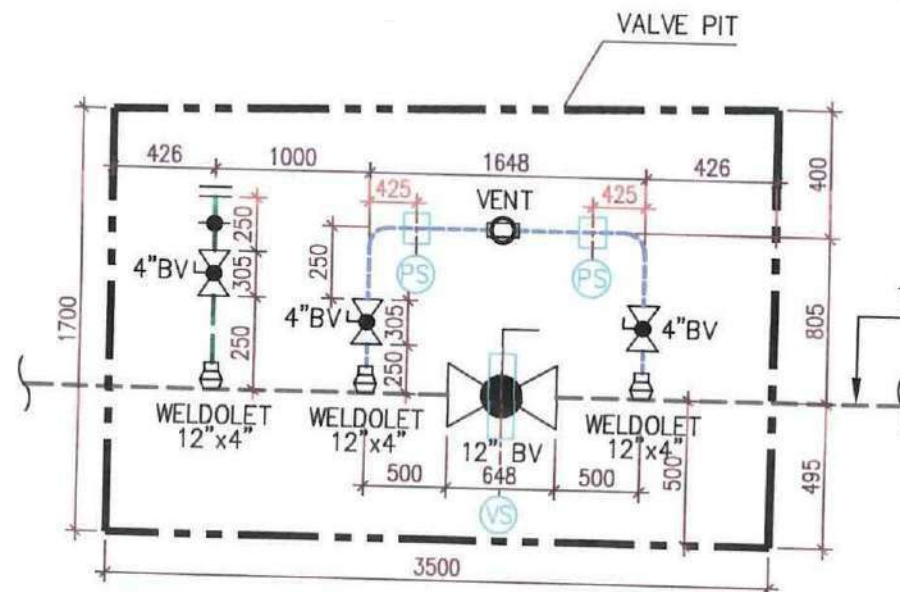
GAIL INDIA LTD.
ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड
BRIDGE AND ROOF CO. (I) LTD.

- NOTES :-**
1. ALL DIMENSION ARE IN MM, UNLESS OTHERWISE MENTIONED.
 2. THE DIMENSION SHOWN IN THE TYPICAL SCHEMATIC DIAGRAM IS TENTATIVE & ACTUAL DIMENSION SHALL BE AS PER THE SITE CONDITION/ DIRECTION OF FIC.
 3. ALL DIMENSIONS OF PIT ARE FROM INSIDE TO INSIDE.
 4. THE ABOVE SCHEMATIC DIAGRAMS ARE FOR ALL SV STATION INSTALLED IN VALVE PIT.
 5. USE OF PLUG VALVE OR GLOBE VALVE ONLY ONE WILL BE TAKEN DEPENDING ON AVAILABILITY AT SITE.
 6. QUANTITY MENTIONED AT SITE IN ABOVE TABLE ARE TENTATIVE, FURTHER MAY INCREASE / DECREASE AND BASED ON DECISION OF EIC/OWNER DEPENDING ON SITE CONDITIONS.

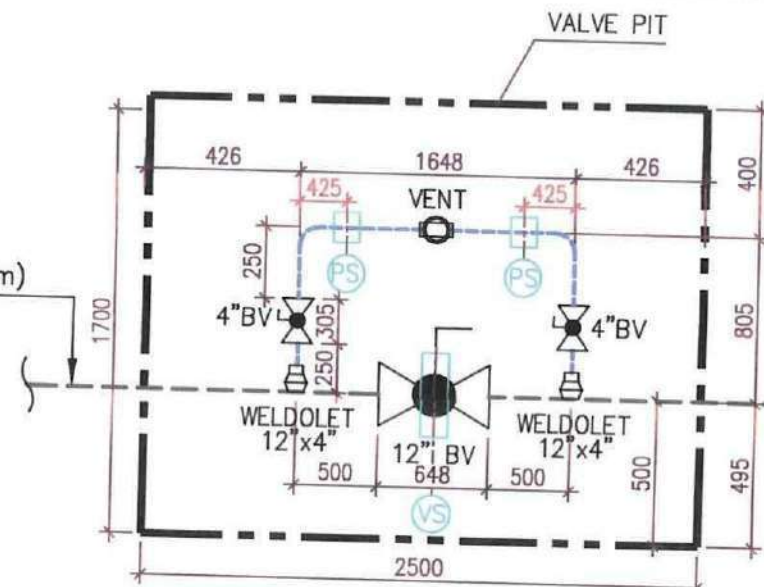
CITY GAS DISTRIBUTION NETWORK

SCHEMATIC DRAWING FOR 10" SV STATION (TYPE-2)

SCALE : NTS (SH 1 OF 1)
DWG. NO. - BR-CGD-STD.-DWG-110

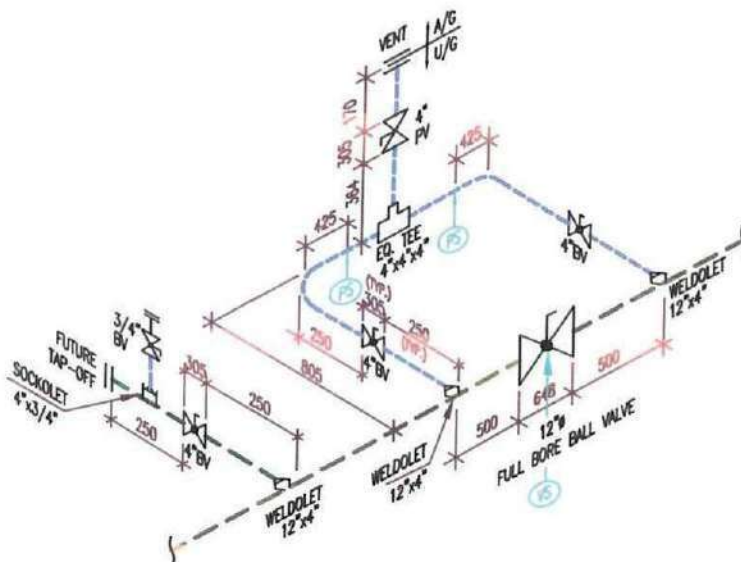


**DETAIL OF 12"SV STATION
(WITH FUTURE TAP-OFF)**

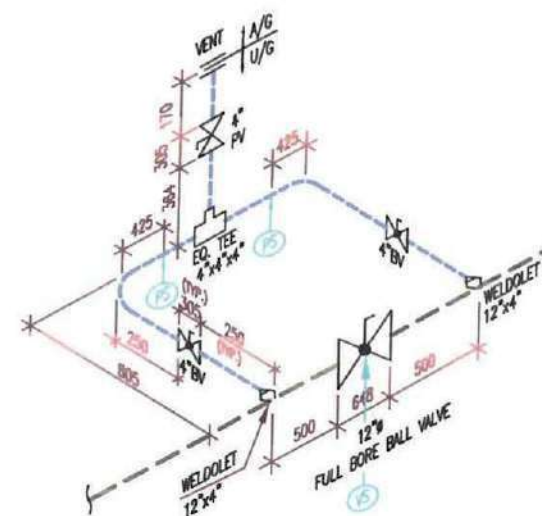


**DETAIL OF 12"SV STATION
(WITHOUT FUTURE TAP-OFF)**

SR. NO.	DESCRIPTION	SIZE	RATING	MATERIAL	QUANTITY
1	WELDOLET	12"x4"	300#	ASTM A-105(CHARPY) BW, MSSSP-97/AS PER PMS	3
2	EQUAL TEE	4"	300#	SCH-40, ASTM A 234 GR.WPB (CHARPY) BW, B-16.9/AS PER PMS	1
3	BALL VALVE	3/4"	800#	AS PER DATA SHEET	1
		4"	300#		3
		12"	300#		1
4	PLUG VALVE	4"	300#		1
5	FLANGE	4"	300#	ASTM A-105(CHARPY) WNRF, 125 AARH, B-16.5/AS PER PMS	2
		3/4"	300#	ASTM A-105 SWRF, 125 AARH, B-16.5/AS PER PMS	1
6	BLIND FLANGE	4"	300#	ASTM A-105(CHARPY) RF, 125 AARH, B-16.5/AS PER PMS	2
		3/4"	300#	ASTM A-105 RF, 125 AARH, B-16.5/AS PER PMS	1
7	90° ELBOW	4"	300#	ASTM A-234 GR.WPB (CHARPY) BW, 1.5D, B-16.9/AS PER PMS	2
8	SOCKOLET	4"x3/4"	6000#	ASTM A105/AS PER PMS	1
9	PIPE	12"	MAIN LINE	AS PER SOR	~3300mm
		4"	300#	SCH. 40 ASTM A 106 GR.B (CHARPY)/AS PER PMS	~4000mm
		3/4"	300#	S 160 ASTM A 106 GR.B/AS PER PMS	~300 mm



**ISOMETRIC DETAIL OF 12"SV STATION
(WITH FUTURE TAP-OFF)**



**ISOMETRIC DETAIL OF 12"SV STATION
(WITHOUT FUTURE TAP-OFF)**

SR. NO.	DESCRIPTION	SIZE	RATING	MATERIAL	QUANTITY
1	WELDOLET	12"x4"	300#	ASTM A-105(CHARPY) BW, MSSSP-97/AS PER PMS	2
2	EQUAL TEE	4"	300#	SCH. 40 ASTM A 234 GR.WPB (CHARPY) BW, B-16.9/AS PER PMS	1
3	BALL VALVE	4"	300#	AS PER DATA SHEET	2
		12"	300#		1
4	PLUG VALVE	4"	300#		1
5	FLANGE	4"	300#	ASTM A-105(CHARPY) WNRF, 125 AARH, B-16.5/AS PER PMS	1
6	BLIND FLANGE	4"	300#	ASTM A-105(CHARPY) RF, 125 AARH, B-16.5/AS PER PMS	1
7	90° ELBOW	4"	300#	ASTM A-234 GR.WPB (CHARPY) BW, 1.5D, B-16.9/AS PER PMS	2
8	PIPE	12"	MAIN LINE	AS PER SOR	~3000mm
		4"	300#	S40 ASTM A 106 GR.B (CHARPY)/AS PER PMS	~3500mm

LEGEND	
	12"Ø PIPELINE
	4"Ø PIPELINE
	2"Ø PIPELINE



GAIL INDIA LTD.

ब्रिज एंड रूफ कंपनी (इंडिया) लिमिटेड

BRIDGE AND ROOF CO. (I) LTD.

CITY GAS DISTRIBUTION NETWORK

SCHEMATIC DRAWING FOR 12"Ø SV STATION (TYPE-2)

SCALE : NTS (SH 1 OF 1)

DWG. NO. - BR-CGD-STD.-DWG-111

NOTES :-

1. ALL DIMENSION ARE IN MM, UNLESS OTHERWISE MENTIONED.
2. THE DIMENSION SHOWN IN THE TYPICAL SCHEMATIC DIAGRAM IS TENTATIVE & ACTUAL DIMENSION SHALL BE AS PER THE SITE CONDITION / DIRECTION OF EIC.
3. ALL DIMENSIONS OF PIT ARE FROM INSIDE TO INSIDE.
4. THE ABOVE SCHEMATIC DIAGRAMS ARE FOR ALL SV STATION INSTALLED IN VALVE PIT.
5. USE OF PLUG VALVE OR GLOBE VALVE ONLY ONE WILL BE TAKEN DEPENDING ON AVAILABILITY AT SITE.
6. QUANTITY MENTIONED AT SITE IN ABOVE TABLE ARE TENTATIVE, FURTHER MAY INCREASE / DECREASE AND BASED ON DECISION OF EIC/OWNR DEPENDING ON SITE CONDITIONS.