

MILITARY ENGINEER SERVICES
CHIEF ENGINEER A&N ZONE
BRICHGUNJ, JUNGLIGHAT (PO), SRI VIJAYA PURAM - 744 103

Name of Work : ENGINEERING PROCUREMENT AND CONSTRUCTION (EPC) FOR PROVISIONING OF BASIC STORAGE AND INFRASTRUCTURE FOR SPL VEH AND EQPT INCL GHE/GSE FOR NGMMCB DET 1 AT CAMPBELL BAY

CONTENTS

SI No.	Particulars	Page Nos.
1	2	3
1.	Contents	1
2.	Tender Forwarding Letter and Instructions for filling and submission of Tender	2 To 5
3.	Notice Inviting Tender [IAFW – 2162] [Revised – 1960] including Appendix "A" to Notice Inviting Tender and Integrity Pact [IP]	6 To 23
4.	Tender and lump sum contract for works required under IAFW-2159 (Revised 1947) & Sch A Notes	24 To 59
5.	Payment Schedules and milestones	60 To 62
5.	DBRs	63 to 79
6.	Schedules	80 to 108
7.	BOQ	109 to 126
8.	Sch 'B' to 'D'	127
9.	Letter of Intent and EPC agreement	128 to 130
10.	Tender Page, General Conditions of Contracts IAFW-2249 (1989 Print) together with amendments and errata thereto	131 to 137
11.	Schedule of minimum fair wages	138
12.	Special Conditions	139 To 162
13.	Particular specifications including list of drawings, Soil report, Design Parameters including list of drawings and relevant documents.	163 To 310
14.	Soil Investigation report	311 to 339
15.	Errata and amendments to tender documents	
16.	Relevant correspondences	
17.	Acceptance letter	
Total Pages		

Number of drawings: 81 sheets

Signature of the contractor

**AAD (Contracts)
for Accepting Officer**

Tel /Fax : 03192-286148
e-mail: e8ceanz@gmail.com

Head Quarters,
Chief Engineer (A&N) Zone,
Brichgunj, Junglighat PO,
Sri Vijaya Puram – 744 103

801260 / 25 / E8

04 Jun 2026

M/s _____

**ENGINEERING PROCUREMENT AND CONSTRUCTION (EPC) FOR PROVISIONING
OF BASIC STORAGE AND INFRASTRUCTURE FOR SPL VEH AND EQPT INCL
GHE/GSE FOR NGMMCB DET 1 AT CAMPBELL BAY**

Dear Sir,

1. Tender documents in respect of above work are uploaded on the site www.defproc.gov.in. The tender is based on single stage two cover / ~~two stage three cover~~ e-tendering system. The contents of Cover I & Cover II are specified in NOTICE OF TENDER.
2. Bids will be received online by ACCEPTING OFFICER upto the date and time mentioned in the **NOTICE INVITING TENDER (NIT)**. No tender/bid will be received in physical form and any tender/bid received in such manner will be treated as non bona fide.
3. Bid will be opened on line on a due date fixed for opening as per critical dates given in the portal. Cover-1 will be opened first. Tenderers may see the result of the opening of Cover-1 on the tender portal. Date of opening of Cover-2 shall be decided after technical evaluation of Cover-1 keeping in view the various eligibility criteria given in the NIT and the same will be intimated to the tenderers while uploading the technical evaluation on the tender portal.
4. Your attention is also drawn to instruction on filling and submission of tender attached herewith. You may forward your points on tender documents through e-mail and/or depute your technical representative for discussion on tender/drawings and to clarify doubts, if any, at least 10 days prior to bid submission start date. You are requested not to write piece meal points and forward your points duly consolidated in one go. You may also attend the pre bid meeting on the date given in the tender.
5. Unenlisted contractors are required to submit the scanned copies (in pdf file) of documents required as per eligibility criteria mentioned in instructions for filling the tender documents and Appendix 'A' to NIT alongwith EARNEST MONEY DEPOSIT (EMD) and tender fee on procurement portal mentioned above and submit the physical documents in the office of Chief Engineer Delhi Zone within time limit specified in NIT. Inadequacy /deficiency of documents shall make the bid liable for rejection resulting in disqualification for opening of finance bid.
6. Enlisted contractors of MES shall submit the scanned copies (pdf file) of enlistment letter, tender fee and such other documents as mentioned in Appx 'A' to NIT on e-procurement portal and submit physical documents in the office of [HQ Chief Engineer \(A&N\) Zone, Brichgunj, Junglighat PO, Sri Vijaya Puram – 744103](#) before date & time fixed for this purpose.
7. The contractor must ensure that the tender/bid is uploaded on the tender portal using the authorised DSC in time as the Accepting Officer will take no cognizance of any quotations/offer received in any other electronic or physical form like email/fax/by hand/through post from tenderer/bidder.
8. Keeping in view delays due to system failure or other communication related failures, it is suggested that tender/bid may be uploaded sufficiently in advance of the last due date and time fixed on the portal.
9. General Conditions of Contracts (IAFW-2249) (1989 Print) and errata and amendments thereto, Schedule of Minimum Fair Wages and MES SSR ([Part-I, 2009](#) and [Part-II, 2020](#)) are not enclosed with these documents. These are available for perusal in the Office of GE/AGE concerned and this office. Tenderer is also requested to keep the copy of these documents with him as same are available in the market.

10. **PERFORMANCE SECURITY DEPOSIT:** After acceptance of the Tender, the contractor will be required to lodge with the Accepting Officer **PERFORMANCE SECURITY DEPOSIT @ 5% of Contract amount.** The amount is required to be lodged within 28 (Twenty eight) days of the receipt by the contractor of notification of acceptance of tender / bid, failing which action as stipulated in Condition 19 of IAFW-2249 (General Conditions of Contracts) shall be taken. **Work Order No 1 shall be placed by GE only after approval of duly vetted Design & drawings by HQ CE (A&N) ZONE, SRI VIJAYA PURAM and on submission of Performance Security of adequate value by the contractor within the stipulated period of 28 days.**

10.1 The Performance Security shall be valid as specified below:-

- [i] The Performance Security in the form of Government Securities or FDR or any other Government Instruments shall be valid till expiry of Defects Liability Period as stipulated in the tender documents from the date of commencement of work.
- [ii] The Performance Security in the form of Bank Guarantee Bond shall be valid till expiry of Defects Liability Period plus minimum 60 days beyond that from the date of commencement of work.

10.2 In the event of contract being cancelled, under Condition 52, 53 & 54 of General Conditions of Contract IAFW 2249, the Performance Security shall be forfeited in full and shall be credited into Consolidated Fund of India.

10.3 The performance security deposit may be refunded to the contractor after expiration of the defect liability period (vide condition 46) by the GE, provided always that the contractor shall first have been paid the final bill and have rendered a no demand certificate (IAFW-451).

11. The tender is based on CPM. The tenderer is expected to be fully conversant with this technique and employ technical staff who can use this technique in sufficient detail. Sufficient books and other literature on the subject are widely available which the tenderer may take use of. The time allowed for the completion of the work shall be worked out through CPM after dividing the work in broad stages. The tenderer's attention is drawn to the Special Condition of the tender regarding preparation of the detailed network and time schedule/CPM and his liability for employing sufficient resources to adhere to his schedule. Any inability on the part of the tenderer in using the technique will be taken as his technical insufficiency and will affect his class of enlistment and further prospects of receiving tenders for works.

12. The contractor shall also deploy Engineer having experience in use of Primavera/MS Project tools for project monitoring on day to day basis for works costing Rs 15 Crore or more. The dated project time schedule shall be jointly prepared by GE and contractor using these tools within four weeks of conclusion of contracts. The project time schedule shall be updated weekly with all necessary details and work done report shall be signed by the contractor and included as part of the Works Diary by the JE, which will be checked by the Engineer-in-Charge.

13. ANY TENDERER, WHICH PROPOSES ALTERATIONS TO ANY OF THE CONDITIONS, SPECIFICATIONS LAID DOWN IN THE TENDER DOCUMENTS OR ANY NEW CONDITION, WHATSOEVER, IS LIABLE TO BE REJECTED.

14. **SITE VISIT AND VERIFICATION OF INFORMATION:** Bidders should visit the Project site(s) for ascertaining the site conditions, soil condition, location, surroundings, climate, availability of power, water & other utilities for construction, access to site, availability, handling and storage of materials, weather data, applicable laws and regulations and any other matter considered relevant by them including carrying out necessary survey/investigation. Irrespective of whether the bidders visit the site (or) not, it is deemed that they are aware of all the factors affecting quoting of their bid and execution of the work. No claim whatsoever will be admissible in this regard.

15. **PRE-BID MEETING**

15.1 A pre-bid meeting will held as per the date and time mentioned in the tender id on VC mode. However bidders can seek any clarification through email: e8ceanz@gmail.com regarding the work.

Yours faithfully,

Signature of the Contractor

AAD (Contracts)
for Accepting Officer

INSTRUCTIONS FOR FILLING IN AND SUBMISSION OF TENDER**1. EARNEST MONEY DEPOSIT (EMD)**

1.1 Contractor(s) who are not enlisted with MES/who are enlisted but have not executed the Standing Security Bond shall submit Earnest Money Deposit as detailed in Notice of Tender in one of the following forms, along with their tender/bid:-

- (a) Deposit at Call Receipt from a Scheduled Bank in favour of GE/AGE (I) concerned.
- (b) Receipted Treasury Challan, the amount being credited to the Revenue Deposit of GE/AGE (I).

1.2 It is advisable that Earnest Money is deposited in the form of deposit call receipt from an approved Schedule Bank for easy refund. In case the tenderer/bidder wants to lodge 'Earnest Money Deposit' in any other form allowed by MES, a confirmation about its acceptability will be obtained from the Accepting Officer well in advance of the bid submission end date and time. Earnest Money Deposit shall be submitted in the name of concerned GE/AGE (I).

NOTES:- Earnest Money Deposit (EMD) in the form of cheque/Bank Guarantee etc., will not be accepted. **Non-Submission of Earnest Money Deposit (EMD) (scanned copy along with Technical Bid & hard copy before the date & time fixed for opening of BOQ) will render the bid disqualified for opening of Cover -II (finance bid).**

2. GENERAL INSTRUCTIONS FOR COMPLIANCE

2.1 The bids received only in the electronic form will be considered. All bids shall be submitted on defproc.gov.in portal. Documents should be scanned and forwarded in 'pdf' format and 'xls' form as indicated. Bids shall be uploaded on 'defproc.gov.in' portal on or before the bid closing date mentioned in the tender. No tender/bid in any other electronic or physical form like date email/fax/by hand/through post will be considered.

2.2 The bid shall be DIGITALLY signed using authorised DSC. All pages of tender documents, drawings, corrections/alterations shall be signed/initialled by the lowest bidder after acceptance of tender for making original and CTC of the contract.

2.3 Digital signatory of the bid/tender shall ensure that he is competent to bind the contractor (through partnership deed, general power of attorney or Memorandum and Article of Association of the Company) in all the matters pertaining to the contract with Union of India including arbitration clause. A scanned copy of the documents in confirmation of such authority shall be attached with the tender/bid in 'pdf' form in Cover 1. It shall be ensured that power of attorney shall be executed in accordance with the constitution of the company as laid down in its Memorandum & Article of Association.

2.4 Drawings, if issued in physical form, must be returned duly initialled by the tenderer/bidder in separate envelope indicating his name and address.

2.5 The tender shall be signed, dated and witnessed at all places provided for in the documents after acceptance. All corrections shall be initialled. The Contractor shall initial every page of tender and shall sign all drawings forming part of the tender. Any tender/bid, which proposes alterations to any of the conditions whatsoever, is liable to be rejected.

3. BOQ

3.1 The tenderer shall quote his rates on the BOQ EXCEL FILE only as per guide lines of e-procure web portal. No alteration to the format will be accepted and such bid will be disqualified.

3.2 In case any tenderer wishes to revise/modify the rates quoted in the BOQ file, he can do so only in the BOQ files before uploading the tender through **<https://defproc.gov.in>** site only before closing date & time.

3.3 After the uploading of tender, Department may upload the errata/ amendment through corrigendum. The tenderer/bidder should submit their offer considering the errata/amendment carried out through corrigendum issued from time to time.

3.4 While uploading the bid, the tenderers/bidders should specifically check whether any **revised BOQ** has been uploaded by department through corrigendum prior to **Bid submission start date**. Tenderers/bidders attention is specifically drawn to the fact that they should submit their offer on revised BOQ only. In case any tenderer/bidder submits offer on pre-revised BOQ in lieu of Revised BOQ, **it will be considered as a wilful negligence by the tenderer/bidder and quotation shall be considered non-bonafide.**

INSTRUCTIONS FOR FILLING IN AND SUBMISSION OF TENDER (Contd...)

4. Tenders/bidders who uploaded their priced tenders/bids and are desirous of being present at the time of opening of the tenders/bids, may do so at the appointed time.

5. Hard copies of all above documents shall be sent by the contractor to the Tender issuing authority well in advance to be received before the date & time fixed for the same.

6. The contractor shall employ Indian Nationals after verifying their antecedents and loyalty. Attention is also drawn to relevant provisions in Special Condition referred here-in-after and also Conditions 24 & 25 of IAFW-2249 (General Conditions of Contract).

7. **REVOCATION / UPWARD REVISION OF OFFER / VOLUNTARY REDUCTION BY THE LOWEST TENDERER AFTER OPENING OF COVER 2:**

7.1 Revoking the offer or revising the rates upward/offering voluntary reduction by the lowest tenderer, after opening of Cover 2, shall be considered as a wilful default.

7.2 For this default a penalty of an amount equal to earnest money shall be levied. In case of an un-enlisted tenderer, earnest money deposited by him shall be forfeited. In case of MES enlisted tenderer, an amount equal to the earnest money stipulated in the NIT shall be notified to the tenderer for depositing through MRO and consideration of such tenderer in tender evaluation for future works shall remain suspended till the aforementioned amount is deposited in the Government Treasury. No other disciplinary/administrative action will be taken against such tenderer. In such a situation, the next lowest offer will not be considered for acceptance. Instead retendering will be resorted to in a transparent and fair manner and the defaulting tenderer and his related firm if any, shall not be eligible for the tender in second call or subsequent calls. Reduction offered by the tenderer in respect of the freakishly high rates shall not be treated as voluntary reduction.

8. **PROJECT MANAGEMENT TECHNIQUE:**

8.1 The project planning for work covered in the scope of tender is based on PRIMAVERA or MS PROJECT software tools.

8.2 The tenderer/bidder is expected to be fully conversant with the PRIMAVERA or MS PROJECT software tools and employ technical staff, who can use the technique in sufficient details. Sufficient books and other literature on the subject are widely available in the market, which the tenderer/bidder may make use of.

8.3 The tenderer's /bidder's attention is drawn to special condition of the tender regarding preparation of the detailed network analysis and time schedule for the work and his liability for employing sufficient resources to adhere to this schedule. Any inability on the part of the tenderer/bidder in using the technique will be taken as his technical inefficiency and will affect his class of enlistment and future prospect/invitation to tenders for future works.

9. Department may issue amendments/errata in form of CORRIGENDUM to tender/ revised BOQ to the tender documents. The tenderer / bidder is requested to read the tender documents in conjunction with all the errata/amendments/corrigendum, if any, issued by the department.

10. Attention of bidders is drawn to the official secret Act, particularly section 5 thereof for compliance.

11. These instructions shall form part of the contract documents and shall be signed along with the tender documents during signing of contract agreement.

Signature of Contractor

AAD (Contracts)
For Accepting Officer

MILITARY ENGINEER SERVICES
NOTICE INVITING TENDER (NIT)

1. A tender is invited for the work as mentioned in Appendix 'A' to this NOTICE INVITING TENDER (NIT).
2. The work is estimated to cost as indicated in aforesaid Appendix 'A'. This estimate, however, is not a guarantee and is merely given as a rough guide and if the work costs more or less, a tenderer/bidder will have no claim on that account.
3. The work is to be completed within the period as indicated in aforesaid Appendix 'A' in accordance with the phasing, if any, indicated in the tender from the date of handing over site, which will be on or about two weeks after the date of acceptance of tender.
4. Contractors whose names are on the MES approved list and within whose financial category the estimated amount would fall and un-enlisted contractors may submit tender/bid subject to other criteria mentioned in Appendix A. However in case of term contracts, enlisted contractors of Class SS to E may submit tender. Not more than one tender shall be submitted/uploaded by one contractor/ firm. Under no circumstances will a father and his son(s) or other close relations who have business dealing with one another be allowed to tender/bid for the same contract as separate competitors. Two firms shall be deemed to have business dealing if any of the partners/proprietor/director is common among both of them. A breach of this condition will render the tenders/bids of both the parties liable for rejection.
5. The Office of [HQ Chief Engineer \(A&N\) Zone, Brichgunj, Junglighat Post, Sri Vijaya Puram - 744103](#) will be the Accepting Officer here-in-after referred to as such for the purpose of this contract.
6. Not more than one tender/bid shall be submitted/uploaded by one bidder firm. Under no circumstances will a father and his son(s) or other close relations who have business dealing with one another be allowed to tender/bid for the same tender as separate competitors. A breach of this condition will render the tenders/bids of both the parties liable for rejection.
7. The Technical Bid and Financial Bid (Cover-1 and Cover-2) shall be uploaded by the contractor on or before the date & time mentioned in **NIT**. A scanned copy of DD with enlistment details and other documents as specified in Appendix A shall be uploaded as Cover-1 (Technical bid) of the tender on e-tendering portal. DD is refundable in case the contractor is not considered eligible in technical evaluation of Cover-1 resulting in non-opening of Cover-1. The applicant contractor shall bear the cost of bank charges for procuring and encashing the DD including revalidation of DDs and shall not have any claim from Government whatsoever on this account.
8. Tender form and conditions of contract and other necessary documents shall be available on website defproc.gov.in for download and shall form part of contract agreement in case the tender/bid is accepted.
9. In case of MES enlisted contractor who has not executed the Standing Security Bond and un enlisted contractor, the Cover-I shall be accompanied by Earnest Money for the amount mentioned in Appendix 'A' in the form of deposit at call receipt in favour of concerned CCE/GE/GE (I)/AGE (I) (see Appendix 'A') by a Scheduled Bank or in received treasury Challan the amount being credited to the revenue deposit of the concerned CCE/GE/GE(I)/AGE(I) (see Appendix 'A'). The CCE/GE/GE (I)/AGE (I) will return the Earnest Money, wherever applicable, to all unsuccessful tenderers/bidders by endorsing an authority on the deposit at call receipt for its refund, on receipt of intimation from the Accepting Officer to do that.
10. In case of successful contractor i.e., the lowest contractor having submitted EMD, he shall have the option of converting the EMD instrument into part of the Performance Security to be deposited by him within 28 days from the receipt of intimation of acceptance of tender from Accepting Officer.
11. Sample of materials and stores to be supplied by the contractor will also be available for inspection by the bidder at the office of concerned GE/GE (I)/AGE (I)/Project Manager during working hours. The bidder is advised to visit the site of work by making prior appointment with GE/GE (I)/AGE (I)/CCE/Project Manager, who is the Executing Agency of the work (see Appendix 'A'). The bidder shall be deemed to have full knowledge of all relevant documents, samples, site etc., whether he has inspected them or not.
12. Any bid which proposes any alteration to any of the conditions laid down or proposes any other new condition whatsoever, is liable to be rejected.

MILITARY ENGINEER SERVICES
NOTICE INVITING TENDER (NIT) (Contd...)

13. The uploading of bid by a bidder implies that bidder has read this notice and the conditions of contract and has made himself aware of the scope and specification of work to be done and of the conditions and rates at which stores (as applicable) etc., will be issued to him and local conditions and other factors having bearing on the execution of the work.
14. The bidder must be in possession of a copy of the MES Schedule (SSR) ([Part-I](#) & [Part-II](#) of latest edition) including amendments and errata thereto.
15. Accepting Officer does not bind himself to accept the lowest or any tender/bid or to give any reason for not doing so.
16. The Accepting Officer reserves the right to accept a tender submitted by a Public Undertaking/Small & Medium Enterprises (SMEs), giving a price preference/purchase preference over other tender(s)/bids which may be lower, as are admissible under the Government Policy. No claim for any compensation or otherwise shall be admissible for such tenderer/bidder whose tender/bid is rejected.
17. The **Notice Inviting Tender (NIT)** including Appendix 'A' and Annexures thereto, if any, shall form part of the contract agreement.
18. Irrespective of whatever is mentioned in condition 19.3 of IAFW-2249 with regard to suspension of tenders on account of non-submission of Performance security, issue of tenders to such tenderers shall remain suspended for a period of six months from the date of cancellation of contract under condition 19.3 of IAFW-2249 in case of un-enlisted Contractors. In case of MES enlisted Contractor, issue of tenders shall remain suspended till deposit of EMD or six months from date of cancellation whichever is later.

Signature of Contractor

AAD (Contracts)
For Accepting Officer

APPENDIX 'A' TO NOTICE INVITING TENDER [NIT]

1.	Name of work	:	ENGINEERING PROCUREMENT AND CONSTRUCTION (EPC) FOR PROVISIONING OF BASIC STORAGE AND INFRASTRUCTURE FOR SPL VEH AND EQPT INCL GHE/GSE FOR NGMMCB DET 1 AT CAMPBELL BAY	
2.	Estimated cost of work	:	Rs. 3054.00 Lakhs at par market cost	
3.	Period of Completion	:	1095 days	
4.	Cost of tender documents & Garrison Engineer	:	Rs. 3000/- in the shape of Demand Draft (DD)/ Bankers Cheque from any Scheduled Bank in favour of GE Campbell Bay and payable at Campbell Bay (Note: In case of retendering, the contractor who had quoted in the previous call and submitted the tender fee is not required to submit the cost of tender)	
5.	Website / portal address		www.defproc.gov.in	
6.	Type of contract	:	The tender shall be based on Engineering, Procurement and Construction (EPC) mode on lumpsum basis (IAFW 2159) and GCC (IAFW-2249) with Schedule 'A' (BOQ) to be quoted by tenderer. The tenderers are required to quote their Lumpsum amounts for the scope detailed in Schedule 'A' (BOQ)	
7.	Timeline Details:			
	[a] Bid submission start date		} Refer critical dates on the website.	
	[b] Bid submission end date			
	[c] Date of bid opening			
8.	Eligibility criteria:		Contractor shall satisfy the following:-	
	[a] <u>For MES enlisted contractors</u>	:	[i]	Contractor shall satisfy the following: - Enlistment in Class SS & Category a(i) as per MES enlistment rules
			[ii]	Shall not carry adverse remarks in Work Load Return or any similar report circulated by the competent engineer authority.
			[iii]	Prequalification criteria as in Note no 1 below.
	[b] <u>For contractors not enlisted with MES</u>	:	[i]	Contractor shall meet the enlistment criteria of SS Class & category a (i) contractor with regard to satisfactorily completion of requisite value works with Central/ State Government/ Central/ State PSUs/ AWHO/ AFNHB/ CGEWHO/ DGMAP, annual turnover, bank solvency, working capital and other requirements given in Para 1.4 & 1.5 of Section 1 of MES Manual of Contracts 2020 as available in all MES formations as well as MES website (www.mes.gov.in).
			[ii]	Not carrying adverse remarks in Work Load Return (WLR) or any other report circulated by any competent authority, if already working in MES.
			[iii]	Not suspended / debarred / blacklisted (either permanently or temporarily) from participating in any bid or for business dealings by any Central / State Government Department or any Central / State Government PSU or any Autonomous Body under Central / State Government or any Local Body as on the bid submission end date.
			[iv]	Prequalification criteria as in Note no 1 below.

APPENDIX 'A' TO NOTICE INVITING TENDER [Contd....]

			[vi]	Un-enlisted Contractor who have secured two works in MES should get themselves registered in the appropriate designated Class with any Registering Authority, else the firm will not be eligible for participation in the tender unless until the firm is enlisted with the MES.
9.	Tender issuing and Accepting Officer	:	<u>Name:</u> Chief Engineer <u>Address:</u> HQ Chief Engineer A&N Zone , Birchgunj, Junglighat Post, Sri Vijaya Puram - 744 103. <u>Contact Detail</u> (Phone no & Email Id) of concerned officer : 03192 -286121, 03192-286168 <u>e-mail:</u> e8ceanz@gmail.com	
10.	Executing Agency	:	Garrison Engineer Campbell Bay Telephone: 03192-213101 Email id: ipnportb4-mes@gov.in	
11.	Earnest Money	:	Rs.15,00,000/- in favour of GE Campbell Bay and payable at Campbell Bay in the form of Deposit at call receipt. FDR not acceptable.	

NOTES:

1. PRE-QUALIFICATION CRITERIA(PQC)

(a) Average Annual financial turnover during the last 3 years, ending 31st March of the previous financial year, should be at least 9.16 Crores.

(b) Experience of having successfully completed similar works during last 7 years, ending last day of month previous to the month of bid submission start date, should be either of the following :

Three similar completed works costing not less than the amount equal to 40% of the estimated cost.

or

Two similar completed works costing not less than the amount equal to 50% of the estimated cost.

or

One similar completed work costing not less than the amount equal to 80% of the estimated cost.

(c) "similar work" shall means construction of Building having RCC framed structure, completed as per condition 49 of General Condition of contracts IAFW-2249 or equivalent in other works with Central/State Government/ Central/ State PSUs/ AWHO/ AFNHB/ CGEWHO/ DGMAP only.

(d) For the purpose of value of completed works, the value of previously completed works be enhanced @ 5% per year to bring them at par with present cost.

2. In case after opening of Cover 1, the number of MES enlisted contractors of 'SS' class as well as un-enlisted contractors, if any, fulfilling the other eligibility criteria given in NIT is less than **7(seven)**, applications in respect of contractors one class or **two classes below** the eligible class shall also be considered subject to fulfilment of PQC as per Note No 1 above and other eligibility criteria given in the NIT. Therefore MES contractor's of one class below or **two class below** may also bid for this tender. However contractors of one/two classes below the eligible class shall not be considered in case their present residual work in hand is more than twice their present tendering limit. Such bidders shall upload in their Cover-1 bid details of works in hand showing names of work, names of Accepting Officers, Contract amounts, dates of commencement and completion (stipulated) and progress as on bid submission date. These details shall be verified by the Tender Issuing Authority from concerned formations in case bids of such contractors are considered for evaluation.

APPENDIX 'A' TO NOTICE INVITING TENDER [Contd....]

3.

In case after opening of Cover 1, the number of MES enlisted contractors of 'SS' Class as well as un-enlisted contractors, if any, fulfilling the other eligibility criteria given in NIT, are 7 (Seven) or more, applications of only those one class below the eligible class bidders shall be considered who fulfil the PQC as per Note 1 above and are meeting the criteria of upgradation in 'SS' Class with respect of past experience of completed works (individual work experience and average annual turnover as applicable) and financial soundness (solvency/financial soundness and working capital) as per details given in Manual on Contracts. Therefore such contractors shall upload the requisite information/documents in the Cover-1.

APPENDIX 'A' TO NOTICE INVITING TENDER [Contd....]

4. Un-enlisted contractor shall be considered provided he meets the eligibility criteria. However foreign firms shall not be eligible for this tender. However Indian Firms having foreign national / Indian nationals staying abroad / Indian national having taken foreign citizenship, as director(s) shall be considered subject to security clearance from the concerned authorities.
5. Contractor enlisted with MES will upload following documents in Cover-1 for checking eligibility:-
 - [a] Application for tender on Firm's letter head.
 - [b] Enlistment letter issued by the Registering Authority duly renewed for the cycle period in vogue.
 - [c] Scanned copy of DD / Bankers Cheque towards cost of tender and EMD instrument in case SSD bond is not signed at the time of registration.
 - [d] Scanned copy of GST Registration Certificate.
 - [e] Integrity Pact as specified here-in-after [Refer Annexure-II] & Letter of Intent Annexure -E
 - [f] Documents required in respect of PQC criteria.
 - [g] Any other document required as described in this Appendix.
6. Contractors not enlisted with MES will be required to upload following documents in Cover-1 for checking eligibility:-
 - [a] Application for tender on Firm's letterhead.
 - [b] Scanned copy of DD / Bankers Cheque toward cost of tender and Earnest Money Deposit (EMD) instrument.
 - [c] Copy of Police Verification Report / Police Clearance Certificate / Character Certificate from the Police Authority of the area where the registered office of the firm is located / notarized copy of valid Passport of Proprietor / each Partner / each Director.
 - [d] All documents required for enlistment in MES for [class 'SS' and category 'a \(i\)'](#) as per Para 1.5 of Section 1 of MES Manual on Contracts 2020. [\[Also Refer Annex-I\]](#).
 - [e] Details of works being executed in MES, if any.
 - [f] Documents required in respect of PQC criteria.
 - [g] Integrity Pact as specified here-in-after [Refer Annexure-II] & Letter of Intent Annexure -E
 - [h] Any other document required as described in this Appendix.

APPENDIX 'A' TO NOTICE INVITING TENDER [Contd....]

7. Tenders not accompanied by scanned copies of requisite DD / Bankers Cheque towards cost of tender and earnest money (as applicable) in Cover-1 shall not be considered for validation of 'T' bid and their Financial Bids will not be opened.
8. Contractors should ensure that their original physical DDs and Earnest Money Deposit (EMD) instruments (as applicable) reach the office of Accepting Officer within 05 days of bid submission end date failing which following action shall be taken:-
 - [a] In case of tenders from an enlisted contractor of MES, where scanned copies of requisite DD/Bankers Cheque towards cost of tender have been uploaded in Cover-1 but physical copies are not received within the stipulated period, their financial bids (Cover-2) will be opened. However non-submission of physical copies of cost of tender shall be considered as willful negligence of the tenderer with ulterior motives and such tenderer shall be banned from bidding for a period of six months commencing from the date of opening of Financial Bid (Cover-2).
 - [b] In case of tenders from un-enlisted contractors, where scanned copies of requisite DD/Bankers Cheque towards cost of tender have been uploaded in Cover-1 but physical copies are not received within the stipulated period, their financial bids (Cover-2) will not be opened. Name of such contractors along with complete address shall be circulated for not opening of their bids for a period of six months commencing from the date of opening of finance bid (Cover 2).
 - [c] In case of tenders from enlisted and un-enlisted contractors, where scanned copies of instrument for Earnest Money Deposit (as applicable) have been uploaded in Cover 1 but the same are not received in physical form within stipulated period, such tenders shall not qualify for opening of financial bid (Cover-2).
9. Contractor will not be allowed to execute the work by subletting or through power of attorney to a third party / another firm on his behalf. However a contractor can execute the work through power of attorney to sons / daughters / spouse of Proprietor / Partner / Director and firm's own employees, Director, Project manager provided they are not having a separate enlisted firm in MES in their name as Proprietor / Partner / Director.
10. After opening of cover-1 and during its technical evaluation, in case any deficiency is noticed in the documents required to be uploaded by the tenderers as per NIT a communication in the form of e-mail / SMS / Speed Post etc shall be sent to the contractor to rectify the deficiency within a period of seven days from date of communication failing which their financial bid (Cover-2) shall not be opened and contractor shall not have any claim on the same.
11. Invitation for e-tender does not constitute any guarantee for validation of Technical bid and subsequent opening of financial bid of any applicant/bidder merely by virtue of enclosing DD. Accepting Officer reserves the right to reject the Technical bid and not to open the financial bid of any applicant/bidder. Technical bid validation shall be decided by the Accepting Officer based on eligibility of the firm as per criteria given in this Appendix. Tenderer/bidder will be informed regarding non-validation of his Technical bid assigning reasons therefore through tender evaluation report which shall be uploaded on the website. Such tenderer, if desires, may appeal to the next higher Engineer Authority (NHEA) viz **HQ Chief Engineer Southern Command, Pune** on email id "dydrcontceengrpl-mes@gov.in" with copy to the Accepting Officer on email e8ceanz@gmail.com before the scheduled date of opening of Cover-2. NHEA shall decide the matter within a period of seven working days from the date of receipt of appeal. The decision of the NHEA shall be final and binding. The tenderer/bidder shall not be entitled for any compensation whatsoever for rejection of his bid.
12. In case an un-enlisted contractor is already executing works in MES, he shall not be considered eligible for the subject tender if the total value of such works is more than twice the tendering limit of the MES Class of contractor for which it is eligible. For this purpose, details of the works being executed by such a contractor shall be uploaded in the Cover-1 of the bid and shall be checked / verified by the Accepting Officer.

APPENDIX 'A' TO NOTICE INVITING TENDER [Contd....]

13. In case the BOQ is revised through the corrigendum and the bidder has failed to quote on revised BOQ (ie he has quoted on pre revised BOQ), such bids shall be treated as willful negligence by the bidder and his quotation shall be considered non-bonafide. In such cases the lowest tender shall be determined from amongst the valid / bonafide bids only. Accepting Officer may decide whether to retender or consider the lowest bonafide tender for acceptance.
14. Withdrawal/Revoking the offer or revising the rates upward or offering voluntary reduction by the lowest tenderer after bid submission end date shall be considered as a willful default. For this default a penalty of an amount equal to Earnest Money shall be levied. In case of an un-enlisted tenderer, Earnest Money deposited by him shall be forfeited. In case of MES enlisted tenderer having deposited the Standing Security Bond, an amount equal to the earnest money stipulated in the NIT shall be notified to the tenderer for depositing through MRO and consideration of such tenderer in tender evaluation for future works shall remain suspended till the aforementioned amount is deposited in the Government Treasury. No other disciplinary / administrative action shall be taken against such tenderers. In such a situation, the next lowest offer shall not be considered for acceptance. Instead, retendering shall be resorted to in a transparent and fair manner and the defaulting tenderer and his related firm if any, shall not be eligible for this tender in second call or subsequent calls.
- 14A Irrespective of whatever is mentioned in condition 19.3 of IAFW 2249 with regard to suspension of tenders on account of non-submission of Performance Security, issue of tenders to such tenderers shall remain suspended for a period of six months from the date of cancellation of contract under condition 19.3 of IAFW 2249 in case of un-enlisted Contractors. In case of MES enlisted contractor, issue of tenders shall remain suspended till deposit of EMD or six months from the date of cancellation whichever is later.
15. Tender to related firms shall not be issued simultaneously. Firms shall be termed as related if Proprietor/ one or more Partners/ Directors are common. Decision of Accepting Officer on issue/ deny the tender to any one of the related firms shall be final and binding.
16. Tenderer shall note that Court of the place from where tender has been published shall alone have jurisdiction to decide any dispute out of or in respect of this tender. After acceptance of tender, Condition 72 – Jurisdiction of Courts of IAFW-2249 shall be applicable.
17. **INTEGRITY PACT**: As per details given at [Annexure 'II'](#). The Integrity Pact (IP) is an integral part of contract and both parties are bound by its provisions. Scanned copy of IP duly signed on each page by the bidder(s) shall be uploaded as part of technical bid (Cover – I) and original IP duly signed on each page shall be forwarded by post along with demand draft. Bidders who do not upload scanned copy of IP duly signed, shall be intimated of the same along with intimation of other such deficient documents, through option of 'Short fall Documents' (in e-tendering portal) before 'T' bid evaluation. Any bidder who fails to forward the copy of Integrity Pact (IP) duly signed even after this communication, shall be disqualified in the Technical Bid (Cover-I).
18. Address of Accepting Officer: Chief Engineer HQ (A&N) Zone, Brichgunj, Junglighat (PO), Port Blair – 744 103.
19. Contact Details of the Concerned Officer: Chief Engineer HQ (A&N) Zone, Brichgunj, Junglighat (PO), Port Blair – 744 103.

Signature of Contractor

For Accepting Officer

APPENDIX 'A' TO NOTICE INVITING TENDER [Contd....]

Annexure - 'I'

ELIGIBILITY CRITERIA FOR UN-ENLISTED CONTRACTORS

1. In addition to the documents and PQC specified here-in-before, the following additional documents are to be submitted by the Un-enlisted Contractors while participating in the tender in support of meeting the enlistment criteria of relevant class.
- 1.1 All the affidavits shall be given on non-judicial stamp paper of value Rs.100/- duly signed by the Contractor and attested by the Magistrate/Notary Public.
- 1.2 All the documents/details are to be uploaded along with Technical bid and hard copies of the documents shall reach this office within the stipulated time.
- [a] Affidavit for constitution of firm (proprietorship/Partnership/company) with office address and details of Proprietor / Partners / Directors of the firm with residential address.
- [b] List of works executed during last 05 (Five) years in the following format including copies of Work Orders/Work allotment letters, Copies of completion certificates, Performance certificates and Form 16 A /TDS certificate for GST (GSTR - 7A).

	SI No	CA No & Name of work	Amount of contract	Formation viz CE, CWE, GE or office of other Dept with their complete postal address, Phone No, Fax No and Email ID	Date of commencement	Original/ Scheduled date of completion	Actual date of completion	Whether invoked Arbitrati-on/Litig-ation. If yes the outcome of the same	Remarks
	1	2	3	4	5	6	7	8	9

- [c] Annual turnover duly supported with audited balance sheet. The turn over certificate must bear the UDIN (Unique Document Identification Number). The turn over certificate and audited balance sheet should be from same Chartered Accountant. In case balance sheets are not audited, Form 26 AS and /or Annual GST return shall be forwarded in support of turn over.
- [d] Audited balance sheet of last five years in case of Limited companies.
- [e] Solvency certificate for Rs.8.00 Crore or Financially sound for engagement upto Rs.40.00 Crore. Solvency certificate shall be obtained from any Nationalised / Scheduled bank in the following format. In case of partnership firm, certificate shall include names of all partners as recorded with the bank.

Bank Address and Code No.

This is certified that to the best of our knowledge and information Shri/Smt.....having address....., a customer of our bank are/is respectable and can be considered solvent upto Rs..... (Rupees)/financially sound for any engagement upto Rs..... (Rupees). This certificate is issued without any guarantee or responsibility on the bank or any of the officer(s).

(Signature)
Name, Designation and Personal
Code No of Signatory & Seal of bank
Complete Postal Address,
Telephone No, e-mail ID of Branch

APPENDIX 'A' TO NOTICE INVITING TENDER [Contd....]**Annexure - 'I' (Contd...)****ELIGIBILITY CRITERIA FOR UN-ENLISTED CONTRACTORS [Contd....]**

[f] Working Capital certificate for not less than **Rs.75.00 Lakh**. Working Capital certificate shall be obtained from any Nationalised / Scheduled bank in the following format. In case of partnership firm, certificate shall include names of all partners as recorded with the bank.

Bank Address and Code No.

This is certified that Shri/Smt.....having address.....has /have been maintaining a Saving Bank Account /Current Account/ Fixed Deposit Account with this Branch of bank since.....and the firm is having working capital of approximately Rs and/ or the firm is enjoying overdraft/credit facilities upto limit of Rs This certificate is issued without any guarantee or responsibility on the bank of any or the officer(s).

(Signature)

Name, Designation and Personal
Code No of Signatory & Seal of bank
Complete Postal Address,
Telephone No, e-mail ID of Branch

- [g] Affidavit from contractor that there is no Government dues / recovery outstanding against him.
- [h] Affidavit from Contractor that he is not involved in any arbitration/litigation cases. In case, they are involved, they will give brief details of such cases on affidavit.
- [j] Two self-attested photographs of Proprietor / Partners / Directors of firm for verification of character and antecedents from the police authorities. Places where online police verification process is available, the contractor will carry out police verification of the Proprietor / Partners / Directors and submit the verification reports for cross verification by the Department. Alternatively the contractor may submit a notarised copy of valid passport issued by Govt of India.
- [k] Copy of partnership deed in case of partnership firm.
- [l] Memorandum and Articles of Association in case of Limited Companies.
- [m] Copy of Registration Certificate of firm with Registrar of Companies/Register of Firms.
- [n] Affidavit that no near relative(s) of the contractor or his/their employees/agents is/are working as Gazetted/ Commissioned Officer(s) in MES/ Corps of Engineers/Ministry of Defence. If the near relative(s) is/are working in such capacity in any formation upto Zonal CE/CCE, he/ they shall furnish details. The contractor shall not be entitled to tender for the works in entire area of CE Zone/ CCE.
- [o] Affidavit that no near relative(s) of the contractor or his/their employees/agents is/are working as Junior Engineer(s) in MES/Corps of Engineers. If his near relative(s) is/are working in such capacity in any formation, the contractor shall furnish details. The contractor shall not be entitled to tender for the works in entire area of that zone.
- [p] Copy of power of attorney / Resolution of the Board in favour of any Partner / Director of the firm. The power of attorney shall bind the contractor (through partnership deed, general power of attorney or Memorandum and Article of Association of the Company) in all the matters pertaining to the contract with Union of India including arbitration clause.
- [q] Copy of immediate last Income Tax Return.

APPENDIX 'A' TO NOTICE INVITING TENDER [Contd....]

- [r] Self-attested copy of PAN Card of Proprietor, Partners, Directors and the firm / Company.
- [s] Self-attested copies of GST registration, EPFO registration and ESIC registration certificates.

Yours faithfully,

AAD (Contracts)
for Chief Engineer

Enclosures: (As above)

APPENDIX 'A' TO NOTICE INVITING TENDER [Contd....]**Annexure 'II'****INTEGRITY PACT****General**

1. Whereas the President of India, represented by Chief Engineer (CE) hereinafter referred to as Principal / Owner and the first part, has floated the Tender and intends to award, under laid down organisational procedure, contract for **"ENGINEERING PROCUREMENT AND CONSTRUCTION (EPC) FOR PROVISIONING OF BASIC STORAGE AND INFRASTRUCTURE FOR SPL VEH AND EQPT INCL GHE/GSE FOR NGMMCB DET 1 AT CAMPBELL BAY."** hereinafter referred to as works / Services and M/s _____ (represented by deemed to include its successors and its assignees), hereinafter referred to as the Bidder / Contractor and the second part is willing to carry out the works / services.

2. Whereas the Bidder is a Proprietorship Concern / Partnership Firm / Limited Liability Firm / Private Limited Company / Limited Company / Joint Venture constituted in accordance with the relevant law in the matter and the Principal / Owner is Chief Engineer (CE) performing its functions on behalf of the President of India.

Objectives

3. Now, therefore, the Principal / Owner and the Bidder agree to enter into this pre-contract agreement, referred to as **INTEGRITY PACT (IP)**, to avoid all forms of corruption by following a system that is fair, transparent and free from any influence / prejudiced dealings prior to, during and subsequent to the conclusion of the contract to be entered into with a view to:-

3.1 Enabling the Principal / Owner to get the desired works / services at a competitive price in conformity with the defined specifications of the Services by avoiding high cost and the distortionary impact of corruption on public procurement.

3.2 Enabling Bidders to abstain from bribing or any corrupt practice in order to secure the contract by providing assurance to them that their competitors will also refrain from bribing and other corrupt practices and the Principal / Owner will commit to prevent corruption, in any form, by their officials by following transparent procedures.

Commitments of the Principal / Owner

4. The Principal / Owner commits itself to the following:-

4.1 The Principal /Owner undertakes that, no official of the Principal / Owner, connected directly or indirectly with the contract will demand, take a promise for or accept, directly or through intermediaries, any bribe, consideration, gift, reward, favour or any material or immaterial benefit or any other advantage from the Bidder, either for themselves or for any person, organization or third party related to the contract; in exchange for an advantage; in the bidding process, bid evaluation, contracting or implementation process related to the Contract.

4.2 The Principal / Owner will, during the pre-contract stage, treat all Bidders alike and will provide to all Bidders the same information and will not provide any such information to any particular Bidder which could afford an advantage to that particular Bidder in comparison to other Bidders.

4.3 All the officials of the Principal / Owner will report to the appropriate Government office any attempted or completed breach(s) of the above commitments as well as any substantial suspicion of such a breach.

5. In case of any such preceding misconduct on the part of such official (s) is reported by the Bidder to the Principal / Owner with wilful and verifiable facts and the same is prima facie found to be correct by the Principal / Owner, necessary disciplinary proceedings, or any other action as deemed fit, including criminal proceedings may be initiated by the Principal / Owner and such a person shall be debarred from further dealing related to the tender / contract process. In such a case while an Inquiry is being conducted by the Principal / Owner, the tender process/ proceedings under the contract would not be stalled.

Commitments of Bidders

6. The Bidder commits himself to take all measures necessary to prevent corrupt practices, unfair means and illegal activities during any stage of his bid or during any pre-contract or post-contract stage in order to secure the contract or in furtherance to secure it and in particular commits himself to the following:-

APPENDIX 'A' TO NOTICE INVITING TENDER [Contd....]**Annexure 'II' (Contd....)****INTEGRITY PACT (Contd...)**

6.1 Bidder will not offer, directly or through intermediaries, any bribe, gift, consideration, reward, favour any material or non-material benefit or other advantage, commission, fee, brokerage or inducement to any official of the Principal / Owner, connected directly or indirectly with the bidding process, or to any person, organization or third party related to the contract in exchange for any advantage in the bidding, evaluation, contracting and implementation of the Contract.

6.2 The Bidder further undertakes that he not given, offered or promised to give, directly or indirectly any bribe, gift, consideration, reward, favour any material or non-material benefits or other advantage, commission, fees, brokerage or inducement to any official of the Principal / Owner or otherwise in procuring the Contract or forbearing to do or having done any act in relation to the obtaining or execution of the contract or any other Contract with the Government for showing or forbearing to show favour or disfavour to any person in relation to the Contract or any other Contract with the Government.

6.3 The Bidder will not collude with other parties interested in the contract to impair the transparency, fairness and progress of the bidding process, bid evaluation, contracting and implementation of the contract.

6.4 The Bidder will not accept any advantage in exchange for any corrupt practice, unfair means and illegal activities.

6.5 The Bidder would not enter into conditional contract with any Agent(s), broker(s) or any other intermediaries wherein payment is made or penalty is levied, directly or indirectly, on success or failure of the award of the contract.

6.6 The Bidder commits to refrain from giving any complaint directly or through any other manner without supporting it with full and verifiable facts. Complaint will be processed as per **Guidelines for Handling of Complaints** in vogue. In case the complaint is found to be vexatious, frivolous or malicious in nature, it would be construed as a violation of Integrity Pact.

7. **Previous Transgression**

7.1 The Bidder declares that no previous transgression occurred in the last three years immediately before signing of this Integrity Pact with any other company in respect of any corrupt practices envisaged hereunder or with any Public Sector Enterprise in India or any Government Department in India.

7.2 If the Bidder makes incorrect statement on this subject, Bidder can be disqualified from tender process or the contract and if already awarded, same can be terminated for such reason.

8. **Company Code of Conduct**

8.1 Bidders are advised to have a company code of conduct (clearly rejecting the use of bribes and other unethical behaviour) and a compliance program for the implementation of the code of conduct throughout the country.

9. **Sanction for Violation**

9.1 Any breach of the aforesaid provisions by the Bidder or any one employed by him or acting on his behalf (whether with or without the knowledge of the Bidder) or the commission of any offence by the Bidder or any one employed by him or acting on his behalf, as defined in Chapter IX of the Indian Penal Code, 1860 or the Prevention of Corruption Act 1988 or any other act enacted for the prevention of corruption shall entitle the Principal / Owner to take all or any one of the following actions, wherever required:-

(i) Technical bid of the Bidder will not be opened. Bidder will not be entitled to or given any compensation. However, the proceedings with the other Bidder(s) would continue.

(ii) Financial bid of the Bidder will not be opened. Bidder will not be entitled to or given any compensation. However, the proceedings with the other Bidder(s) would continue.

APPENDIX 'A' TO NOTICE INVITING TENDER [Contd....]

Annexure 'II' (Contd....)

INTEGRITY PACT (Contd....)

- (i) The Earnest Money Deposit shall stand forfeited either fully or partially, as decided by the Principal / Owner, in case contract is not awarded to the Bidder and the Principal / Owner shall not be required to assign any reason therefor. For enlisted contractors an amount less than or equal to Earnest Money Deposit as decided by the Principal/ Owner shall be deducted from any amount held with the Department / any payment due.
- (ii) To immediately cancel the contract, if already concluded / awarded without any compensation to the Bidder.
- (iii) To encash the Performance Security furnished by the Bidder.
- (iv) To cancel all or any other Contract(s) with the Bidder.
- (v) To temporarily suspend or temporarily debar / permanently debar the bidder as per the extant policy.
- (vi) If adequate amount is not available in the present tender / contract, the deficient amount can be recovered from any outstanding payment due to the Bidder from the Principal / Owner in connection with any contract for any other works / services.
- (vii) If the Bidder or any employee of the Bidder or any person acting on behalf of the Bidder, either directly or indirectly, is closely related to any of the officers of the Principal / Owner, or alternatively if any close relative of an officer of the Principal / Owner has financial interest/stake in the Bidder's firm, the same shall be disclosed by the Bidder at the time of submission of tender. Any failure to disclose the interest involved shall entitle the Principal / Owner to debar the Bidder from the bid process or rescind the contract without payment of any compensation to the Bidder. The term 'close relative' for this purpose would mean spouse whether residing with the Government servant or not, but does not include a spouse separated from the Government servant by a decree or order of a competent Court, son or daughter or step son or step daughter and wholly dependent upon Government servant, but does not include a child or step child who is no longer in any way dependent upon the Government servant or of whose custody the Government servant has been deprived of by or under any law, any other person related, whether by blood or marriage, to the Govt. servant or to the Government servant's wife or husband and wholly dependent upon Government servant.
- (x) The Bidder shall not lend to or borrow any money from or enter into any monetary dealings or transactions, directly or indirectly, with any employee of the Principal / Owner and if he does so, the Principal / Owner shall be entitled forthwith to cancel the contract and all other contracts with the Bidder.

9.2 The decision of the Principal / Owner to the effect that a breach of the provisions of this Integrity Pact has been committed by the Bidder shall be final and binding on the Bidder. **However, the Bidder can approach the Independent External Monitor(s) (IEMs) appointed for the purpose of this Pact.**

10. **Independent External Monitors (IEMs)**

10.1 MoD has appointed the following Independent External Monitors for this pact in consultation with the Central Vigilance Commission:-

<u>Sl No</u>	<u>Name of IEM</u>	<u>e-mail id</u>
1.	Shri Narayan Murthy Ganapathy, IFoS (Retd)	Gana_narayan@yahoo.com
2.	Shri Lalatendu Mohanti, IPS (Retd)	L.mohanti@gmail.com

10.2 Details of Nodal officer nominated by E-in-C's Branch are as follows:-

Name : **Shri PKS Sengar, Director (Contracts)**
E-mail id : pkss_2004@yahoo.co.in
Mobile No : 9131948501

APPENDIX 'A' TO NOTICE INVITING TENDER [Contd....]**Annexure 'II' (Contd....)****INTEGRITY PACT (Contd...)**

10.4 If the IEMs need to peruse the relevant records of the Principal / Owner and/ or of the Bidder / contractor in connection with the complaint sent to them, the Principal / Owner and/ or the Bidder/ contractor shall make arrangement for such perusal of records by the IEMs as demanded by them including unrestricted and unconditional access to the project documentation and minutes of meeting. If records/ documents of Sub-Contractor(s) are also required to be perused by the IEMs as demanded by them. IEMs are under obligation to treat the information and documents of the Principal / Owner and Bidder / Contractor / Sub-Contractors with confidentiality.

10.5 The task of the IEMs, is to review independently and objectively, any complaint received with regard to violation Integrity Pact and offer recommendations or carry out inquiry as deemed fit. The IEMs are not subject to any instructions by the representatives of the parties and shall perform their functions neutrally and independently. The report of inquiry, if any, made by the IEMs shall be submitted to either of the following for a final and appropriate decision in the matter keeping in view the provision of this Pact:-

- (a) Engineer-in-Chief in normal cases
- (b) CVO(MES & BRO) / MoD in cases involving vigilance angle

11. Examination of Books of Accounts

In case of any allegation of violation of any provisions of this Integrity Pact or payment of commission, the Principal / Owner or its agencies shall be entitled to examine the Books of Account of the Bidder and the Bidder shall provide necessary information of the relevant financial documents in English and shall extend all possible help for the purpose of such examination.

12. Law and Place of Jurisdiction

This Pact is subject to Indian Law. The place of performance and jurisdiction is the seat of the Principal / Owner.

13. Other Legal Actions

The actions stipulated in this Integrity Pact are without prejudice to any other legal action that may follow in accordance with the provisions of the extant law in force relating to any civil or criminal proceedings.

14. Signing of Integrity Pact on behalf of Bidder

- (a) Proprietorship Concern – The Integrity Pact must be signed by the proprietor or by an authorized signatory holding power of attorney signed by the proprietor.
- (b) Partnership firm – The Integrity Pact must be signed by all partners or by one or more partner holding power of attorney signed by the partners.
- (c) Limited Liability firm – The Integrity Pact must be signed by all partners or by one or more partner holding power of attorney signed by all partners.
- (d) Private Limited / Limited Company – The Integrity Pact must be signed by a representative duly authorized by Board resolution.
- (e) Joint Venture – The Integrity Pact must be signed by all partners and members to Joint Venture or by one or more partner holding power of attorney signed by all partners and members to the Joint Venture.

15. Validity

15.1 The validity of his Integrity Pact shall be from date of its signing. It expires for the Contractor after the final payment under the contract has been made or till the continuation of Defect liability period, whichever is later and for all other bidders, till the Contract has been awarded.

15.2 Should one or several provisions of this Pact turn out to be invalid; the remainder of this Pact remains valid. In this case, the parties will strive to come to an agreement to their original intentions. To be signed by the bidder and same signatory competent / authorized to sign the relevant contract on behalf of MES.

APPENDIX 'A' TO NOTICE INVITING TENDER [Contd....]

Annexure 'II' (Contd....)

INTEGRITY PACT

To
.....
.....
.....

Sub: Tender for the work

"ENGINEERING PROCUREMENT AND CONSTRUCTION (EPC) FOR PROVISIONING OF BASIC STORAGE AND INFRASTRUCTURE FOR SPL VEH AND EQPT INCL GHE/GSE FOR NGMMCB DET 1 AT CAMPBELL BAY"

It is hereby declared that MES is committed to follow the principle of transparency, equity and competitiveness in public procurement.

The subject Notice Inviting Tender (NIT) is an invitation to offer made on the condition that the Bidder will sign the Integrity Agreement, which is an integral part of tender/bid documents, failing which the tenderer/bidder will stand disqualified from the tendering process and the bid of the bidder would be summarily rejected.

This declaration shall form part and parcel of the Integrity Agreement and signing of the same shall be deemed as acceptance and signing of the Integrity Agreement on behalf of the MES.

Yours faithfully

AAD [Contracts]
For Accepting Officer

APPENDIX 'A' TO NOTICE INVITING TENDER [Contd....]**Annexure 'II' (Contd....)****INTEGRITY PACT**

To
Chief Engineer A&N
Zone,
Brichgunj Military
Station,
Sri Vijaya Puram – 744 103

Sub :

**Submission of Tender for the work of "ENGINEERING
PROCUREMENT AND CONSTRUCTION (EPC) FOR PROVISIONING OF
BASIC STORAGE AND INFRASTRUCTURE FOR SPL VEH AND EQPT
INCL GHE/GSE FOR NGMMCB DET 1 AT CAMPBELL BAY."**

Dear Sir,

I/We acknowledge that MES is committed to follow the principles thereof as enumerated in the Integrity Agreement enclosed with the tender/bid document.

I/We agree that the Notice Inviting Tender (NIT) is an invitation to offer made on the condition that I/We will sign the enclosed Integrity Agreement, which is an integral part of tender documents, failing which I/We will stand disqualified from the tendering process. I/We acknowledge that **THE MAKING OF THE BID SHALL BE REGARDED AS AN UNCONDITIONAL AND ABSOLUTE ACCEPTANCE** of this condition of the NIT.

I/We confirm acceptance and compliance with the Integrity Agreement in letter and spirit and further agree that execution of the said Integrity Agreement shall be separate and distinct from the main contract, which will come into existence when tender/bid is finally accepted by MES. I/We acknowledge and accept the duration of the Integrity Agreement, which shall be in the line with Para 1 of the enclosed Integrity Agreement.

I/We acknowledge that in the event of my/our failure to sign and accept the Integrity Agreement, while submitting the tender/bid, MES shall have unqualified, absolute and unfettered right to disqualify the tenderer/bidder and reject the tender/bid in accordance with terms and conditions of the tender/bid.

Yours faithfully

(Duly authorized signatory of the Bidder)

{In lieu of IAFW-2159 (Revised-1947)}

TO BE READ IN CONJUNCTION WITH
GENERAL CONDITIONS OF CONTRACTS IAFW- 2249

MILITARY ENGINEER SERVICES

Tel/Fax: **03192 286148**
E-mail: e8ceanz@gmail.com
Zone,

Head Quarters
Chief Engineer (A&N)

Birchgunj, Junglighat PO,
Sri Vijaya Puram-744 103

801260 / 25 / E8

04 Jun 2026

E-TENDER

LUMP SUM TENDER AND CONTRACT FOR WORKS REQUIRED
IN THE EXECUTION OF

"ENGINEERING PROCUREMENT AND CONSTRUCTION (EPC) FOR
PROVISIONING OF BASIC STORAGE AND INFRASTRUCTURE FOR SPL VEH
AND EQPT INCL GHE/GSE FOR NGMMCB DET 1 AT CAMPBELL BAY"

A tender/ bidder who is qualified as per the eligibility criteria mentioned in the tender documents and has interalia sound past record is hereby authorized to tender for the above work. The tender / bid [both COVER-1 & COVER-2] shall be submitted / uploaded on the MES website portal [www.defproc.gov.in] as per time and date mentioned in the tender documents.

Date and time of opening of Price Bid i.e. Cover-2 will be intimated online after completion of evaluation of Technical Bid / Cover – 1. The financial bids of only those tenderers who meet the eligibility criteria as per Notice of tender shall only be opened.

Any correspondence concerning this tender should be addressed as indicated at the top of this sheet quoting the reference as given.

THE PRESIDENT OF INDIA DOES NOT BIND HIMSELF TO ACCEPT THE LOWEST OR ANY TENDER.

documents)

(Signature of the Officer issuing tender

Appointment: AAD (Contracts)
For Accepting officer

In lieu of IAFW-2159 (Revised 1947)

SCHEDULE-'A' NOTES
(LIST OF WORKS AND PRICES)

NOTES:

1. **GENERAL :**

- 1.1 The scope of the work under the agreement shall be **Engineering, Procurement and Construction (EPC)** for Provision of new buildings/structures as per the scope of work.
- 1.2 The scope of work includes, but is not limited to the planning, design, including third party inspection/review, supply, construction, installation, testing, commissioning etc., for the facilities and infrastructure to be provided by the Contractor as per details given in subsequent clauses here-in-after.
- 1.3 Description of Buildings/Structures, works and services given here-in-after are in brief. These are deemed amplified and read in conjunction with Special Conditions, Particular Specifications and Specifications & Conditions in relevant trade section of MES Schedule Part-I & Part-II, Scales of Accommodation for Defence Personnel and applicable Indian/ International Standards.
- 1.4 The details mentioned in DBR and general and particular specifications are indicative in nature. The bidder will ensure to complete the work and make it functional as per latest edition of NBC, statutory requirements and as per good, sound and standard engineering practices etc.
- 1.5 The E.P.C. contractor is expected to discharge his in conformity with the contract as per the tender documents and those documents specified therein to constitute the contract document and in conformity with all laws, regulations, acts, statutes, bye-laws applicable to all aspects of the investigation, design, engineering, construction, manufacture, delivery and shall indemnify the owner against any claims or damages, fines, suits, legal or administrative actions/ strictures penalties, etc. resulting from the neglect or inability or avoidance of the above said laws, regulations, statutes, etc.
- 1.6 It is emphasized that the EPC Contractor is expected to comply with all regulations, environmental regulations and health and safety regulations and comply with all the requirements spelt out in this regard in the contract. Where there is a difference between the employer's requirements and regulatory requirements the more stringent provision shall prevail. It is assumed that EPC Contractor has completed his due diligence on this prior to filling/quoting the tender and no claim on this account shall be admissible.
- 1.7 The EPC contractor shall bear the complete responsibility and cost of the surveys, investigation studies, design development of the employer's design/ performance criteria up to detail design level, Engineering (including all specialized engineering requirements mentioned in the contract or needed for the successful completion and handover of the project), Manufacture, Delivery, Construction, Erection and Installation, Testing, Commissioning, Handing Over and provision of liabilities towards Defect Liability Period for the entire facility.
- 1.8 **Period of Completion:** The entire work covered under this contract shall be completed within a period of **1095 days** from the date of handing over of site.

SCHEDULE-'A' NOTES (Contd...)

2. **SCOPE OF WORK:** This contract covers for all items of works described in **BOQ Part-I to IX**. The buildings and all services described under BOQ shall be executed at locations as shown on the site plan. The broad scope of work included in the BOQ is as under.

(a)	Schedule-'A' Part-I	:	Buildings & Structures including Internal Electrification, Internal Water Supply and Retaining Wall.	To be quoted by tenderer
(b)	Schedule-'A' Part-II	:	Excavation, Earth Work for Provisional Schedules	Pre priced by MES
(c)	Schedule-'A' Part-III	:	External Water supply	Pre priced by MES
(d)	Schedule-'A' Part-IV	:	External Electric Supply	Pre priced by MES
(e)	Schedule-'A' Part-V	:	Road / Path / Culvert	Pre priced by MES
(f)	Schedule-'A' Part-VI	:	Area Drainage	Pre priced by MES
(g)	Schedule-'A' Part-VII	:	Sewage Disposal	Pre priced by MES
(h)	Schedule-'A' Part-VIII	:	COMPOUND WALL,FENCING,GATES	Pre priced by MES
(j)	Schedule-'A' Part-IX	:	COOLING APPLIANCES	Pre priced by MES
(k)	Schedule-'A' Part-X	:	CONDUITS	Pre priced by MES
(l)	Schedule-'A' Part-XI	:	CHEMICAL EARTHING	Pre priced by MES
(m)	Schedule-'A' Part-XII	:	FLAME PROOF LIGHTS, INDUSTRIAL SOCKETS & HIGH BAY LIGHTS	Pre priced by MES
(n)	Schedule-'A' Part-XIV	:	Miscellaneous Items	To be quoted by tenderer

2.1 **Objective**

2.1.1 This contract is an EPC Contract wherein the Employer has provided concept drawings, specifications and other documents to establish and make clear the Employer's goals, objectives, requirements and expectations to do Engineering procurement for **PROVISIONING OF BASIC STORAGE AND INFRASTRUCTURE FOR SPL VEH AND EQPT INCL GHE/GSE FOR NGMMCB DET 1 AT CAMPBELL BAY** as detailed in the contract documents. The Contractor is required to use the concept documents provided by the Employer and then fully develop detailed, final and thorough plans, design, specifications and all other documents (**referred to in the contract document as 'Design Development' or 'Design Development Report'**) needed to successfully execute the works. In this regard the Employer is providing the following in concept form:

- (a) Line plan of buildings
- (b) Design Basis Report
- (c) Schedule of Finishes
- (d) Specifications

SCHEDULE-'A' NOTES (Contd...)

2.1.2 These documents are intended to provide the contractor with sufficient information so as to clearly understand the Employer's intent, goals and objectives in execution of the works. The contractor is not required to strictly confirm to concepts provided by the employer, but, on the contrary, is encouraged to improve on concepts with the goal to provide the final solution which best meets the Employer's goals and objectives. The contractor shall use a certain degree of liberty and flexibility in producing solutions which best meet established goals and objectives. The contractor will be required to adopt the general concepts, as provided, and expand and develop the same to produce complete, thorough, comprehensive and high quality designs, working drawings, and specifications for review and approval by the Employer. While developing the complete and final designs and specifications, the contractor shall review the concept designs and planning for betterments or improvements which may be incorporated to better achieve the Employer's goals and objectives. These betterments, if any, shall be submitted by the contractor to the employer for review and approval before the final design is completed. A brief summary of the Employer's key goals and objectives in executing works under this EPC Contract are as follows:

- (a) High quality construction
- (b) Pleasant and sustainable architectural appearance/features planned as per terrain and local climatic conditions
- (c) Quality life for residents
- (d) Maximize sustainability concepts.
- (e) Minimize long term facilities maintenance and upkeep costs.
- (f) Employee latest/modern construction technologies and best practices.
- (g) Maximize the natural surroundings and attributes to the extent possible.
- (h) Complete interim project priority milestones and overall schedule objectives on time.
- (j) Complete project within established budget.
- (k) Completion of various stages of the project within laid down time schedule as approved by the Accepting Officer.

2.1.3 The specifications contained, herein, shall apply to all works/items of work as are required to be executed under the Contract or otherwise directed.

2.1.4 The Specifications must be read in conjunction with the conditions of contract, concept drawings, specifications and other documents forming the Contract documents. Notwithstanding the subdivision of the specification under different headings, every part of it shall be deemed supplementary to and complementary of every other part. In the event of a discrepancy, difference or conflicting provisions among different parts of the documents on the same issue, the interpretation shall be based on the order of precedence as laid down below :-

- (a) Provisions as contained in Notes to Schedule "A"
- (b) Provisions as contained in the Scope of Work.
- (c) Provisions as contained in the Design Basis Report (DBR)
- (d) Provisions as contained in Design Development Report.
- (e) Provisions as contained in Particular Specifications
- (f) Provisions as contained in the Schedule of Finishes
- (g) Provisions as contained in the MES Standard Schedule of Rates (SSR)(Part -I)
- (h) Provisions as contained in the relevant Indian Standard of BIS
- (j) Provisions as contained in the TD (Typical Details) drawings
- (k) Provisions as contained in the General Conditions of Contract (GCC)

The heading in these specifications shall not be deemed to be part, thereof, or be taken into consideration in the interpretation or construction, thereof, or of the Contract.

SCHEDULE-'A' NOTES (Contd...)

2.1.5 The scope of work is not exhaustive. However, contractor is required to execute all the items as per scope of work, Design Basis Reports (DBR) and in compliance with general specifications, particular specifications, drawings etc. to make the buildings, complex and its services fit for its intended purpose i.e. handing over for functional use. The details mentioned in DBR and general as well as particular specification / conceptual drawings/site plan/line plan are indicative in nature. The bidder will ensure to complete the work and make it functional as per relevant Codes and Standards.

3. SAFETY MEASURES OF WORKING

3.1 In addition to the safety precautions to be taken by the contractor, as described in Special conditions herein after and IAFW-2249 (General Conditions of Contracts) the contractor shall take following additional safety precautions for his workmen without any extra cost to the Government.

- (i) Safety adjustable waist belt with proper arrangement.
- (ii) Safety helmets with strap. The above shall be provided to his workmen as and when required and directed by Engineer-in-Charge.

4. SCHEDULE 'A' PART - II to VIII

4.1 Works in respect of Schedule 'A' Parts - II to VIII have been pre-priced by MES based on Unit rates given in MES Schedule of Rates 2020 Part II or analogous rates thereof or assessed rates and are carried over to BOQ under column "Estimated rate" against Schedule 'A' Parts - II to VIII. The accuracy of unit rates is however not guaranteed. The tenderers attention is invited to condition 6A (B) of IAFW-2249 (General Conditions of Contracts). The tenderer shall work out his own unit rates from the drawings, specifications and other information furnished to him in the tender documents and arrive at total lump sum for each part of Schedule 'A' which will be quoted under relevant column catered in the BOQ. The contractor shall have no claim whatsoever on account of any errors in the unit rates/prices inserted by MES. It is an express condition of the contract that the tendered amount shall be deemed to include for the full and entire completion of the items of work and the contractor shall have no claim on account of any error in the unit rates/prices inserted by MES.

4.2 The description of items in various parts of Schedule 'A' is in brief. These shall be deemed to be amplified and read in conjunction with special conditions, particular specifications, specifications for materials and workmanship and conditions in relevant trade section of MES standard schedule of rates Part-I, 2009 and Part-II, 2020.

4.3 The rates inserted shall include for material and labour, supply and fixing and or laying complete including testing as required / as specified, unless otherwise specifically mentioned in the description of respective items.

4.4 The unit rates quoted by the Contractor against the items in Schedule 'A' Part - I shall be deemed to include the cost of construction of the entire work all as specified and/or shown on drawings except the items of works listed in other parts of Schedule 'A'.

4.5 All items enumerated under [Schedule 'A' Part - II to IX](#) are provisional. The extent of work required to be executed in respect of [Schedule 'A' Part II - to IX](#) will be governed by Condition 6 of IAFW - 2249 forming part of this contract.

SCHEDULE-'A' NOTES (Contd...)

- 4.6 'Unit Rate' inserted by the Contractor for Schedule 'A' Part-I shall be deemed to include for cutting chases for concealing pipes, PVC conduit, Steel conduit/specials and terminal boxes etc., and forming holes in/through walls, floors etc., where required and making good the disturbed surfaces to match with the adjoining surfaces. No price adjustment to lump sum rates in Schedule 'A' Part-I shall be made for cutting chases, forming holes etc., in the event of any variation in provisional quantities of other Schedule 'A' parts.
- 4.7 In case details in respect of items shown on main drawings are not given in the drawings referred to in the main drawings, then the same shall be followed from any other drawings included in the list of drawings or mentioned thereon in the drawings.
- 4.8 Probable layout system of various items of internal/external services are indicated on drawings. These are tentative and may be varied wherever necessary at the discretion of the Engineer-in-Charge. The contractor shall not be entitled for any claim on account of such variation.
- 4.9 The layout of buildings indicated in the site plan / layout plan is tentative and may be varied where necessary at the discretion of the GE. No adjustment in prices shall be done on account of final approved layout within the site plan area.
- 4.10 The under mentioned remarks shall be deemed to have been inserted in respective column against each item of **Schedule 'A' Part I to IX:-**
- | | | |
|----------------|---|--|
| Under Column 3 | - | Refer list of drawings |
| Under Column 7 | - | Refer Note No.1 of Schedule 'A' (Period of completion) |
| Under Column 8 | - | Refer Notes of Schedule 'A' |
5. Lump sum quoted by the tenderer for the items in Schedule 'A' Part-I shall not include the cost of all services covered in other parts of Schedule 'A', which are enumerated in general summary and also for any other specific items of works which have been specifically excluded hereinafter from the scope of the contract.
- 5.1 The Lump sum quoted by the tenderer for Schedule 'A' Part-I includes for all items/works, fittings and fixtures, excavation & earthwork shown on drawings. The lump sum shall further include for the following:-
- 6.
- [i] Strengthening measures for building in **Seismic Zone-V for all buildings.**
 - [ii] Provision of niches for DB's for fixing MCB's and suitable opening in walls/Galvalume sheet for fixing of exhaust fan including all necessary civil work.
 - [iii] Crumple section all as shown on drawings.
 - [iv] Fan hook with fan boxes.
 - [v] Plinth protection, hard standing, ramps, interlocking paver tiles, PCC solid block masonry steps, dwarf walls, toe walls, PVC rain water pipes etc., all as specified and as shown on drawings.
 - [vi] Niches, railings, peg sets, MS rungs, Decorative Curtain rods with brackets, splash stone, ground sink, electric meter boxes, main switch boxes, RCC Jalli, PCC curbs, GI/ PVC Spouts, Cills, Space for water cooler, opening for exhaust fan, Cable duct as per Standard Engineering practice including those shown on drawings etc., and other miscellaneous items shown on drawings.

SCHEDULE-'A' NOTES [Contd...]

- [vii] Any other civil works to accommodate various fitting/fitments all as shown on drawings.
 - [viii] Provision of doors, windows and partitions including all fixtures and fittings i.e. builders hardware.
 - [ix] Anti-termite treatment.
 - [x] Water proofing treatment to RCC roof slabs as shown on drawings.
 - [xi] Structural steel roof truss along with Galvalume sheet roofing, rain water gutter, eaves board all as shown on drawings.
 - [xii] Aluminium windows, aluminium grills, aluminium louvered ventilators, aluminium fixed glazing and aluminium door.
 - [xiii] False ceiling as shown in drawings.
 - [xiv] All sanitary appliances, accessories, toilet/bathroom fittings, grating, mirrors, SGSW gully traps, floor / nahani traps, plumbing works, soil / waste / vent pipes, drain pipes, etc.,
 - [xv] Rotational moulded HDPE Overhead tanks including float valves with float, vent pipe, over flow pipe, wash out pipe and PCC staging as shown on drawings.
 - [xiv] Welding of all members of steel structure as per relevant IS.
 - [xv] All other miscellaneous item(s) shown in drawings.
 - [xvi] Since only outline drawing has been included with this tender, the items shown on drawing are not exhaustive. The items required as per standard Engineering practice as per Married and other Accommodation constructed in MES shall be deemed to be included for proper completion of Building.
 - [xvii] Barricading of height 6m all around at site made of pre-painted galvalume aluminium zinc coating GI based plain steel sheet 0.5mm having tensile strength of 550MPa including framed work, barricading posts conforming to Fe -410-0, fixing arrangements etc., all as directed by Engineer-in-Charge.
7. The locations of plants/equipment, etc. brought to the site by the contractor shall be as directed by the GE. The locations for these plants may be changed within the limits of layout plan and the Contractor shall have no extra claim on this account. The contractor shall store materials, T&P etc., all as directed by Engineer-in-charge. Contractor shall ensure that storage of materials, T&P, labour deployed at site do not affect the operational requirement/ functioning of the authorities controlling the area. The Contractor shall take all necessary precautions to protect the Plants/Equipment brought to site and all the materials collected by him for incorporation in the work and no claim whatsoever for pilferages of materials and loss of plants/equipment shall be entertained on this account by the department.
8. The lump sum quoted by the tenderer shall also include for any minor details of works and/or construction which are obviously and fairly intended and which may not have been specifically referred to in the tender documents but which are essential for the execution and completion of the work in a workman like manner and sound construction.
9. If certain details are missing, in that case, the details indicated elsewhere in the drawings, which are similar or near to the missed out items of work shall be followed. In the absence of any other similar and near details, the minimum essential requirement for the completion of work from the structural and utility point of view shall be deemed to be included in the amount quoted.

SCHEDULE-'A' NOTES [Contd...]

10. In the case of difference of opinion between the contractor and Garrison Engineer as to whether or not a certain item of work constitutes minor or extra and constructional detail included in the lump sum amount quoted or not, the decision of the Accepting Officer, shall be final, conclusive and binding.
11. Some of the minor details/ items which are essential for entire completion of work are detailed as under for guidance:-
 - (i) Reinforcement of any RCC member not indicated on drawing.
 - (ii) Dwarf wall in situations like verandah, passage etc., not indicated in drawings.
 - (iii) Lintel over doors, windows and openings not shown on drawings.
 - (iv) Builders Hardware for door/windows not indicated on drawings.
12. For structural details, refer structural drawings only. If there is any discrepancy between architectural and structural drawings with regard to structural details, details shown on structural drawing shall prevail. Similarly if there is discrepancy between structural and architectural drawings with regards to architectural details, details shown in Architectural drawings shall prevail. The decision of the Accepting Officer as to what constitutes structural or architectural details shall be final, conclusive and binding.
13. In case where type and size of beams, slabs, columns, gusset plate details, bolts and nuts etc., are not indicated, these shall be provided as decided by the Accepting Officer.
14. If, there is any discrepancy regarding general notes on RCC works, TD (Typical detail) drawing and structural drawing, the detail shown in main structural drawing shall be followed. Similarly details shown in main drawings shall always be followed in case of discrepancy between main drawing and TD (Typical detail) drawings.
16. Nothing extra shall be admissible on account of work executed as stated above and the contractor shall be deemed to have taken into consideration the above provisions before quoting his lump sum and submitting his tender.
15. In case where type and size of beams, slabs, columns, gusset plate details, bolts and nuts etc are not indicated, these shall be provided as decided by the Accepting Officer.
16. If, there is any discrepancy regarding general notes on RCC works, TD (Typical detail) drawing and structural drawing, the detail shown in main structural drawing shall be followed. Similarly details shown in main drawings shall always be followed in case of discrepancy between main drawing and TD (Typical detail) drawings.
17. Nothing extra shall be admissible on account of work executed as stated above and the contractor shall be deemed to have taken into consideration the above provisions before quoting his lump sum and submitting his tender.
18. The contractor shall be deemed to have calculated his own details from drawings and specifications before quoting his unit rates. Notwithstanding any errors or inaccuracies in the quoted rates by the contractor, those rates shall be deemed to include for the full and entire completion of the items of work in accordance with provisions of the contract and NO adjustment what so ever shall be made on account of any errors in those rates.

SCHEDULE-'A' NOTES [Contd...]

19. In addition to list of drawings attached with tender documents, if any other drawing(s) referred to in drawings or in the tender documents, but not listed in list of drawings, these drawings shall also form part of the tender documents. The contractor shall be deemed to have taken the details, etc., shown in these missing drawings into consideration before quoting the lump sum amount. Nothing extra shall be paid on this account.
20. The details of the fittings/fixtures and other minor items shown in the main building drawings shall supersede the details of the same given in typical drawings enclosed in case of variation.
21. Fittings for Internal Electrification are shown in main plan of building covered under Schedule 'A' Part-I. Tenderer to note that these fittings of internal electrification are not part of the Lump sum part and shall be measured and paid under respective Part of Schedule 'A'.
22. The cost of foundations complete in respect of items of Schedule 'A' Part-I, including excavation and earth work required for foundations after carrying out surface excavation, PCC lean concrete below footings/ plinth beams, RCC footings/ RCC plinth beams, including reinforcement and form work shall be deemed to be included in the lump sum quoted under Schedule 'A' Part-I.
23. **VALUATION OF DEVIATION FOR ITEM OF WORK COVERED BY DEVIATION ORDERS IN RESPECT OF**
 - 23.1 **SCHEDULE 'A' PART- II to VIII:** Schedule 'A' Part - II to VIII are pre priced and the percentage derived from the lump sum amount quoted by the tenderer shall be applicable for any deviation.
 - 23.2 **SCHEDULE 'A' PART- IX:** Condition 62(C) of IAFW-2249 shall be applicable.
 - 23.3 **SCHEDULE 'A' PART- I:** In the event of deviation from the scope of work covered in Schedule 'A' Part - I included in lump sum, the same shall be priced all as per Condition 62 of IAFW-2249 (General Conditions of Contracts). However items which are available in SSR Part II the same shall be priced at with SSR 2020 Part II rates and enhanced by 100%.

SCHEDULE-'A' NOTES [Contd...]**24.0 YARD STICK**

- 24.1 Contractor shall submit yard stick for each building / structure mentioned in Schedule 'A' Part-I in duplicate to GE within one month of WO No.1, indicating percentage of payment to be made for each stage of the building along with supporting details i.e. detailed estimates. Yard stick shall be approved by the **CWE**.
- 24.2 There may be certain changes in yard stick percentages as submitted by the contractor while approving the yard stick by **CWE** due to market rates of various materials and due to policy of department of withholding sufficient amount for later stages of the building. Contractor shall not have any claim on this account and percentage payment to be made for each stage as approved by the **CWE** shall be final and binding on the contractor.
- 24.3 Payment against lump sum building(s) shall be made as per approved yard stick percentage. Payment against lump sum buildings to the contractor shall be allowed in 3rd RAR onwards, only after yard stick for building(s) are finalized and approved by **CWE**. Any delay in payment of 3rd RAR on account of late submission of yard stick by the contractor to the GE shall be contractor's responsibility and NO claim on this account shall be entertained.

25.0 SCHEDULE 'A' PART – IX (TO BE QUOTED BY THE CONTRACTOR)

- 25.1 The tenderer shall work out his own unit rates from the drawings, specifications and other information furnished to him in the tender documents and arrive at a lump sum price for each item of Schedule 'A' and insert unit rate in figures under relevant column of BOQ. It is an express Condition of the Contract that the tendered amount shall be deemed to include for the full and entire completion of the items of the work.

26.0 SPECIAL NOTES FOR SCHEDULE 'A' PART – I

- 26.1 The architectural drawings of the building covered under Schedule 'A' Part – I is uploaded along with the tender document.
- 26.2 The tenderer has to give the design for building covered under Sch 'A' Part I. The tenderer shall be required to submit details in two stages as mentioned here-in-after.
- 26.3 For designing the foundation of Buildings/structure, **Soil investigation Report is to be done by Contractor however Soil report of adjoining site is uploaded as Appendix 'SI'.**
- 26.4 The design parameters for Buildings/structure are uploaded as DBR (Structural) **which are to be taken into consideration by the tenderer in totality.**
- 26.5 **DESIGN LIFE:**
The class of Structure of the buildings/ structures being provisioned under the subject work is "General Buildings and Structures", as such, the Mean Probable design life of structure in years shall be **50years** as stipulated in IS 875 (part-II) 2015 "Code of practice for design loads of building and construction".

SCHEDULE-'A' NOTES [Contd...]**26.6 Ceiling Height**

- | | |
|------------------------------|------------------------|
| 1. Parking for Spl Vehicle | - As per Arch Drawings |
| 2. Office Space with Parking | - As per Arch Drawings |
| 3. POL Store | - As per Arch Drawings |
| 4. Guard Room | - As per Arch Drawings |
| 5. Sentry Post | - As per Arch Drawings |
| 6. Watch Tower | - As per Arch Drawings |

Contractor's special attention is invited that no alteration / amendments to architectural drawings especially the length, width, height, size of opening etc., shall be acceptable and complete design shall be suiting the Architectural details. **The Particular Specifications and Schedule of Finishes drawings in the tender has been prepared considering the current Engineering practices, In case of mismatch with regard to drawings, availability of materials with regard to specifications, deficiency noticed on the drawings w.r.t to fixing details etc., the contractor may seek clarifications during tender stage. During the course of execution, if requirement of superior specifications are felt due to non-availability and other exigencies and missing details if any asked will not be entertained and contractor is bound to execute the work without any extra cost the department and NO DO will be paid on this account.**

- 26.7 Detailed specifications are given in particular specification which shall be taken into consideration by the tenderer for designing the buildings covered under Schedule 'A' Part - I and arriving the lump sum amount against each item of BOQ covered under Schedule 'A' Part - I .
- 26.8 The unit rate quoted by the Contractor against items in Schedule 'A' Part-I shall be deemed to include the cost of construction of the entire Building / structure with complete Green Building concept (GRIHA 3 Star Ratings) all as specified and/or shown on drawings including notes thereon except the items of works listed in other parts of Schedule 'A'. It also includes for **designing complete structure from foundation to roof, submission of design calculation details including structural and any other drawing** as applicable before vetting, submission of structure stability certificate, Bills of quantities, submission of final vetted drawings by **any IIT / NIT/ IISC Bangalore**. 'Unit Rate' quoted against Schedule 'A' **Part - I** shall also be deemed to include for cutting chases for concealing pipes, PVC conduit, Steel conduit/specials and terminal boxes etc., and forming holes in/through walls, floors etc., where required and making good the disturbed surfaces to match with the adjoining surfaces. No price adjustment to lump sum rates in Schedule 'A' Part - I shall be made for cutting chases, forming holes etc., in the event of any variation in provisional quantities of other Sch 'A' parts.
- 26.9 In case details in respect of items shown on main drawings are not given in the drawings referred to in the main drawings, then the same shall be followed from any other drawings included in the list of drawings or mentioned thereon in the drawings.
- 26.10 The description of items of Schedule 'A' **Part I** shall be deemed to be amplified and read in conjunction with other parts, Special Conditions, particular specifications, specifications for materials and workmanship and Conditions in relevant trade section of MES standard schedule of rates Part I -2009 and Contract drawings.

SCHEDULE-'A' NOTES [Contd...]

- 26.11 (a) After acceptance of work, Contractor shall carryout structural design and drawings as per design parameters enclosed in DBR (Structural).
- (b) Design documents and drawings shall be submitted offline by the contractor to this office as per DBR (Structural) for checking before vetting by any IIT/NIT/IISC Bangalore. Time line for the same shall be as under.
- (i) Submission of preliminary Drawings showing location of beam and column layout with size for Architectural co-ordination by Architect section of Dept – 20 Days.
- (ii) Architectural coordination and correction: - 5 days
- (iii) Submission of draft design report for checking by E2 Design section containing all the input and design data, load calculation, load combinations, STAAD input and output file along with preliminary structural drawings:- 10 days
- (iv) Checking by E2 design section, clarification of doubts and correction by consultant:- 10 days
- (c) After checking, within 15 days contractor shall submit final Design Report and vetted drgs.
- (d) Drawings must be complete and detailed enough for interpretation by Engineer/ Quantity Surveyor.
- (e) Bills of Quantities of various items of work involved (along with estimation) with individual item rate pricing based on which the tenderer has arrived on the quoted rate of lump sum shall be submitted.
- (f) DDR Design Development Report to be submitted by contractor.
- (g) The bill of quantities shall be accompanied with an abstract with an indication of distinctive stages as per progress of work with quantified items with reference to design, drawings and specifications, priced and amount worked for each stage to arrive at the quoted lump sum amount.
- (h) In the event of any discrepancy in the total amount arrived by adding all the stages and the lump sum quoted, the lump sum quoted shall prevail and the stage wise amount reworked proportionally.
- 26.12 The details and documents submitted by Contractor as stated above shall not be made part of Contract Agreement except the duly vetted approved drawings by Accepting Officer and the Bills of Quantities and yardstick duly corrected post clarifications and vetting. The calculation sheets, drawings, reports and similar documents provided by the Contractor shall remain the property of the Accepting Officer and he shall have full right to use them in any manner for the Project or for any other purpose, at the sole discretion of Accepting Officer. The rate quoted against Part I shall deemed to include the cost towards submission of all the above details. The item of Sch 'A' Part – I quoted by contractor is frozen and can't be altered on account of post corrections if any due to final vetting of drawings.
- 26.13 If Contractor fails to submit the documents as per Para 26.11 within 120 Days, it shall be deemed that the offer is revoked by the tenderer himself and the EMD shall be forfeited. In case of MES enlisted contractor, amount equal to the Earnest Money stipulated in the Notice Inviting Tender, shall be notified to the tenderer for depositing the amount through MRO. Issue of tender to such tenderers shall remain suspended till the aforesaid amount equal to the Earnest Money is deposited in Govt. Treasury.

SCHEDULE-'A' NOTES [Contd...]

- 26.14 Clarification on the proposals, if any, needed shall be sought in writing. Tenderer will also be asked to withdraw conditions, if any, which are not in conformity with the departmental requirements. Upward revision of quotation shall not be permitted due to reasons of increase in specifications, inclusive of modification to items or any additional items required for completion of work as a whole on account of clarification on drawings / technical scrutiny of drawings sought by the department and same will be provided by without any extra claim.
- 26.15 Discussion with contractor with regard to the conditions and other technical aspects, by the Accepting Officer or any other Officer on his behalf, if any needed, may be held. He should make himself available within 48 hours after intimation. The quantities and pricing of individual items shall be revised post clarifications and vetting. **However, the rate quoted against the lump sum by the contractor in the financial bid shall remain the same.**
- 26.16 **Work order shall be placed on contractor by GE only after approval of duly vetted Design & drawings by HQ CE (A&N) Zone, Sri Vijaya Puram. The completion period indicated in NIT shall be from date of issue of work order for period of 1095 days.**
- 26.17 **The contractor shall submit 06 sets of complete approved design drawings as per DBR (Structural) for complete buildings covered under Sch 'A' Part – I which will be made form part of tender for circulating certified copies of contract Agreement. Cost of the same shall be deemed included in quoted rates of buildings under Sch 'A' Part – I.**
- 26.18 In spite of the fact that the design calculations / drawings have been got approved from IIT / NIT / IISc, the contractor is wholly / solely responsible till such time completion certificate is issued for the subject work the entire satisfaction of the GE. Further contractor will be fully responsible for any defects noticed with regard to operation of the installation, defects in any equipment supplied by him during 24 months from the certified date of completion and he shall make good / replace defective work executed without any extra cost to the Govt.

27. DRAWINGS

- 27.1 If specification for any fittings/fixtures are not given anywhere in tender documents, the same shall be provided all as shown/described in drawings and/or conforming to latest IS Standard make/specification as approved by GE.
- 27.2 Typical details of drawings given in the list of drawings of individual type of buildings shall be followed as applicable. The details of fittings/fixtures and other minor items shown on main building drawings shall supersede the details of the same given in typical drawings enclosed in case of variance.
- 27.3 Whether indicated in drawings or not, all openings in walls shall be provided with suitable lintels/beams if not specifically marked as given in Schedule of lintels/beams or as directed by Engineer-in-Charge. The lump sum quoted by the tenderer is deemed to include for the same.

SCHEDULE 'A' NOTES (Contd.,)

- 27.4 Any drawing mentioned in the contract drawings or particular specifications but if specifically not included in the list of drawings shall also be deemed to form part of contract. All built in furniture shall be provided as shown on drawings and lump sum quoted for Schedule 'A' Part-I is deemed to include for the provision of built in furniture.
- 28.0 After completion of work Contractor shall submit the complete set of completion drawings consisting of B/R & E/M site plan marked with external services as executed. One set of architectural drawings and structural drawings duly incorporating the changes if any during execution along with schematic drawings of internal water supply and internal electrification be submitted to GE in a cloth bound tracing sheet, together with soft copy of the same. The cost of submission of such drawings both in hard and soft copy shall be deemed to be included in the rates quoted for Schedule 'A' Part - I.
- 29.0 Contractor may use Mechanical devices required for excavation in trenches, without any extra cost to Govt. However, payment shall be done only for the authorised width as per drawings and preambles of SSR, irrespective of the actual width excavated. The unit rate quoted shall be included for such provisions and contractor shall have no claim on this account.
- 30.0 **SITE LAYOUT, VISIT AND LOCATION :**
- 30.1 **LAYOUT:**
- 30.1.1 Layout of Building/Structures and Services indicated in the SITE PLAN are Tentative. No Adjustment in Price shall be done on account of Final Approved Layout.
- 30.2 **VISIT TO SITE :**
- 30.2.1 **The bidders are advised to visit the work site(s) by taking prior appointment with GE before uploading their bid. The bidders shall have no claim what-so-ever on this account at a later stage whether they actually inspected the work site(s) or not.**
- 30.3 **LOCATION:**
- 30.3.1 The tenderer's particular attention is also drawn to the fact that the Andaman & Nicobar Islands are remote Islands. Sri Vijaya Puram is situated approximately 1200km away from mainland connected by Airline from Chennai, Kolkata and Visakhapatnam and by Ship from Chennai, Kolkata and Visakhapatnam. The work site is located at Campbell Bay which is located 540km (approx.) from Sri Vijaya Puram. Therefore the tenderer's are advised to well acquaint themselves about the working conditions and availability of local materials in this Island and all other matters affecting the execution and completion of works before quoting their rates and no extra claim shall be entertained at a later stage.

SCHEDULE-'A' NOTES [Contd...]

- 30.3.2 The contractor should fully acquaint himself of the prevailing conditions at the proposed site, meteorological conditions like climate rainfall, relative humidity, wind, storm and cyclones, visibility, oceanographic conditions, local conditions, site specific parameters and shall include for all such conditions, contingent measures in the bid including those which may not have been specifically brought out in the tender documents or not. The tenderers are advised to visit the site with prior information to the GE, to ascertain the conditions of working at site. The Contractor shall be deemed to have satisfied himself as to the nature of works, local facilities including type and nature of approach available to various locations of works and different mode of conveyance of materials, T&P, etc. which will be involved in the subject tender, and all matters affecting the execution and entire completion of work. The rates quoted shall be deemed to include considering all these site conditions and nature of works involved in the subject tender. No extra charges due to misunderstanding or otherwise whatsoever shall be allowed. The tenderers attention is invited to ascertain himself about the working space available on land side, and available roads/approaches to site. Necessary additional space required for any work shall be made available at his own cost by contractor. No extra charges on this account whatsoever shall be allowed.
- 30.3.3 The Contractor shall take all necessary precautions to protect the plants / equipment brought to site and all the materials collected by him for incorporation in the work and no claim whatsoever for pilferages of materials and loss of plants / equipment shall be entertained on this account by the Department.
- 30.3.4 Contractor shall take all precautionary measures to avoid any inconvenience to the users. The site of work shall be left clean and tidy after day's work. No obstruction to passage shall be made by dumping materials during progress of work.
- 30.3.5 Permission for the usage of any of the existing facilities such as approaches, if available may be granted by the GE on written request from the contractor and in the event of damage to such facilities caused due to usage of the same shall be made good by the contractor at no extra cost to the Govt. If the contractor fails to make good the damages caused as above in spite of direction from GE, these damages shall be made good and brought back to the original standard by the department at the risk and cost of the contractor. GE's decision in this regard shall be final, conclusive and binding.

SCHEDULE-'A' NOTES [Contd...]

30.3.6 Any damage caused to any existing structure, etc., due to bad workmanship / negligence of his workers, the same shall be rectified/ replaced by the Contractor at his own expenses to match with the existing surfaces. Decision of the GE in this regard is final and binding.

30.4 **SOIL INVESTIGATION(S) :**

30.4.1 **Soil Investigation report of adjacent site is attached as Appendix F. However the bidder has to ascertain the Soil Conditions themselves before bidding and bidders to note that no claim whatsoever will be admissible for non-ascertaining the soil conditions.**

30.5 **CLIMATE :**

30.5.1 The bidder has to refer official documents of Govt. of India/ Andaman Nicobar Island Administration in respect of environmental factors like max/min/mean temperatures, humidity and rainfall for architectural, structural, B/R and E/M services design.

30.6 **SEISMOLOGY :**

30.6.1 Seismic zone of Andaman Nicobar Island is mentioned in DBR.

30.7 **SOIL :**

30.7.1 The soil is generally the mixture of soft / hard dense soil, soft disintegrated rock (Ordinary rock). However the project is to be taken up only as per soil investigation to be carried out by Contractor and as catered under Annexure.

31.0 **SOURCE OF AGGREGATES**

31.1 The aggregates to be incorporated in the work shall be as under:-

[i] **Coarse Aggregate:** Crushed stone aggregate to be incorporated in the work shall be obtained from Main Land (INDIA) confirming to the requirements laid down in tender documents/SSR/relevant IS and as approved by GE.

[ii] **Fine Aggregate:** River sand to be incorporated in the entire work shall be obtained from Main Land (INDIA) conforming to requirements as specified in the tender documents and as approved by GE.

31.2 The contractor shall obtain River sand from any quarries of main land (India) and shipped from any of the Ports of Chennai / Vizag / Kolkata. Tenderer to note that, river and crushed sand from local quarries (which included all islands of conglomerate of A&N) shall NOT be used. The material shall conform to the requirements as laid down in relevant IS as approved by the GE.

SCHEDULE-'A' NOTES [Contd...]

32. While informing completion & requesting for issuance completion certificate contractor shall submit following documents / drawings (record drawings) both Architectural and Structural drawings to AGE/GE along with his letter. The drawings so prepared on computer based AUTOCAD software, shall be submitted in print copy duly signed in laminated form and also in digital form in CD with total 5 sets each. These shall be signed by the Engineer-in-Charge and GE in token of their check. Cost of submission of above drawings shall deemed to be included in the unit rates quoted for Schedule 'A' Part-I. Completion certificate by GE will be issued on satisfactory completion of work and receipt of above drawings / documents complete.
- [i] B/R & E/M site plan duly marked with external services as executed.
 - [ii] One set of architectural drawings and structural drawings duly incorporating changes, if any, during execution.
 - [iii] Schematic drawings of internal water supply and internal electrification to be submitted to GE in a cloth bound tracing sheet.
 - [iv] Written Guarantees for ATT, Water proofing treatment, External Weather proof painting, LED light fittings and any other guarantee certificates as specified in the tender documents.
 - [v] Periodical services measurement book (PSMB) for all the buildings catered under Schedule 'A' Part-I.
33. The rates inserted shall include for material and labour, supply and fixing and or laying, install, commissioning, etc. all plants equipment and tools including testing as required / specified complete including testing as required / as specified unless otherwise specifically mentioned in the description of respective items.
34. It is made clear that cost of material for testing, all field apparatus required for sampling and testing as per MES Schedule / IS codes and manpower required to such testing will be provided along with necessary transport arrangement to and from to the approved testing agency or laboratory by the contractor during the construction phase of the work and defect liability period. Field laboratory with all the required apparatus as listed in tender documents along with trained manpower for conducting tests along with requisite furniture, computer with connected equipment shall be established by the contractor at site of work at his own cost for carrying out test at stipulated frequency. Any test which is required to be carried out as per MES Schedule / IS code, but cannot be performed at field laboratory established by the contractor, expenditure of such test shall be borne by the contractor and nothing extra shall be payable on this account.
35. Contractor shall produce all proof for procurement and transportation of materials from main land for incorporation in the work from the approved transport agencies and produce their respective vouchers for verification of MES authorities. No payment will be released without such vouchers in RAR payments / Final bill.
36. All reinforcement in RCC work shall be high strength **CRS/HCRM/CRM Steel bars of FE 500 / Fe 500D /Fe 550 grade CRS** conforming to requirements of IS 1786:2008, Min. elongation of bars shall be 18%.

SCHEDULE-'A' NOTES [Contd...]

36. **BLANK**

37. **BLANK**

38. **GOODS AND SERVICE TAX (GST)**

38.1 Consequent to Govt. orders for implementation of GST with effect from 01 Jul 2017, there is a revision in taxation structures on works contracts and taxes on procurement of materials to be used/incorporated in works. The tenderer is advised to ascertain tax liabilities enforced by the Govt. as applicable on bid submission end date. The rate and amount quoted by the bidder is deemed to be inclusive of all taxes applicable as on bid submission end date of tender. In this connection please refer Govt. of India Gazette notification dated 12 April 2017 as regards to GST and its subsequent notifications, clarifications and public announcements thereof. Accordingly all other provisions in the tender documents regarding applicability of taxes and/or reimbursement/refund on variation in taxes directly related to contract value shall be deemed to be modified suitably and are to be read in conjunction with each other. No claim whatsoever will be admissible on this account due to misunderstanding if any by the bidder.

39. In terms of provisions of the Contract Labour Regulations and Abolition Central Rules, 1971, tenderers are required to obtain a license from the Asst. Labour Commissioner for the labour employed under subject work and the same shall be submitted to the Engineer-in-Charge before commencement of work. Further, contractor has to submit an indemnity bond to the GE immediately after acceptance of his tender.

40. In case of any deviations required under the contract to be ordered during execution of work are covered in Condition 7 of IAFW-2249. The deviations shall be dealt as under:-

[i] In case of any deviation, mode of pricing shall be decided by Accepting officer in terms of Condition 62 of IAFW-2249.

[ii] In the event of a deviation order involving fixation of Special (Star) Rate, Draft rate shall be prepared by GE (within a maximum period of 30 days) while initiating the proposal for deviation seeking approval of Accepting officer and notified to contractor. While notifying the Draft rate, it will be clearly stipulated that the same is merely an estimated rate and firm rate shall be fixed based on actuals and receipt of supporting documents from contractor such as vouchers / literature of product / test certificates etc., (as applicable) on completion of work involving Star Rate. Any objection to the method of fixing Star rate will be dealt as per Condition 7 of IAFW-2249.

[iii] Draft Star Rate shall be made based on market enquiry through telephonic enquiry / quotations / email / rate lists / internet based sources, materials & labour constants available in various civil engineering books and record available in respect of Star Rates approved in the past for similar items of work etc. Contractor may also assist GEs office in preparation of draft Star rate.

[iv] The Draft Star rate shall be purely a draft rate and shall not be used for claiming final payment during execution of work. However GE shall allow part payment to the tune of 80% during execution to avoid any financial hardship to the contractor.

SCHEDULE-'A' NOTES [Contd...]

- [v] After completion of the item of work involving Star rate, contractor shall submit the vouchers / literature of product / test certificate (as applicable, decision of GE being final in case of any disagreement) for finalisation of Star rate. The Star Rate shall be technically checked by DCWE [C] / Director [C] depending upon the financial effect & approved by competent authority within a period of one month from submission of the relevant documents by contractor as mentioned above.
- [vi] The star rate as approved by competent authority after technical check by DCWE[C] / Director [C] depending upon the financial effect shall be referred as "the rate decided by GE" under Para 62[G] of IAFW-2249.
41. Refer condition 49 of IAFW-2249 General Conditions of Contracts, the contractor shall remove from the site all unused stores and materials, tools, plant, equipment belonging to contractor and provided for the execution of work under this contract and delivered in clean tidy manner upto the entire satisfaction of Engineer -in-charge. Nothing extra whatsoever shall be paid to the contractor for such cleaning of site.
42. The quoted rates are includes for removing debris and clear the site after completion of work all as directed by Engineer-in-charge, failing which necessary recovery will be made from contractor's due and the work will be got executed on risk and cost of contractor through other agencies.
43. BLANK
44. Contractor shall produce all proof for procurement and transportation of materials from main land for the incorporation in the work from the approved transport agencies and produce their respective vouchers / invoices for verification of MES authorities. No payment will be released without such supporting documents in RAR payment / Final bill.
45. **Mobilisation Advance:** An interest free advance of 10% of contract amount shall be paid to the Contractor by the Department on production of Bank Guarantee on approved form from a nationalized / scheduled Bank for the amount equal to 110% of the advance as per special condition included in the tender documents. The Bank Guarantee(s) shall indemnify the Government against the Non-return Advance and also against default on the Contractor's part in performance of contract.
46. **ELECTRICAL LICENSE:** The electrical works to be executed under subject work is required Electrical License in accordance with Rule 29 under Part-III of Central Electricity Authority (Measures relating to safety and electric supply) Regulation 2010. The contractor shall have valid Electrical License issued by the Local Govt. authorities in the name of the firm or get the work executed through any agency having valid Electrical License. Prior to commencement of electrical work, copy of valid Electrical license in the name of the contractor or copy of agreement with agency having valid Electrical license along with agency's Electrical license shall be submitted by the contractor to the GE. In case contractor does not possess valid Electrical license and he intends to get the work executed through any agency having valid Electrical license and with whom he has the agreement, Prior approval of such agency shall be got done from CWE. Reference of Electrical license and details of supervisors certificate of competency and permit of tradesman employed for execution of all electric works / electric component of works in the Schedule / BOQ shall be duly incorporated in the Works Dairy and relevant site documents respectively for the whole period during which such work is executed.

SCHEDULE-'A' NOTES [Contd...]**47. CONSULTANT(S) FOR ENGINEERING SCOPE**

47.1 For Architectural and structural designs, mechanical, electrical, plumbing, design / drawings and other services required under Engineering scope of the work, the contractor will be permitted to source his designs and drawings from single consultant or multiple consultants as under:-

- (a) Consultants approved by E-in-C's branch / CE Command.
- (b) Suitable professionals with qualification requirement as stipulated are employed in his own organisation.
- (c) Any other consultant meeting the qualification requirement as stipulated to be nominated by the contractor for the subject work.

SI No.	Qualification Experience	Minimum Strength
1.	M.Arch. with Minimum 02 year experience	01
2.	Structural Engineer (M.Tech in Structural Engineering) with minimum 02 year experience.	01
3.	ME / M.Tech (Mechanical / Electrical) with Minimum 02 year experience in MEP / Integrated Service Design.	01
4.	Civil Engineer (Degree Holder) with Minimum 05 year experience in the field of Civil Engineering.	02
5.	Project Director / Manager for monitoring works at site.	01
Total		06

47.2 Planning and design of all services shall comply the requirements stipulated in NBC-2016, latest BIS codes, super ECBC norms as per ECBC-2017 and GRIHA-III rating. In case of any conflict among ECBC, GRIHA and scope of work, superior provision is to be adopted. Decision of Accepting Officer regarding superior provisions shall be final and binding.

49.0 PROJECT MANAGEMENT

49.1 In amplification of Condition 25 of IAFW-2249, at least one graduate engineer in Civil Engineering with requisite experience shall be employed by the contractor who will be well conversant and qualified to the satisfaction of Garrison Engineer on utilisation of Project Management tools and techniques using Primavera / MS Project. The engineer so employed shall be approved by GE and shall not be changed during currency of the project without prior permission of GE. The contractor's site office will have necessary software, hardware to monitor the project on day to day basis using above Primavera / MS Project tools. The total project duration considered from start to completion will also include likely time delays specific to the area of execution of the work and shall be within the accepted time of completion mentioned in the contract.

49.2 The details of the project schedule network will include:-

[a] All activities in detail work break down structure (WBS) for each activity with assigned T&P labour and duration with facility to follow progress.

SCHEDULE-'A' NOTES [Contd...]

[b] Material procurement planning and utilisation (qty and time of availability) details to ensure actual availability prior to the commencement of the activity / task.

[c] Plant deployment details (activity wise)

[d] Activity Vs labour employment details.

- 49.3 Dated projected Time Schedule will be jointly prepared by contractor and Garrison Engineer using MS Project / Primavera within two weeks of acceptance of the contract and shall be kept on record of GE for further reference.
- 49.4 The Project Time Schedule shall be updated daily with all necessary details and the 'Work done report' will be signed by the contractor and including as part of the 'Work Diary' by the JE and checked by the Engineer-in-Charge. Weekly review of the work progress shall be done between the Engineer-in-Charge and the contractor to monitor the progress made during the week vis-a-vis total progress. The weekly report shall also include forecast of resources to include plant, stores, labour, etc., for the next week. A detailed monthly report will be prepared and submitted to the GE by the contractor and review done jointly to examine increasing resources to ensure completion within the laid down time period. The detailed monthly progress report shall be presented and discussed by the contractor along with GE and Accepting Officer at the office of CE A&N Zone every month.

50. MATERIAL PROCUREMENT PLAN

- 50.1 Contractor shall workout material procurement plan to suit with the CPM chart considering constraints at site for storage of material and get it approved from GE. Height of heaps for storage material shall not exceed 1.50 metre from base. The materials required for the works shall be procured well in advance as per CPM chart so that the materials required for next three months will always be available at site.
- 50.2 The Scope of work caters for mobilization of serviceable T & P, procurement of materials required for all items of Schedule 'A'. The contractor shall get mix design and job mix formula designed and obtains approval from GE timely with setting up site lab as specified here-in-before & after.
- 50.3 Contractor shall organise enough lighting arrangement for execution of work in night hours. The quoted rate shall include for these proven and nothing extra will be admissible on this account.
- 50.4 The materials i.e coarse and fine aggregate for rigid pavements / concrete works etc shall be stacked on a hard platform in neat trapezoidal stacks which shall be measured and recorded in measurement as "Not to abstracted". Care shall be taken to avoid mixing of aggregate with soil/foreign materials by inserting PVC sheet of suitable thickness / painted MS sheet at the bottom of the stack. The aggregate mixed with the soil/foreign materials will not be allowed to use in the work. Main land coarse aggregates and local coarse aggregate shall be stacked separately at different locations as directed by GE. The exact location will be marked and as directed by GE on ground. The quoted rates are deemed to include the cost of making hard platform for stacking of aggregates.
- 50.5 It is made clear that Contractor's quoted rates are deemed to include for cost of material for testing, all field apparatus required for sampling and testing as per MES Schedule/IS codes/MORTH specifications/TI and manpower incidental to such testing will be provided along with necessary transport arrangement to and fro to the approved testing agency or laboratory by the contractor during the construction phase of the work. Field laboratory will be checked by Tech rep of accepting officer and shall have all the required apparatus as listed in Particular Specifications specified here-in-after along with trained man power for conducting tests and requisite furniture, computer with connected equipment. The lab shall be established by the contractor at site of work at his own cost for carrying out field test at stipulated frequency. Any other test which is required to be carried out as per MES Schedule/IS code/MORTH specifications, but cannot be performed at field laboratory established by the contractor, all

SCHEDULE-'A' NOTES [Contd...]

such tests shall be carried out by the Contractor at IITs/IISC Bangalore/SEMT Pune, GE Command Testing Lab (GE CTL) and cost of such tests shall be borne by the contractor and their quoted rates shall be deemed to include for the same. All the tests shall be carried out by qualified lab technicians employed by the Contractor in the presence of Engineer-in-charge or his representative and a third party i.e either AGE/GE (I) (lab) or SO-I / II (lab) as appointed by Accepting Officer, who shall directly report to him on quality control issues / matters. The essential lab equipment shall be kept till completion of the Defects liability Period. All lab equipment/peripherals shall be got calibrated by NABL accredited lab and certificates to this effect shall be submitted to GE. Contractor shall procure and made available all relevant test manual/IS codes/ASTM codes in field laboratory.

50.6 Mix design required for the subject work will be prepared by any IITs/IISC Bangalore/SEMT Pune. The cost of mix design shall be borne by contractor.

50.7 Contractor shall deploy at least minimum machinery / T&P (excluding reserves) on the work as specified here-in-after. List of equipment to be installed in site lab for quality control is given in Particular Specifications. The contractor should note that list of machinery/equipment given in tender documents is minimum requirement. The contractor may have to bring / use additional machinery/ equipment other than specified in this document for smooth functioning and timely completion of the work with respect to Project Schedule without any extra cost to the department. During progress of Rigid pavement works, if the T & P such as slip form paver, Sensor paver, Batching plants etc are found unserviceable / non-functioning more than 21 days, a penalty of Rs.12,000/- per day shall be levied to the contractor from the date the T & P are found unserviceable to till the equipment is made functional. However, in case the delay is beyond 60 days from the date of un-serviceability of plants, Government reserve its right cancel the contract in terms of Condition 54 of IAFW-2249 (General Conditions of Contracts) forming part of this tender which shall be final and binding. No claim what so ever shall be entertained on this account. The contractor shall produce MOU wherever applicable prior to commencement of work for alternative arrangements in case the T&P is not functional more than 28 days.

50.8 List of tests and other equipments to be installed in site lab for quality control is given in Particular Specifications.

51.0 **PREPARATORY WORKS:** The following items of works shall be considered as Preparatory Works under the subject Contract. These provisions shall be provided by the Contractor as specified here in below at his own expenses and the quoted rates shall be deemed to include for these provisions and nothing extra will be paid by Government in this regard.

51.1 **TEMPORARY APPROACH FOR CONTRACTOR'S MEN AND MATERIALS:-**

Contractor shall provide temporary approach for movement of men and materials. Contractor is at liberty to use any specification for this provision. The contractor shall bring this stretch of approach roads to its original status by using excavated earth which shall be properly compacted and rolled to the satisfaction of Engineer-in-Charge before work is completed and certified so by GE. The existing approach road needs to be strengthened and widened and shall always be kept in serviceable condition for movement of T & P. The rate quoted for the various items in BOQ is deemed to include for this cost element and nothing extra shall be paid on this account. The contractor shall be deemed to have visited the site of work to ascertain exact quantum of road and other services desired for the purpose and Cost thereof.

51.2 **TEMPORARY MOVABLE COLLAPSIBLE TENT / COVERS**

Two collapsible tents / rain covers of minimum 36M length and of required width which can be moved on rails otherwise on wheels shall be arranged and mobilized by the contractor so as to protect the concreting work in case of rains at his own expense and the quoted rates shall be deemed to include for the same and nothing will be paid by Govt.

SCHEDULE-'A' NOTES [Contd...]**51.3 CORDONING OF AREA WITH TEMPORARY BARRICADING**

Cordoning off the area shall commensurate with requirement at site. Steel sheets (PGI/CGI) of minimum height 4.00 mtr shall be used to block any FOD (Foreign object damage) towards the operational area. Extent of steel sheets shall be limited to the actual work site and shifted from phase to phase as instructed by Engineer-in-charge. On completion of work, the contractor shall dismantle the temporary barricading and clear off the materials. The steel sheet cladding shall be done with suitable steel structure frame work as approved by GE. Dismantled barricading shall be taken away as this becomes contractor's property. The contractor shall also cordon off the area of office, labs and storage yards by providing necessary barricading. These provisions shall be provided by the Contractor at his own expenses and the quoted rates shall be deemed to be included for these provisions and nothing extra will be paid by Government in this regard.

- 51.4 Contractor shall also arrange to put caution tapes to barricade the area / location at work site as per the requirement emerging during the currency of work.

52.0 COMPLETION OF DEFECT LIABILITY PERIOD

52.1 ----- Blank-----

- 52.2 The requisite T & P including required man power to be made available on notification of defects if any identified by the GE during defects liability within 15 days of notification by GE.
- 52.3 In the absence of any definite provision in the specifications contained herein, reference may be made to the latest MORTH (Ministry of Shipping, Road Transport and Highways) (Govt of India) published by IRC (Indian Road Congress), MES Schedules Part-I (2009) & Part-II (2020), ICAO, CPWD Specifications and IS codes. Wherever these are silent, construction and completion of works shall conform to sound engineering practice, and in case of any dispute arising out of the interpretation of the above, the decision of Accepting Officer shall be final and binding on the Contractor.
- 52.4 All the Code of Practice, Standards and Specifications applicable shall be the latest editions with upto date correction slip and revisions etc shall be available at site. The cost of these books and references shall deemed to be included in unit the rates quoted by the contractor.
- 52.5 Please note that no foreign exchange or import license facility will be arranged by the Department for any material, plants, equipments and tools required for execution of subject work.

53.0 LIST OF MAJOR PLANT AND EQPT (MINIMUM ESSENTIAL)

- 53.1 The details of minimum T&P required during execution of work are as under:

SCHEDULE-'A' NOTES [Contd...]

SI No	Description of Machinery/Equipment	Minimum Nos required	Vintage (in year)
1	Computerised ready mix concrete plant of min 30Cum/hour with printing facility.	01 No	05
2	Slip form paver with electronic sensor (Minimum 5.0m to 8m width) for laying concrete pavement	01 No	05
3	Hand held heavy duty needle vibrators (Electrically operated / diesel driven) for PQC	As per Requirement	05
4	Machine for joint filling	01 No	08
5	Diamond cutter for Joints (Diesel / electric driven) (Two full depth concrete cutting machine)	02 Nos	08
6	Wet Mix Macadam (WMM) plant of 90 to 120 TPH capacity	01 No	08
7	Vibratory type sand screeners	As per Requirement	08
8	Concrete Vibrator (Plate)	02 Nos	08
9	Air Compressor 350Cfm	01 No	08
10	Automatic level	01	08
11	Core cutting machine (150mm diameter & 100mm dia bit)	01 No	08
12	Field testing equipment to test 'K' value & CBR value	01 No	08
13	Lab testing equipments for site lab	As per Requirement	08
14	Scaffolding material	As per Requirement	08
15	Total station survey equipment	01 No	08
16	Dual mode tandem vibratory roller (05 to 10 ton capacity)	02 Nos	08
17	Smooth wheel roller 08 to 10 ton capacity	02 Nos	08
18	Earth compactor 08 to 10 Ton	02 Nos	08
19	Welding machine with cable etc complete set	01	08
20	Concrete Pump	01	08
21	Civil Engineering Lab Equipment	01 Set with site lab	08
22	Truck/Tipper	03	08
23	DG Set 10 KVA	01	08
24	Concrete Cube Moulds (15 x 15 x 15 cm Size)	40 Nos	08
25	Steel Shuttering	1500 Sqm	08
26	Personal Protective Equipment	For at least 60 Labour	05

Note:

(i) Plant and equipment shall be duly calibrated in frequent intervals and calibration certificate shall be obtained from authorized agencies and submitted.

(ii) After completion of relevant activity, connected T & P may be removed from the site only after written permission from GE.

(iii) Documentary proof shall be submitted by the contractor to Engineer-in-charge showing availability of T & P at site like copy of RC book as well as temporary pass issued by the station authority/ details of entry in register at technical area gate in token of entry of T & P to technical area.

(iv) A register shall be maintained by the contractor showing availability of T & P on daily basis with serviceability status duly signed by contractor & Engineer-in-charge and countersigned by GE on weekly basis. This will form part of RAR/final bill.

(v) Maximum vintage of all plants & machineries has been specified here-in-before.

SCHEDULE-'A' NOTES [Contd...]

(vi) MOU with service provider for maintenance of T & P to be submitted to GE. The original manufacturer's AMC is current and valid.

(vii) The contractor should bring requisite T & P for rectification of defects within 15 days from the date of notifying the defects to the contractor by GE.

(viii) The plant has fitness certificate from the authorised service centre of original manufacturer / OEM shall be produced.

(ix) The plant has been calibrated by the OEM / Authorised service centre as per recommended periodicity.

(x) The original manufacturer's AMC shall be certified by OEM

(xi) Plants and equipment applicable to type of construction (rigid / flexible) shall be deployed.

(xii) The operator of plant shall be certified by OEM.

(xiii) Other than above mentioned equipment list, if any tools/plants are necessitated to deploy at site for execution of works, cost of the same shall be deemed to include in tender and nothing extra amount shall be admissible on this account.

53.2 (a) Contractor shall arrange any additional T & P and any other T & P required during execution of work without any extra cost to the Govt so as to ensure timely completion of the work. The contractor shall also make suitable arrangement to ensure uninterrupted execution of work in case of failure of any of above referred T & P. The vintage of the Tools & Plants shall be as specified here-in-before.

(b) For mobilizing T & P, no payment shall be allowed to the contractor. However advance on account for materials procured shall only be allowed in terms of contract conditions, provided the materials are approved for incorporation in the work.

(c) Contractor's vehicles shall be allowed to ply on perimeter / link roads as directed by GE. A proper discipline shall be followed in this respect in consideration with flight safety norms.

53.3 The locations(s) of Hot Mix Plant (s), Concrete Batching Plant(s) etc shall be as shown on Site Plan and as directed by the GE. The location for these plants may be changed as directed by GE as per requirements and the Contractor shall have no claims whatsoever on this account.

54.0 LEVELLING

54.1 Before commencement of any work, the initial levels shall be recorded at a grid interval of 2m X 2m with the help of TOTAL STATION, jointly by MES executives and Contractor's representatives. After achieving required formation level as decided and directed by GE as per the required gradient/profile, the measurement/levels shall be recorded again at the same grid intervals.

54.2 With the help of TOTAL STATION alongwith Leica Geosystem or equivalent the levels at same interval and same places shall be taken after completion of each layer of all works at various locations as applicable (ie. compacting and rolling the formation of sub grade, base/embankments, GSB, WMM, DLC, PQC). All the levels of works at various location and stages so taken shall be fed into the computer on MS Excel sheet and longitudinal section and cross section will be got drawn by the contractor and signed jointly by the contractor and JE, Engineer in charge and GE. The first such longitudinal and cross section showing existing levels and proposed top level of excavated soil base / existing surface shall be got approved from Accepting Officer. Contractor's quoted rates shall deem to include for these provisions and nothing extra shall be payable on this account.

SCHEDULE-'A' NOTES [Contd...]**55.0 CONTRACT SUPERVISION**

- 55.1 Engineering Establishment : Following staff must be deployed and always be made available by the firm for entire duration of the execution of the work listed in the tender documents.

Sl No	Role	Nos	Essential Qualification	Desirable Qualification
1	Project Manager	01	Graduation in Civil Engineering from a Govt. recognized University/Institute with a minimum of 10 years' experience in handling high rise buildings.	One of the Engineers should be familiar with Auto CAD, MS Projects, Primavera and MS Office
2	Site Engineer Civil	02	Graduate in Civil Engineering from a Govt. recognised University/ Institute with at least 05 years of practical experience in handling of high rise buildings.	
3	Site Engineer Electrical	01	Graduation in Electrical Engineering from a Govt. Recognized University/Institute with a minimum of 10 Year's experience in handling high rise buildings.	
4	Site Supervisor	03	Diploma in civil engineering from a govt recognized university/institute with a minimum of 05 years experience in Bldg Construction.	
5	Lab Assistant	01	(10+2) holders from a Govt. recognized college with a minimum of 05 years experience in relevant field.	
6	Safety Engineer	01	Diploma holder from a Govt. recognised University/ Institute with at least 02 years of experience in high rise building construction.	
7	Quality Control Engineer	01	Graduate in Civil Engineering from a Govt. recognised University/ Institute with at least 05 years of experience in quality control checking in building and project documentation.	

- 55.2 Engineering establishment detailed above are to be employed by the Contractor without fail and responsibility in this regard shall solely rest with the contractor. It is to be ensured that they are deployed at site during execution of work, failing which the work will be stalled / suspended. Concerned AGE/JE is responsible for keeping necessary record of the same and non-compliance if any shall immediately be brought out to the notice of GE.
- 55.3 The other provisions given in condition 25 of General Condition of contracts shall hold good and shall be binding on the contract

56.0 PROJECT MANAGEMENT

- 56.1 In amplification of Condition 25 of IAFW-2249, the engineering establishment as specified here-in-before detailed in tender documents shall be employed by the contractor who will be well conversant and qualified to the satisfaction of Garrison Engineer on utilization of project management tools and techniques using Primavera/ MS Project. The Engineers so employed shall be approved by GE and shall not be changed during the currency of the project without his prior permission.
- 56.2 The contractor's site office will have necessary software, hardware and one qualified operator (in addition to above graduates / diploma in Civil Engineering) to monitor the project on day to day basis using above Primavera/ MS Project tools. The total project duration considered from start to completion will also include likely time delays specific to the area of execution of the work and shall be within the accepted time of completion mentioned in the contract.
- 56.3 The details in the Project Schedule Network will include:-
- (a) All activities in detail **work break down structure (WBS) for each activity** with assigned T&P labour and duration with facility to follow progress.

SCHEDULE-'A' NOTES [Contd...]

(b) Material Procurement planning and utilization (qty and time of availability) details to ensure actual availability prior to the commencement of the activity/task.

(c) Plant deployment details (activity wise).

(d) Work activity Vs Engineers establishment and Labour employment details.

- 56.4 Dated Project Time Schedule will be jointly prepared by contractor and Garrison Engineer using MS Project/Primavera within two weeks of acceptance of the contract and shall be kept on record of Garrison Engineer for further reference.
- 56.5 The Project Time Schedule will be updated daily with all necessary details and the "Work Done Report" will be signed by the contractor and included as part of the "Works Diary" by the JE and checked by the Engineer-in-Charge. A weekly review of the work progress will be done between the Engineer-in-Charge and the contractor to monitor the progress made during the week vis-à-vis total progress. The weekly report will also include forecast of resources to include plant, stores, labour, etc for the next week. A detailed monthly report will be prepared and submitted to the GE by the contractor and review done jointly to examine increasing resources to ensure completion within the laid down time period. The outcome of the monthly meeting shall be submitted to Chief Engineer. However, if the work is hampered or runs behind Schedule, then joint meeting shall be held and issues discussed, participated by director of the firm or one senior management member and Project Manager of Contractor with Accepting Officer/Director (Contracts)/ Officers detailed by Accepting Officer.

57.0 TRIAL LENGTH/ AREA

- 57.1 **Rigid Pavement.** At-least 30 days prior to the construction of the trial length, the contractor shall submit to the GE's approval a detailed Method Statement giving description of the proposed material, plant, equipment and construction methods for the all layers of rigid pavement construction (i.e formation preparation, GSB, WMM, DLC and PQC). All the major equipment like paving train (including paver with connected equipment), batching plant, tippers, etc., proposed in the construction are to be approved by the GE before their procurement. The trial size of pavement shall be constructed away from carriage way. The Engineer-in-charge shall also approve the location and length of trial construction which shall be a minimum of 60 Sqm. The trial length shall contain the construction of at least one transverse construction joint involving hardened concrete and freshly laid sub base. The construction of trial length will repeated till the contractor proves his ability to satisfactory construct the pavement in subsequent trials. Cores will be cut for testing and inspection of concrete. No payment will be made for construction of trial length and contractor's quoted rates shall include for the same. No claim whatsoever on this account shall be admissible at a later date. **(Trial bay shall be inspected by Technical Rep of Accepting Officer)**
- 57.2 The relevant provisions stated in clause No. 20.B.6.12 of SSR Part – I (2009) shall also be applicable.
- 57.0 **SITE OFFICE FOR MES EXECUTIVES:** Contractor shall provide 01 No temporary site office of prefabricated/pre-engineered structure of suitable size of approx 12.00 sqm along with toilet facility as directed by GE for Executive Staff/ Officer of MES. The site office shall be well furnished with tables, executive chairs, modular chairs & steel almirah (as directed by GE). The costs of the same shall be borne by the contractor and the rate quoted by the contractor shall be deemed to include for this provision. The site office and office furniture shall be sole property of the contractor and will be removed from site after completion of entire work.

SCHEDULE-'A' NOTES [Contd...]**58.0 OBSERVANCE OF SECURITY RESTRICTIONS**

- 58.1 (a) Since the work lies in restricted area, carrying camera enabled mobile phone by contractors or their agents are strictly prohibited. Also all vehicles brought by contractors in connection with execution of work should possess all valid papers and to be produced for security check. Any photography record of execution of works shall be with the permission of GE / Station authorities arrangements.
- (b) No arguments of the contractor shall be accepted to this reference and decision of the stn authority shall be strictly followed. However, MES Engineer-in-Charge and JE shall be available and contacted for any emergency or site related issues like delay in entry of labour, entry of construction carriage vehicle etc.
- 58.2 The contractor, his agents, work people etc shall adhere to the security instructions as laid down in the Contract Conditions strictly. No claim whatsoever for observance of restrictions imposed at site shall be admissible at any stage of work.
- 58.3 After completion of works, PCN evaluation of executed pavement works at all places shall be evaluated by the Government (through SEMT) and the cost of the same shall also be borne by the Government.
- 58.4 Site of work is a flying station for both civil and defence. Contractor shall have to plan his resources, manpower and work keeping in view the flying schedule of users.
- 58.5 Unless otherwise specified, unit rate against each item of work shall be deemed to be inclusive of material and labour, all plants, equipments and tools including testing for acceptance criteria complete.
- 58.6 Contractor has to provide basic model of mobile phone without media devices to all their staff for effective communication between plant site, storage yard, site, lab, MES and user. The permission for use of mobile phone at site shall be obtained from Defence authority through GE.
- 58.7 The contractor shall store materials, T & P etc. all as directed by Engineer-in-charge. Contractor shall ensure that storage of materials T & P, labour deployed at site do not affect the operational requirement/functioning of the authorities controlling the area. The Contractor shall take all necessary precautions to protect the Plants/Equipments brought to site and all the materials collected by him for incorporation in the work and no claim whatsoever for pilferages of materials and loss of plants/equipments shall be entertained on this account by the department.
- 59.0 Contractor's attention is invited to note the following and shall quote their rates accordingly. No claim what so ever shall be admissible on this account.
- (a) Site will be handed over to the contractor as per the date mentioned in WO No. 1. However contractor is deemed to have full knowledge of the flying schedule at site of work & the working hours available to carry out the work in coordination with users. No claim / compensation on this account will be entertained at a later stage.
- (b) Contractor shall take all precautionary measures to avoid any inconvenience to the users. The site of work shall be left clean and tidy after day work. No obstruction to passage shall be made by dumping materials during progress of work.
- (c) Any damage caused to any existing structure, etc., due to bad workmanship/ negligence of his workers, the same shall be rectified/ replaced by the contractor at his own expenses to match with the existing surfaces. Decision of GE in this regard is final & binding.

SCHEDULE-'A' NOTES [Contd...]

60.0 The following abbreviations wherever occurs in tender documents shall have the meaning as indicated against each:-

(a)	RM, M, m	- Running Metre
(b)	CM, cm	- Centimetre/Cement mortar
(c)	MM, mm	- Milimetre
(d)	CUM, cum, cuM	- Cubic Metre
(e)	SQM, Sqm	- Square Metre
(f)	M/L, M & L	- Material & Labour
(g)	S/F, S&F	- Supplying and fixing
(h)	C/O, CO	- Carried over
(j)	B/F, BF	- Brought forward
(k)	Kg	- Kilogram
(l)	xSqm/ X Sqm	- 10 Sqm
(m)	x RM/ X RM	- Ten RM
(n)	N.B.	- Nominal Bore
(o)	Drg/Drgs/drg/drgs	- Drawing/Drawings/drawing/ drawings
(p)	Cucm/CUCM	- Cubic Centimetre
(q)	PQC	- Pavement Quality Concrete
(r)	WBM, WMM	- Water Bound Macadam, Wet Mix Macadam
(s)	DLC	- Dry Lean Concrete
(t)	GSB	- Granular Sub Base
(u)	DBM	- Dense Bituminous Macadam
(v)	DAC	- Dense Asphaltic Concrete
(w)	PBW	- Part by Weight
(x)	MoM	- Minutes of meeting

61. MATERIALS AND SAMPLES:

61.1. Refer to Condition of 10 of IAFW-2249.

61.2. The materials and articles, which have been specified from certain makers/manufacturers, shall be of makes/manufactures as specified. However, in case any item is being manufactured by any of the manufacturers as GRIHA certified, ISI marked and conforming to ISI, the following order of preference shall be followed without any extra claim and the contractor shall be deemed to have taken into consideration the above provisions before quoting the tender:-

- (a) GRIHA complied products
- (b) ISI marked products
- (c) Conforming to IS

61.3. The materials and articles for the makes/manufacturers which have not been specified in tender documents the same shall be provided as under:

(a) If GRIHA certified materials are being manufactured, the same shall be GRIHA certified. For a list of GRIHA certified manufacturers refer to the website of GRIHA ie www.grihaindia.org

(b) If GRIHA certified materials are not being manufactured but ISI marked materials are being manufactured, the same shall be ISI marked. For a list of ISI marked manufacturers refer to the website of BIS ie www.bis.org.in.

(c) If neither GRIHA certified materials nor ISI marked materials are being manufactured, the same shall be conforming to IS Specifications.

(d) Any minor variation in sizes of items will be approved by GE for complying with the above provisions

SCHEDULE-'A' NOTES [Contd...]

- 61.4 Materials of local origin shall be as specified and conforming to samples kept in GE's office. The tenderer is advised to inspect samples of materials which are displayed in the office of GE before submitting his tender. The tenderer shall be deemed to have inspected the samples and satisfy himself as to the nature and quality of materials he is required to incorporate in the work irrespective of whether he has actually inspected them or not.
- 61.5 The contractor shall not procure any materials and articles unless the samples are prior got approved by the GE before incorporation in the work.

62. COMPLETION DRAWINGS & PERIODICAL SERVICES MEASUREMENT BOOKS:

The contractor shall submit Completion Drawings for all the structures and services in triplicate alongwith Soft copies to the Engineer-in-Charge or the Garrison Engineer. Similarly, the contractor shall also submit Periodical Services Measurement Books (PSMB) of the buildings covered in Schedule 'A' Part-I to the Engineer-in-Charge or the Garrison Engineer as directed. Lump sum quoted shall be deemed to inclusive of this aspect. The final completion shall only be issued by GE only after submission of Completion Drawings and Periodical Services Measurement Books (PSMB) as stipulated.

- 63. EFFICIENT WATER USE DURING CONSTRUCTION:** The contractor shall prevent wastage of water during curing. The contractor shall also made efforts to minimize use of potable water during construction by proper & efficient construction water management practices as follows

- (a) Using gunny bags for curing and using pounding for curing.
- (b) Monitoring to avoid leaks and water wastage.
- (c) Use of additives to reduce water requirements during curing.
- (d) Use of treated waste water/captured storm water.

64. PROVIDE MINIMUM LEVEL OF SANITATION/SAFETY FACILITIES FOR CONSTRUCTION WORKERS:

- 64.1 The contractor shall strictly follow the provisions contained in general conditions of contract for providing basic amenities to the workers. The contractor shall ensure cleanliness of workplace with regard to the disposal of waste and efficient provide clean drinking water and latrines and urinals as per applicable standard.
- 64.2 The contractor shall install a safety demonstration facility on site (in consultation with Green Building Advisor) and arrange training programmes for construction workers to use safety gears and safety procedures.
- 64.3 The contractor shall comply with the National Building Code 2016 norms on construction safety for ensuring safety during construction. The National Building Code 2016 have provisions for clean and hygienic accommodation, toilet facilities, purified drinking water, crèche facility, general store, a subsidized canteen, medical facilities and on site safety equipment, etc.
65. **CONTRACTOR TO FOLLOW ON SITE** Cost of below mentioned items shall be deemed to be included on contractor lump sum quoted amount, Nothing extra shall be paid on this account:-
- (i) Complied with the safety procedures norms and guidelines as outlined in NBC 2016 (BIS 2005) Part 7
 - (ii) Personal Protective Equipment Provided like safety helmets, harness & safety nets etc.
 - (iii) First-Aid box provided
 - (iv) All parts of dangerous machinery shall be guarded
 - (v) Precautions for working on machinery
 - (vi) Hoists and lifts, lifting machines, chains, ropes and other lifting tackles in good condition.

SCHEDULE-'A' NOTES [Contd...]

- (vii) Walking surface or boards at high are of sound construction and provided with safety rails or belts.
- (viii) Providing measures to prevent fires
- (ix) Fire extinguishers and buckets of sand to be provided in a fire-prone area and elsewhere.
- (x) Providing sufficient and suitable light in case of working during the night
- (xi) Safety policies of the construction firm/division/company.
- (xii) Labour camp and Canteen for workers
- (xiii) Washrooms for male and female labours
- (xiv) Drinking water
- (xv) All the labourer deployed by the contractor to wear proper uniform with firm name engraved on it
- (xvi) COVID PROTOCOL : Adequate precautions shall be taken to prevent epidemic infections. Adequate number of face mask, hand wash facilities, hand rub liquid, sanitizers etc. shall be provided to staff and workmen. Quoted rates are deemed to inclusive of these provisions.

66.0 BLANK

66.1 **DISCLAIMER :**

66.2 The Contractor acknowledges that prior to the execution of this Agreement, the Contractor has, after a complete and careful examination, made an independent evaluation of the Request for Qualification, Request for Proposals, Scope of the Project, Specifications and Standards of design, construction and maintenance, Site, local conditions, physical qualities of ground, subsoil and geology, traffic volume & restrictions, suitability and availability of access routes to the Site and all information provided by the Employer or obtained procured or gathered otherwise, and has determined to its satisfaction the accuracy or otherwise thereof and the nature and extent of difficulties, risks and hazards as are likely to arise or may be faced by it in the course of performance of its obligations hereunder. The Contractor confirms that it shall have no claim whatsoever against the Employer in regard the accuracy, adequacy, correctness, reliability and/or completeness of any assessment, assumptions, statement or information provided by it.

66.3 The Contractor acknowledges and hereby accepts to have satisfied itself as to the correctness and sufficiency of the Contract Price.

51.3 The Contractor acknowledges and hereby accepts the risk of inadequacy, mistake or error in or relating to any of the matters set forth elsewhere in the tender document and hereby acknowledges and agrees that the Employer shall not be liable for the same in any manner whatsoever to the Contractor, or any person claiming through or under any of them.

51.4 The Parties agree that any mistake or error in or relating to any of the matters set forth elsewhere in tender document shall not vitiate this Agreement, or render it voidable.

51.5 In the event that either Party becomes aware of any mistake or error relating to any of the matters set forth elsewhere in tender document, that Party shall immediately notify the other Party, specifying the mistake or error.

51.6 Except as otherwise provided in this Agreement, all risks relating to the Project shall be borne by the Contractor and the Employer shall not be liable in any manner for such risks or the consequences thereof.

SCHEDULE-'A' NOTES [Contd...]**52.0 Design by Contractor and Copyright:**

- 521 All these design & drawings will become the property of MES. The drawing cannot be issued to any other person, firm or authority or used by the contractor for any other project. No copies of any drawing or document shall be issued to anyone except MES and authorized representative of MES.
- 52.2 The Contractor shall monitor the progress of work at site on a monthly basis, along with photographs if any, with respect to overall construction schedule, identifying lapses/deviations in the progress or work, assisting the Project Manager in devising remedial measures, preparing revised schedules and revised resource requirements etc., on a monthly basis. This report shall be submitted to Engineer-in-Charge. During the execution of the work, Contractor shall submit a detailed Monthly progress & programme report to the Engineer-in-charge by 5th of every month. The format of monthly progress & programme report shall be as approved by Engineer-in-Charge.
- 52.3 All drawings/specifications/makes, shop drawings and construction methodology etc. are to be got approved from MES prior to execution/procurement. However, it does not imply that contractor absolves themselves from Codal provisions/statutory requirements.
- 52.4 If any modification in Architectural/Structural/Service design/drawing or any other change is needed due to deficiency in design/drawings/scheme arising out of inadequate considerations of site conditions/ non-compliance of Codal provisions, the contractor shall do/redo the design/redevelop the scheme and then execute without any extra cost. The decision of the GE shall be final and binding. No claim whatsoever will be entertained in this regard. However in case of architectural changes in buildings arising out of Client's requirement after preparation/finalization of the drawings leading to change in specifications/finishes/scope of work, the same shall be regularized through deviation order.
- 52.5 The area mentioned in tender document is indicative in nature. The Built Up area is based on concept drawings/permissible as per scale of Accommodation for Defence Services and other components. In case of any increase in area mentioned in tender document due to Employer/User requirement, the cost on this account upto 5% increase is deemed to be included in the quoted by contractor and nothing extra shall be paid on any account.
- 52.6 The various design mix of concrete required for project shall be got done by the contractor from any IITs / NITs at their own cost. The same is to be got approved from Garrison Engineer before execution of work.
- 52.7 All structural drawings & Facade drawings and Design Mix of Concrete shall be got approved from any of the IITs / NITs. Statutory fee shall be borne by the contractor.
- 52.8 In case of discrepancies between specification due to DBR, Scope of Work, Particular Specification, MES Specification (MES Standard Schedule of Rates), IS Codes etc., the order of precedence as mentioned hereinbefore on Sl. page No.27 shall be followed. In case the discrepancy cannot be determined by that method, then the stringent specification of all the above will be applicable and no extra cost shall be admissible on this account.
- 52.9 The facility at each floor as shown is indicative and may interchange/may add/may delete/may increase or decrease in sizes within building envelope as conceptualized. The internal partition and allied services may also change as per functional need and requirement of the Employer.

SCHEDULE-'A' NOTES [Contd...]

- 52.10 Sub-contractors/vendors/specialized agencies as required for execution for the parts of work will have to be got approved from Accepting Officer or its authorized representative. EPC contractor shall submit documentary evidences of such Sub-contractors / vendors / specialized agencies as required to prove their credentials prior to approval.
- 52.11 The contractor is required to submit all its submittals like Drawings, Documents, reports, Schedules, invoice copies, etc. (whether original or revised) in 6 (Six) Hard & 6 (six) soft (CD/DVD) copies. This clause applies to every submittal of contractor under this contract.
- 52.12 The accommodation of interiors, sanitary and electrical fixtures etc., if shown in tender drawings, is indicative only. Make, design, size shall be as approved by the Employer.
- 52.13 As-Built drawings and Documents : Prior to issue of any taking over certificate, the Contractor shall furnish to the Employer and the Engineer a complete set of „as-built“ Drawings, in 6(six) hard copies and in micro film form or in such other medium as may be acceptable to the Employer, reflecting the Project as actually designed, engineered and constructed, including an as-built survey illustrating the layout of the Project and setback lines, if any, of the buildings and structures forming part of Project Facilities. The works shall not be considered to be completed for the purpose of taking over until such documents have been submitted to the Garrison Engineer.
- 52.14 Protection of Environment : The Contractor shall take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or other resulting from pollution, noise or other causes arising as a consequence of his methods of operation. The contractor shall be required to follow all the rules/norms of Station.
- 52.15 Heap of earth/construction malba /debris as stacked at site are required to be disposed off by the contractor including all leads & lifts and space for disposal within the quoted cost.
- 52.16 Inspection before Dispatch: All routine tests shall be conducted before dispatch of equipment. No equipment shall be dispatched from the manufacturer's premises without such tests being conducted and test result recorded. These test certificates shall be given along with the supply of equipment. The Engineer-In-Charge shall, if he so desires inspect and witness the pre-delivery tests. For the purpose, the contractor shall give 15 days“ advance notice. Contractor shall arrange for inspection by Employer. However, waiver if any, for inspection shall be at the discretion of Employer without any cost implication but ROUTINE TEST & TYPE TEST Certificates shall have to be submitted for equipment. Prior to dispatch, all equipment shall be adequately protected & insured for the whole period of transit, storage and erection against corrosion and incidental damages etc. from the effect of vermin, sunlight, rain, heat and humid climate.
- 52.17 **Guarantee/Warranty:**
- 52.17.1 All plants/equipment/machineries installed/commissioned shall be guaranteed/carry warranty (as per applicability of guarantee/warranty given in general as well as particular specifications for each plant/equipment/machinery) for a period of twenty four (24) months (minimum) from the date of taking over of the installation by MES against un-satisfactory performance and/or breakdown due to defective design, material, manufacture, workmanship or installation. The guarantee/warranty period given above is the minimum period for which a plant/equipment/machinery is required to be covered under guarantee/warranty. However, if the guarantee/warranty period in general as well as particular specification or as provided

SCHEDULE-'A' NOTES [Contd...]

by the manufacturer(s) is more than 24 months for any plant/equipment/machinery from the date of taking over of the installation by MES, then the higher period will be the required period of guarantee/ warranty for that particular plant/equipment /machinery. The defect liability period as mentioned in other parts of the tender documents shall be deemed to be modified to this extent for such plants/equipment/machineries installed /commissioned. The plants/equipment/machineries or component or any part thereof so found defective during the guarantee/warranty period shall be repaired or replaced free of cost to the satisfaction of the Engineer in-charge. In case it is felt by MES that undue delay is being caused by the EPC Contractor in doing this, the same will be got done by MES at the risk and cost of the contractor. The decision of GE in this regard shall be final.

52.18 Temporary/Ancillary Provisions**52.18.1 The contractor will also include the following in his scope:**

(a) Installation of temporary barricades of 3 meter height of approved design / design erected all around the site. The structural dimension of the barricade, material and composition, its colour scheme and other details shall be in accordance with the drawing and the direction of Engineer-in-charge. The barricading shall be provided continuously during the execution of the entire work till completion and shall not be removed at any stage without prior approval of the Engineer-in-Charge. The rate for the same shall deemed to be included in the quoted rates and nothing extra shall be payable to the contractor on this account.

(b) Installation of temporary warning signs/lamps on all barricades during the hours of darkness and kept it lit there at all times during these hours.

(c) Repainting of the barricading after regular interval as directed by Engineer-in-charge.

(d) Proper maintenance of the barricading till completion of the work by repairing / shifting / replacing the damaged barricade.

(e) The barricades shall be maintained in one line and level.

52.18.2 Diversion of Services: All works pertaining to services including rerouting/diversion of services, routine testing, installation etc. embracing in one or more than one process shall be subject to examination and approval to each stage thereof by the Engineer-in-charge or concerned department as would be notified by the Engineer-in-charge or his accredited representative when such stage is ready and all the expenditure for the same will be borne by the contractor. In default of such notice, the Engineer-in-charge shall be entitled to appraise the quantity and extent thereof and the decision of Engineer-in-charge or his accredited representative in this regard shall be final and binding. The contractor will not have any claim in case of any delay in removal of trees or shifting, raising, removing of telegraph, telephone or electric lines (overhead or underground), water and sewer lines and other structures etc., if any, which may come in the way of the work. However, suitable extension of time will be granted to cover such delays. Cutting or Transplantation of any Number of existing trees on site as given in the scope of contractor and all the expenditure for the same will be borne by the contractor.**52.18.3 Disposal of surplus excavated earth / Spoils****52.18.4 The Contractor shall be deemed to have taken into account the quantum of excavation involved and that the surplus excavated earth remaining after use in operations such as Horticulture/Landscaping, Gardening, backfilling etc. and to be disposed-off by him.**

SCHEDULE-'A' NOTES [Contd...]

- 52.18.5 It will be the responsibility of the Contractor to get the permission for yard for dumping the surplus excavated earth from Station HQ authority if required. If any royalty/fee is payable to local authority, such royalty/fee shall also be borne by the Contractor. Disposal shall be carried out strictly as per the regulations of local authority. The contractor shall store the excavated earth required for operations such as Horticulture/Landscaping, Gardening, backfilling etc., at suitable place at project site under his safe custody at his own cost. Thereafter, the earth so stored shall be backfilled at site at the appropriate time. The cost of storage, transportation (to & from site), handling etc. shall be borne by the contractor.
- 52.18.6 The contractor shall also make his own arrangement for the disposal of the spoils from the works to such place where the same shall not cause nuisance and should be acceptable to the authorities concerned without any cost to Employer.
- 52.18.7 **Unforeseeable Difficulties**
Except as otherwise specifically stated elsewhere in the Contract:
- (a) The Contractor shall be deemed to have obtained all necessary information as to risks, contingencies and other circumstances which may influence or affect the Works.
- (b) By signing the Contract, the Contractor accepts total responsibility for having foreseen all difficulties and costs of successfully completing the Works and
- (c) The Contract amount shall include all the works mentioned in scope of work, Design Basis Reports (DBR), External Finishes, Internal Finishes, general specification, particular specifications, Concept / tender Drawings, tender documents etc. covered the entire area in all respect to make the buildings & complex fit for its intended purpose i.e. handing over for functional use and not be adjusted to take account of any unforeseen difficulties or costs. Employer shall not provide any material either on chargeable or on free issue basis to the contractor for execution of the project.
- 53.0 Mobilization of Men, Material and Machinery, The Preparation of design/drawings & bill of quantities (of his stated scope of work) etc., Bar Bending Schedule, Shop & Fabrication drawings for all work shall be supplied by the contractor as per agreed schedule/ as the work progresses. However, it shall be the duty and responsibility of the contractor to bring to the notice of the Employer in writing as to any variation, discrepancy or any other changes required in Drawing, design etc. and to obtain/prepare (as the case may be) revised drawings and designs and/or approval of the Employer in writing for the same.
- 53.1 List of Expenses to be borne by the Contractor: The following expenses, costs, charges, bills, etc., are included as part of the Contract and shall be borne by the contractor.
- (a) Premium for fire, Public Liability, Workmen Compensation, all risks and other Insurance for which the Contractor is required by local law.
- (b) Fees or charges for all testing, licenses, certificates or approvals required by
- (c) law or statutory requirements.
- (d) Charges of all maintenance and repair costs including cost of spare parts and testing (if required) incurred in respect of the pump sets, electrical distribution system, water supply system and other plants/equipment/systems.
- (e) Repairs to the Properties.

SCHEDULE-'A' NOTES [Contd...]

- (f) Common Tools for Repair and Maintenance Works Carried out by the technical staff.
- (g) Consumable like POL and non-consumable items such as official receipts, postage, bins, bulbs etc., necessary for the running of the properties.
- (h) All other costs including maintenance cost, taxes, telephone bills, professional fees and charges, plans drawings, tender documents, etc. which have received the approval of the contractor and are necessary for the running of the properties.

54.1

PAYMENT SCHEDULE

NAME OF WORK: ENGINEERING PROCUREMENT AND CONSTRUCTION (EPC) FOR PROVISIONING OF BASIC STORAGE AND INFRASTRUCTURE FOR SPL VEH AND EQPT INCL GHE/GSE FOR NGMMCB DET 1 AT CAMPBELL BAY

S/No	Description	% of quoted amount for payment
1	Mile Stone 1	1% of amount quoted for Srl Item No.02 of BOQ
2	Mile Stone 2	99% of amount quoted for Srl Item No.02 of BOQ
3	Mile Stone 3	As per rate quoted in BOQ against respective item No.3
4	Mile Stone 4	As per rate quoted in BOQ against respective item No.4
5	Mile Stone 5	As per rate quoted in BOQ against respective item No.5
6	Mile Stone 6	As per rate quoted in BOQ against respective item No.6
7	Mile Stone 7	As per rate quoted in BOQ against respective item No.7
8	Mile Stone 8	As per rate quoted in BOQ against respective item No.8
9	Mile Stone 9	As per rate quoted in BOQ against respective item No.9
10	Mile Stone 10	As per rate quoted in BOQ against respective item No.10
11	Mile Stone 11	As per rate quoted in BOQ against respective item No.11
12	Mile Stone 12	As per rate quoted in BOQ against respective item No.12
13	Mile Stone 13	As per rate quoted in BOQ against respective item No.13
14	Mile Stone 14	As per rate quoted in BOQ against respective item No.14
15	Mile Stone 15	As per rate quoted in BOQ against respective item No.15 TO 53

NOTES FOR MILE STONE 2 & 3:

- (i) Yard stick for buildings & payment schedule for services to be prepared by contractor and to be submitted to the GE through Engineer-in-Charge and GE with recommendation duly technical checked for the Approval of the CWE.
- (ii) There may be certain changes in yardstick percentages/ payment schedule for services as submitted by the contractor while approving due to market rates of various materials. Contractor shall not have any claim on this account and the percentage payment to be made for each stage as approved shall be final and binding on the contractor.
- (iii) Payment will be made as per approved yard stick/ payment schedule for services. Payment without approval will be allowed up to and including 2nd RAR only. Any

delay in payment of 3rd RAR on account of late submission of yardstick by the contractor and further its approval shall be the contractor's responsibility and no claim whatsoever will be entertained on this account.

DETAILS OF PAYMENT SCHEDULE FOR MILESTONES 1, 2 & 3

On finalisation of detailed drawings of Buildings/structures included in Sch'A' Part-I, the contractor shall submit further detailed Break up details of above yard sticks along with supporting documents priced at market rates to Engineer-in-Charge building wise and for Retaining wall. The Engineer-in-Charge shall check these details and shall send to GE for further checking of his AGE (Contracts). The GE office shall send these yard sticks to CWE office for technical check of DCWE / ACWE (contracts). These details shall be approved by the CWE and shall be final & binding on the contractor.

SL. No	Parts of Works & Description of works	% of total quoted amount for payment	Remarks
1	2	3	4
1.	Finalisation of Soil Investigation Architectural, structural drawings vetted from IIT/NIT and appd	1.00	Mile stone 1
2.	Retaining Wall	9.50	Mile stone 2
3.	BUILDING INCLUDING INTERNAL SERVICES	89.50	

55.0

BILL OF QUANTITIES

55.1

Based on entire set of drawings so finalised, the Contractor shall work out the Bill of Quantities for Buildings and services with pricing at Market Rates

56.0

PROCESS OF APPROVALS OF DESIGNS AND DRAWINGS

56.1

GE Campbell Bay is the NODAL OFFICER and is responsible for getting the approval for different types of works under the Engineering Phase from the authorities as stipulated below:- The Contractor shall submit all the requisite documents / details through the Nodal Officer and liaise with stipulated authorities for approval within period stipulated hereinbefore.

(a)	Architecture	E-6 Architect section CE (A&N) Zone
(b)	Overall Planning of B/R Services	E-2 Planning section CE (A&N) Zone
(c)	E/M services	E-4 E/M section CE (A&N) Zone
(d)	Structural Design	E-2(Des) section CE (A&N) Zone
(e)	Issues related to Contract	E-8 Contract section CE (A&N) Zone
(f)	Issues related to Site	CWE No.2 / GE(South) Diglipur

56.0

Refer Condition 70 of IAFW-2249)

56.1

The request for invocation of arbitration and appointment of arbitrator by either party shall be done mandatorily on MES Arbitration online platform (MIMAMSA) All proceedings related to such arbitration including submission of

all documents shall be conducted on the subject platform and as per its applicable SOP. All procedural orders, interim award, final award or any other information or directions given by the arbitrator shall be published by him/her on the platform. Publishing and uploading of final award on the platform shall satisfy the requirements of Sec 31(5) of the Arbitration and Conciliation Act 1996. For purpose of calculating limitation period as per Sec 34(3) of the Arbitration and conciliation act 1996, the date of uploading of final award on the platform by the arbitrator shall be applicable.

57.0

THIRD PARTY TECHNICAL INSPECTION (TPTI)

57.1

During execution of work, Third Party Technical Inspection Agency shall be engaged by department to monitor the testing / quality control of work as per Standard Codes of Practice. The TPTI shall access all documents maintained in the work and would randomly check the workmanship, sound Engineering practices and laid down procedures. The TPTI agency will visit atleast once in three months and raise observations, issue advisories and pin point defects for rectification. TPTI shall settle the observations on rectification of obsn and impose recoveries for non-rectification. Regular TPTI reports shall be made and recorded. Contractor shall extend necessary co-operation for the TPTI agency and rectify the defects pointed out by them. The quoted rates are deemed to include this provision and Nothing extra is payable on this account for the TPTI inspection on a later date.

Signature of Contractor
Date:

AAD [Contracts]
For Accepting Officer

DESIGN BASIS REPORT (ARCHITECTURAL)Annexure-A**Name of the Project: PROVISIONING OF BASIC STORAGE AND INFRASTRUCTURE FOR SPECIAL VEHICLES AND EOPTS INAL GHE/ GSE FOR NGMMCB DET 1 AT CAMPBELL BAY****SITE PLAN INCL EXTERNAL SERVICES AND ARCHITECTURAL DRAWINGS****1. Site plans including external services:**

Contractor shall prepare the Site plan/s based on the complete scope of work and the tentative Site plan showing the desired layout of buildings and marked with external services provided by the Department. The approximate dimension of the site is 105 M x 65M. The Site plans shall include the layout of proposed buildings/ structures, made up ground levels if required, roads & pathways, retaining walls, fencing, hard standings, area drainage, culverts, sewage disposal system, external water supply, external electric supply along with the existing ground features shall be submitted.

(a) The following buildings/ structures to be considered for the proposed layout:

(1) RCC Building Parking for Special Vehicles and maintenance facility (04 Nos) with a Vehicle Inspection Pit, CCIS/C T20 Stowage and 04 Nos Store Rooms.

(ii) A/C Plant Room and AHU Building.

(iii) Office space with Parking (G+1).

(iv) Guard Room.

(v) 02 Nos Watch Towers

(vi)

01 x Sentry post

(vii) POL Store

(viii) 01 x RCC Sump/Static Water Tank for firefighting of 225 KL.

(b) The Site plan shall include the following mandatory technical requirements:

(i) Hardstanding: 20M x 52M in front and 37.85 M x 9.0M on two sides for 60T Veh.

(ii) Approach Road from Runway to the Site hardstanding: 10 M Wide and approx. in length.

(iii) Chain link Fencing with Concertina coil on three sides and retaining wall concertina coil on one side.

(iv) Barrier Control Steel gate for 10M wide approach road

The Site plans complete in all respect drawn to a legible scale (1:200) for the following shall be submitted:

(i) Site plan for proposed external B/R Services (bldgs., roads, path, culverts, area drainage, sewage disposal system retaining walls etc).

(ii) Site plan for external water supply.

(iii) Site plan for external electric supply.

DESIGN BASIS REPORT (ARCHITECTURAL)**2. Architectural Drawings:**

Contractor shall prepare the **Architectural Drawings** for all Buildings & Structures including layout of built-in furniture, toilet details, schedule of finishes, internal electrical and water supply services for the given site, sanctioned plinth area and specifications. Tentative line plan of buildings and site plan are enclosed for reference and guidance purpose only. The contractor has the liberty to use these line plans for development of the conceptual plans. But wherever minimum/ maximum dimensions are mentioned in the documents/sketches shall be strictly complied for preparation of drawings. Detailed Architectural drawings shall be developed after getting the approval of concept plan.

The height of any proposed structure including lightning arresters, aviation lights and any other installations shall not exceed 11.24M at a distance of 145M from the centre line of Runway.

3. The architectural drawings for the following buildings to be prepared and submitted for obtaining approval from the Department are as follows:

Sr No	Description of the building/structure	Minimum Area required	Total Plinth Area in SQM	Remarks
1	RCC Building Parking for 04 Nos Spl Vehicles and maintenance facility with a Vehicle Inspection Pit. Plinth height :150mm	F.A : 21 M x 27.40M Min dimension of Inspection Pit 12M x 0.080m x 1M (depth)	12288.00	RCC framed structure with RCC roof. Min clear ceiling ht required is 8M. Motorised Rolling shutters of min dimension 6M x 6M shall be provided for all opens.
2	CCIS/C T20 Stowage (Air conditioned) with a provn of 6T capacity EOT crane having hook height of 5M Plinth height:300mm	F.A. 16M x 33.60M		
3	4 Nos store Rooms Plinth height : 450mm	Each room 5Mx6M		Ceiling hight of 4.0M. 3 tier RCC shelves / racks shall be provided
4	A/c Plant Room and AHU building Plinth height: 450mm		130	Ceiling height of 4.5M
5	Office Space with Parking (G+1) Plinth height : 450mm	P.A for office : 449.00 sqm & P.A for parking 55.20sqm (03 cars & 063 scooters)	504.20	RCC Framed structure Ceiling height of 3.2M
6	Guard Room Plinth height : 450mm		33.34	RCC Framed structure Ceiling height of 3.2M
7	02 Nos Watch Tower (G+1) Plinth height: 450mm		173.84	RCC Framed structure
8	01x Sentry Post Plinth height : 450 mm		3.71	RCC Framed structure
9	POL Store Plinth height : 450		30	RCC Framed structure
10	01 x RCC Sump/SWT for fire fighting		225KL	

4.The minimum plinth area provided is mentioned against each type of building. All buildings shall have aluminium joinery. The buildings/ structures shall have camouflage painting.

DESIGN BASIS REPORT (ARCHITECTURAL)
PREPARATION AND SUBMISSION OF SITE PLAN INCL EXTERNAL SERVICES AND
ARCHITECTURAL DRAWINGS

1. All drawings shall be prepared in AutoCAD/Revit Architecture software.
2. The Contractor/ EPC Consultant shall visit the project Site in coordination with GE before starting the design.
3. All the Arch drawings shall be signed by the Architect registered with council of Architects & with valid registration with the Council of Architecture (COA). Registration number to be quoted while signing. All drawings to be numbered properly with dates.
4. (a) **Preparation of Site Plan:** The Site plan shall be prepared based on the complete scope of work and the tentative site plans provided by the department. The Site plan shall be drawn to scale not less than 1: 200 showing the layout of proposed buildings/ structures, made up ground levels, roads & pathways, retaining walls, fencing, area drainage, culverts, sewage system, external water supply, external electric supply along with the existing ground features.

(b) The **Preliminary Site Plan** showing the layout of all proposed buildings /structures and external services shall be prepared in consultation with the respective GEs and E6, E2 (Plg) & E4 Sections of HQ CE (A&N) Zone. **On finalization of layout, the Site plans shall be vetted by GE and approved by the User.** The User approved drawings to be submitted to this HQ for record and reference.

(c) The Consultant shall obtain the **approval of Accepting Officer in writing before final submission of the Site plans to this HQ.**
5. A set of **Conceptual Architectural drawings** shall be prepared to include all floor plans, all sides' elevations, major sections and details based on the sanctioned plinth area and other parameters given to suit the site as per all relevant codes and Scales of Accn-2022 and other standard architectural practices/ norms in consultation with Arch Section of this HQ. The reference may be taken from the floor line plans provided by the Department. **These Conceptual Architectural drawings along with plinth area and floor area statements of individual building blocks to be got approved by the User.** The User approved drawings to be submitted to this HQ for record. **The Consultant shall also obtain the approval of Arch Section (E6) of HQ CE (A&N) Zone on these drawings before proceeding for preparation of Structural drawings.**
6. A complete set of **Detailed Architectural Drawings** consist of following drawings as per the above mentioned approved Conceptual Architectural drawings shall be prepared and submitted as plain white paper prints for approval
 - (i) All Floor Plans, Roof Plans, all sides elevations, enough number of sections to cover all details, detailed blow ups of various areas/ arch elements, all details of toilets, pantry etc. showing fixtures and waste disposal layouts, all joinery details, all staircase details, typical drawings and any other details as required with specification of all materials and fixing details. **The approval from Arch Section (E6) of this HQ on these drawings shall be obtained.**
 - (ii) Plans/ Roof Plan, elevation and sections shall be in the scale of 1:100 and detail part sections/elevations shall be in the scale of 1:50 with other relevant details at scale in 1:25 or as directed by the Director (Arch).
 - (iii) Details of staircase, Toilets shall be in the scale of 1:25 and constructional details shall be in the scale of 1:10 or as directed by the Director (Arch).
 - (iv) Details of doors/windows, ventilators, jallies, grill & railings etc shall be in the scale of 1:10, complete showing fixing details. The contractor has the liberty to follow the Typical Drawings (TDs) provided by the department.

DESIGN BASIS REPORT (ARCHITECTURAL)

(v) The buildings shall be designed to be aesthetically pleasing externally. All windows, doors, opening etc. on the external walls of the building shall be suitably protected from rain, storm, heat etc. Ornamental features to enhance the architectural aesthetics may be provided.

(vi) All levels including plinth level, floor levels, drops in verandahs, toilets etc. shall be suitably marked in the drawings.

(vii) All toilets shall be illustrated with enlarged details reflecting drops and slope on floor, sanitary fittings, water/ sewage, disposable, plumbing layouts, bathroom fixtures like taps, health faucets, peg sets, WC, towel rail, counter top wash hand basins soap tray with full length mirror etc. as specified shall be provided in all toilets

(viii) All Structural members like columns, beams, floor slabs etc. shall be incorporated in the Architectural drawings.

(ix) Schedule of Finishes & Internal water supply diagrams in consultation with E2 (Pig) Section of this HQ and shall obtain their approval on respective drawings.

(x) Internal Electrification drawings & schematic line diagrams in consultation with E4 Section of this HQ and shall obtain their approval on drawings.

7. The contractor shall submit 04 sets of **Detailed Architectural drawings** duly coordinated with structural drawings for checking and scrutiny by various sections of this HQ and site executives. Comments if any shall be communicated and the same have to be incorporated in **the final drawings and documents**.

8. FINAL SUBMISSION OF THE FOLLOWING

(1) 01 set of One set of completely corrected **Final Site plans and Architectural drawings** in original in A1 size non-tear able tracing paper of 100 GSM of Garware/Gateway brand or equivalent for complete Architectural drawings duly incorporated modification / changes suggested by the client and final drawings shall be signed by the Architect & endorsed by the contractors.

(ii) 02 sets of soft copies in DVD of complete drawings in **.dwg format**.

(iii) 02 sets of scanned soft copies in **.pdf format** duly signed & vetted drawings with drawing numbers and dates.

(iv) 04 sets of complete drawing prints in plain white paper and should be ink signed and stamped.

9. All deliverables shall be submitted to this HQ within the stipulated time frame. The contractor shall carry out amendment required during execution and shall submit both original tracings and duly ink signed and stamped prints with softcopies at no extra cost.

10. A **LIST OF DRAWINGS** for the complete project work / building wise with connected drawings shall be prepared. Each drawing shall be allotted a unique drawing No & sheet No as approved by Director (Arch)

11. The contractor/consultant shall carryout the services required in terms of the agreement according to accepted norms of sound Architectural practices and shall be responsible for accuracy and correctness of drawings. Contractor shall submit the certificate as per format attached as Appendix- (AR-I) in official letter head.

12 All drawings and deliverables once submitted will be property of HQ Chief Engineer (Andaman & Nicobar) Zone, Port Blair and the Contractor/Consultant will have no claim or rights thereafter on the same. The Contractor/EPC consultant is not allowed to use/ reproduce them wholly or partially for any other work. This HQ reserves the right to adopt the drawings in any other Govt. works in future.

DESIGN BASIS REPORT (ARCHITECTURAL)

APPENDIX – (AR-I)

TO WHOM SO EVER IT MAY CONCERN

This is to certify that,

(a) The Architectural drawings have been designed/ planned as per Scope of work, local Bye Laws, Coastal Area Regulations, NBC 2016, the latest BIS Codes as amended till date and details furnished by the Department for the buildings included in the scope of work of this tender/agreement.

(b) The floor areas and plinth areas have been provided as per Accn Statement Part II/details of PA Statement provided in the tender.

(c) The Architectural drawings have been checked and compared with respective structural drawings and other relevant drawings.

(Signature of Regd Architect)

Name: _____
Regd No. _____

(Signature of Contractor)

Office Seal
Date:

DESIGN BASIS REPORT (STRUCTURAL)Annexure 'B'**1. SCOPE****1.0 General**

1.1 The intent of this document covers the design basis for various items covered in the scope of work.

1.2 This structural design criterion is aimed at consolidating the basis of the work that the Contractor's structural designer is going to carry out in delivering the structural framework of the buildings which will be compatible with the Architectural theme, satisfy the functional needs, adhering to the latest available buildings norms and Indian Standards Codal provisions.

1.3 This design basis report covers the minimum design requirement to establish safe, durable & functional design basis that will form the overall design philosophy to be adopted in the 'structural design of this project. Not mentioning of any relevant criteria/design requirement in this design basis report will not free the contractor of the liability to follow the same. The contractor shall ensure adherence to the latest available codes to be followed at the time of design.

1.4 The buildings shall be as per the Architectural requirement for civil and structural works, standard specifications, MES specifications as covered in MES Schedule, relevant I.S. codes and local regulations.

1.5 The peripheral excavation wherever is a cause of concern to stability of existing nearby facilities, RCC diaphragm wall shall be constructed prior to excavation which will form part of the basement structure, wherever applicable. Adequate design & safety with provisions for connections shall be accordingly designed.

1.6 Important Note: Contractors to note that in view of the provisions of National Building Code of India 2016 and Criteria for Earthquake Resistant Design of Structures Part I, General Provisions and Buildings IS 1893 (Part -1) latest version released by BIS, the various design parameters have undergone changes in the new Codes and thus would affect the structural design of the project. All these factors shall be taken into account by the contractor.

1.7 In National Building Code 2016, there are changes in all Sections for structural analysis and design (various types of loads, wind, earthquake etc, and design of RCC and Steel structures). Contractor has to follow the National Building Code 2016, IS: 1893 latest version, IS: 13920 etc and submit the structural design for approval of the Department after getting the designs vetted from any of the IITs/ NITS.

1. Structural Design Parameters: All building super-structures shall be of RCC/framed structure and shall be designed based on relevant IS codes.

1.1 The Analysis and design of structure shall be carried out as per latest codes published by BIS. Some of these are latest versions of IS: 456, IS: 875, IS: 1893 (part I&II), IS: 2950 (Part I), IS:2911(Part I/Section 2), IS: 13920, IS: 3370 (Part 1, 2 & 4)), IS: 800, IS: 801, NBC and any other IS code relevant to the design. The seismic zone to be considered as per latest version of IS: 1893 & Basic wind speed as 44 m/sec (IS: 875 part-3). The design of the civil structure will comply with the requirements of the following:

- (a) National Building Code.
- (b) Local building Regulations.
- (c) Bureau of Indian standard codes.
- (d) International codes as applicable.
- (e) Any other regulation as per requirements.

2. The following structural parameters shall be adopted for design. Any variation/improvement is to be approved from E-2 Design section of this HQ:-

(a) RCC Structure:

(i) The proposed buildings are to be constructed having rectangular configuration with Special moment resisting RCC framed arrangement and to be analyzed and designed for earthquake by static analysis as well as dynamic analysis as stated in IS: 1893 latest version.

(ii) Design of RCC elements shall be carried out using limit state method as per IS 456.

DESIGN BASIS REPORT (STRUCTURAL)

(iii) As per Table 3 of IS 456: 2000, the environmental exposure condition can be classified as "severe." the fire resistance of the structure is to be taken as minimum of 2 hours.

(iv) RCC (Design Mix): M30 grade (minimum) of concrete shall be adopted.

(v) Reinforcement: Fe- 500 D (CRS) TMT Steel Bars.

(vi) No lapping of bars is allowed for diameter of bars greater than 16 mm, mechanical couplers as per IS: 16172 shall be used.

(vii) Main reinf of beam shall not be bent up and hence shear reinf shall be in the form of vertical stirrups only.

(viii) Any additional beam/column if required for obtaining an economical structural design which has not been shown in architectural drawing has to be incorporated without any additional cost.

(ix) Cement- slag cement conforming to IS:455

(x) The foundation shall be checked for quick sand condition with FoS not less than 1.5. Irrespective of the above foundation shall be laid over 300mm thick compacted hardcore.

(xi) Suitable measures to ensure that no quick sand occur shall be included in scope of work.

(b) Steel Structure/ Structural steel:

(1) All structural steel shall be designed as per IS: 800, using limit state method. All structural steel shall conform to IS: 2062.

(ii) Structural steel conforming to IS: 808 shall be used of grade YST 310 as per IS:4923. Structural steel shall be of 350 Mpa conforming to grade E350A/BR as per IS:2062. The minimum thickness of plate shall be 6mm.

(c) DURABILITY AND FIRE RESISTANCE:

(i) Structure should perform satisfactorily in the working environment in its anticipated exposure conditions during service. Requirements of durability shall be taken into consideration as per clause 8 of IS 456: 2000.

(ii) Cover to all structural elements shall be provided as per IS 456 based upon the Fire safety requirement and exposure conditions whichever is more. For members in contact with the ground exposure condition shall be determined after the soil testing and as per the guidelines on exposure conditions given in Table 3 of IS 456. Exposure for Durability criteria for structures shall be based on following conditions:

Location of structure: Campbell Bay

Exposure: Severe

(iii) Fire resistance: As per codal provisions/CFEES guide lines (minimum 02 hrs)

(d) DESIGN LOADS

(i) Dead Load: Self weights from all supported and supporting elements and as per provisions of IS 875 (Part-1).

(ii) Live Load: As per provisions of IS: 875 (Part-2).

(iii) Wind Load: As per provisions of IS: 875 (Part-3) for design life of 50 years (where applicable). $K_2 = 1.05$, $K_3 = 1.10$.

(iv) Seismic Load: As per provisions of latest version of IS: 1893 with Importance Factor-1.5, Earthquake as per latest version of IS: 1893 (Part-1) shall be considered.

(v) Other Loads: Temperature, erection, crane loads and other loads will be considered as per relevant data provided or as per any other IS Code relevant to the design of these bldgs. Collateral Load shall not be less than 25kg/sqm.

(vi) Load Combination: As per provisions of IS: 875 Part-5, IS 456, IS: 800 and IS 1893 Part-I latest version.

DESIGN BASIS REPORT (STRUCTURAL)**ANALYSIS AND DESIGN****1. RCC Buildings and Retaining wall Analysis & Design Guidelines:**

(1) Structural analysis and design shall be carried out using latest version of STAAD, RCDC or SAFE (for foundations) software or through excel sheets.

(ii) Structural analysis and design shall be carried out for all loads and load combinations of dead load, live load, wind load, seismic load and any other load applicable as per latest edition of relevant IS codes.

(iii) RCC Structural design shall be carried out as per provisions of IS 13920 in addition to provisions of IS 456. Structure shall be checked for Ultimate limit state and serviceability limit state (crack and deflection) as per code provisions.

(iv) All beam column joints shall be checked for relative strength of beams and columns in terms of clause 7.2 of IS 13920 (Latest version). Transverse reinforcement in beams shall be calculated in terms of clause 6.3 of IS 13920. Transverse reinforcement in columns shall be detailed in accordance with clause 7.4 of IS 13920. Shear capacity of columns shall be in accordance with clause 7.5 of IS 13920. Special confining reinforcement shall be provided in columns and piles in accordance with clause 8.0 of IS 13920.

(v) The structural frame of building will be designed as special moment resisting frame. If a combination of special moment resisting frame and ductile RCC structural walls is used. RCC walls shall be modelled in the analytical model.

(vi) All liquid retaining/ storage RCC structures shall be leak proof and shall be designed as per IS: 456 and IS: 3370 Part I to IV. For water tanks and underground sumps (where applicable), crack width shall be limited to water tightness Class 2 as per clause 4.4.3.3 of IS 3370 (Part 2).

(vii) Foundations shall be proportioned and designed for bearing capacity given in soil reports for all load combinations as per relevant IS codes. Due consideration to the water table shall be made in designing the foundation.

Notes-

(a) All structural TD drwg to be used for reference only. Design to be done based on Geotechnical investigation at site.

(b) Crumple joint to be provided as per relevant IS code.

(c) Co-efficient of active earth pressure 'Ka' shall be considered as per latest version of IS-1893.

(d) Surcharge/vehicle load giving axle load or any other load to be considered for design of retaining wall.

(e) Parameters to be checked during design

(aa) FOS for sliding

(ab) FOS for overturning

(ac) Max soil pressure at toe and heel and

(ad) Check for shear.

(f) The backfill of retaining wall (heel side) shall be filled with 300mm wide graded aggregate through out the depth and weep holes of dia 75mm/100mm shall be placed at a staggered distance not exceeding 1m vertically and horizontally.

(g) Expansion joint shall be sealed with min 22 gauge aluminium strip 250mm wide (min) on both side of wall.

(h) Galvanised Iron punched tap concertina coil of 450mm dia shall be fixed over retaining wall with ISA 50x50x6mm MS Post at every 1.50m c/c. Concertina Coil having barb thickness not less than 0.5mm, barb length not less than 18mm, width of barb of barb 15mm with a centre to centre spacing of barbs not more than 33mm with a core diameter of 2.5mm barb, stretchable to 6mtr length fixed using fins and wires to the angle iron posts and well secured.

DESIGN BASIS REPORT (STRUCTURAL)

(j) A typical drg of retaining wall is enclosed for reference by bidders.

2. Preparation of structural drawings:

The following requirement shall be met with while preparation of structural drawings:

- (i) The structural drawings shall be drawn to a scale sufficient for clear interpretation by executives.
- (ii) Every sketch shall be given as serial number so that it can be uniquely referred to along with sheet No e.g. "Section of Beam PB-(Drawing No 5) Sheet No 8/9 etc.". Reference number shall be taken by the consultant from client.
- (iii) The tenderer must familiarize himself with the general format of structural drawing followed in the office of the client and prepare his drawings accordingly.
- (iv) The structural drawing should give Reinforcement and dimensions of various structural elements of RCC structural members. Detailing of reinforcement bars must be given exhaustively and clearly so as to be totally unambiguous for executives.
- (v) 'Notes' regarding steel structure shall be mentioned in detail. All details of all the joints including welding/bolt details shall be shown in drawing. Complete fixing detail of steel structure with RCC columns shall also be shown. Welding length and thickness shall also be shown in drawings. Fixing details of galvalume sheets will purlins and purlins to rafter shall also be shown on drawing.
- (vi) Erection hooks shall be shown on drawings.
- (vii) Notes regarding various RCC details i.e. type of cement, RCC, Reinforcement steel, acceptance criteria of concrete, quality of water, cover to reinforcement etc. shall be mentioned on drgs in details.
- (viii) Cross section and details of main structural members showing joint details and specifying the dimensions.
- (ix) Roof, water tank platform and mumty framing plan and details showing all the members (as applicable).
- (x) Foundation plan and its details shall be clearly shown on drawings.
- (xi) Anchor bolt layout plan and details shall be shown on drawings (where applicable).
- (xii) General arrangement drawings for floor & roof plan, elevation and other details.
- (xiii) The vetting agency will be liable and answerable for any design deficiencies detected during design life of the RCC Bldg/Retaining wall and may be called upon to address such issue if any.
- (xiv) Structural designer signing the drawings must have M.Tech (structures) with minimum 2 years' experience.
- (xv) Certificate as under shall be given duly signed by structural designer on each structural drawing:-

Certificate

"It is certified that the design/specifications included in these drawings are in accordance with the current Govt. policy, IS codal provisions, NBC guide lines and sound engineering practice and earthquake resistant design for Seismic Zone as per latest version of IS-1893".

(0) A blank space of minimum size 7 cm height and 12 cm width shall be left for signature by deptt. Representatives.

3. CHECKING BY CLIENT [CE (A&N) Vijaya Puram]:

- (i) Tenderer/Consultant shall firstly submit preliminary drawings showing locations of beam, column layout and sizes for architectural coordination by Architecture Section of the deptt. i.e. E6 Section. After architectural coordination, structural design and drawings shall be done by consultant.

DESIGN BASIS REPORT (STRUCTURAL)

(ii) Name, address, qualifications and mobile/phone No of the structural engineer shall be mentioned on the letter head of tenderer along with preliminary report.

(iii) Tender/consultant shall submit draft design report for checking by client containing all the input and design data, load calculations, load combinations, STAAD input and output file along with preliminary structural drawings. Soft copy of STAAD, RCDC and SAFE and Excel files (as applicable) should also be sent to this office for approval prior to vetting from designated institute. STAAD, RCDC and SAFE model should have 'Nil' error and all members should pass on running the analysis and design.

(iv) Structural designer and draftsman of tenderer shall be available during checking for necessary clarification/explanation to the client and amendments in design and drawings at the appointed date and time. The modifications/changes, in loads/ structural elements shall be amended by the contractor as per the clients direction by considering safety, serviceability and durability consideration, without any extra cost to the Govt. Checking by the client will not absolve the tenderer's responsibility from ensuring structural soundness.

(v) Even if not notified by the client, other structural details as required to complete the project and all minor structural details like chajja projections, parapet walls, facia, lintels, railings etc. as per arch drgs, shall be deemed to be included in design and constructed at site without any extra cost to the client.

4. Third party vetting/proof checking:

(i) The vetting of structural design (including all design calculations) and drawings shall be got done from any IITs/NITs. The cost of the same is deemed to be included in quoted rates and nothing extra will be admissible.

(ii) The vetting of structural design and drawings shall be from the designated institute (duly signed by authorized signatory on behalf of the Institute) and not from a professor/individual of the institute in his personal capacity. The institute vetting the designs and drawings shall ensure that the designs and drawings are in compliance as per laid down IS Standards, regulations and sound engineering practices.

(iii) A certificate that all details have been thoroughly checked and are in compliance to standards, codes, regulations in respect of safety and soundness shall be obtained from vetting agency by the consultant and shall be submitted to the department.

Note: If the Auth signatory of institute is not a faculty of Structural Engg, the drawings shall also be signed by Prof/faculty of Structural Engg

(iv) Vetting agency will also be liable and answerable for any design deficiencies detected during design life of the structures and may be called upon to address such issues, if any.

5. Submission of final drawings and documents

(a) Structural design and structural drawings shall be signed by a person having M.Tech in structure qualification with Min 02 years experience.

(b) Tenderer shall submit the following drawings and documents duly vetted within time period as specified in tender.

(i) Final Design Folder incl all design calculations: 01 Folder STAAD, RCDC, SAFE and excel files (as applicable) input/output, drgs/ sketches in hard copy. (Duly signed by structural designer and stamped).

(aa) Structural designer qualification and experience certificate to be attached in design folder.

(ab) Certificate from Vetting Institute to be attached with design report

(ii) Soft Copy of Design Folder STAAD, RCDC, SAFE files, Excel and Auto CADD Str drgs in a CD.

(iii) Original Tracings of all drawings. (Duly signed by structural designer and Vetted by Vetting Institute)

(iv) Printout of drawings (Duly signed by structural designer and Vetted by Vetting (iv)

DESIGN BASIS REPORT (STRUCTURAL)

Institute)

* [one set each for AGE, GE, CWE, E6, E2 (Design) & E8 Sections of CE office to be submitted in E8 section of CE office]

(v) 01 CD

(vi) 01 set on A1 size 100 micron laser film.

(vii) 06 set of each drg (on A1 size Paper)

6. Liability of contractor structural consultant and vetting institute:

After acceptance of tender, the overall responsibility shall rest with the Contractor, Structural Consultant & Vetting Institute for faulty structural design and drawings and defect/ damage detected in designed infrastructure due to faulty design during its design life.

7. Delay:

The Contractor shall be held accountable for delays in providing the final design and drgs. The same shall be dealt in terms of Condition 50 of IAFW-2249.

(e) OTHER PARAMETERS

(i) Whenever any reference to IS/BIS Code is made, the same shall be taken as the latest revision (with all amendments issued there to) on the last date of submission of tender.

(ii) Apart from the IS/BIS Codes mentioned in particular for wind, live and earthquake load in the various clauses of this specifications, all other relevant codes such as American stands (AISC, MBMA, AISI & AWS specifications) related to the specific job under consideration and/or referred to in the above mentioned codes shall be followed where applicable, if the specifications for the same are not available in the relevant BIS codes.

(iii) Importance factor is to be taken as per IS code. Structures are analyzed as space frames and design to be carried out using latest version of standard software as brought out at 1(i).

(iv) No reduction in Live Load (as stated at Para 3.2 of IS; 875 (Part-II)) is to be considered for design of structure.

(v) Expansion & contraction due to change in temperature of the materials of a structure shall be considered in design. Provision shall be made either to relieve the stress by provision of expansion/contraction joints in accordance with IS: 3414 or design the structure to carry additional stresses due to temperature effects as appropriate to the problem.

(vi) Other design parameters will be as per relevant BIS codes.

(vii) The specified design life of the structure is to be taken as 50 years for all the bldgs.

(f) SOIL INVESTIGATION

Copy of soil investigation report of nearby area is enclosed just for guidance only. Detailed soil investigation is to be carried out by the contractor on their own through approved firms and shall be responsible for the adequacy of the design. In addition to this, following points shall be noted:

(a) The recommended value of 2.5 (minimum) shall be taken for bearing capacity safety factor.

(b) Chemical Attack:

(i) Results of chemical test on selected soil and groundwater samples shall be-considered in soil investigation report. The results showing percent of sulphates and chlorides and the PH value of soil shall be indicated.

(ii) IS: 456 recommends that precautions shall be taken against chemical degradation of concrete if sulphates content of the soils exceeds 0.2 percent, or Groundwater contains more than 300 mg/ltr of sulphates (SO₃).

(iii) The test results with these specified limits of the sulphate content of the groundwater shall be suitably considered. In case groundwater is encountered to the final explored depth during field investigation, suitable provisions shall be made in design as described in IS: 456.

DESIGN BASIS REPORT (STRUCTURAL)

(g) The contractor warrants to and undertakes to the employer that the work shall be designed by appropriately qualified/ experienced professional having experience in carrying out of similar type of nature and complexity of the works.

(h) Third Party vetting of Design and Drawing and its report.

(a) The vetting of following documents shall be done from the any of the IITs/NITs only.

(i) Input data/structure file.

(ii) Design Basis Report and list of codes and BIS publication referred for the design.

(iii) Design calculations.

(iv) Structural drawings

(b) The above vetted documents should be signed by authorized signatory on behalf of the institute and not by professor/individual of the institute in personal capacity. Necessary MOU will be submitted to this HQ.

(c) The third party vetting the designs/drawings shall also be liable for ensuring that the designs and drawings produced are in compliance as per laid down standards, regulation and sound engineering practices.

(d) in A certificate that all design parameters and other design details have been thoroughly checked and are in compliance to standards, codes, regulations respect of safety, soundness and economy shall be obtained from the vetting agency. The vetting agency shall also be liable and answerable for any design deficiencies detected during design life of the building and may be called upon to address such issues, if any.

(e) The vetting agency shall also be liable and answerable for any design deficiencies detected during design life of the building and may be called upon to address such issues, if any.

(j) In respect of the contractor's obligations with respect to the design and drawings of the project, the following shall apply:

(a) The contractor shall prepare and submit the design & drawings in three copies (Hard & Soft) for each of the design and Drawings, duly vetted by IITs/NITs for review, to the Accepting Officer.

(b) Within 30 (thirty) days of the receipt of the drawings, the Accepting Officer or their representative shall review the same and convey its observations to the contractor with particular reference to their conformity or otherwise with the Scope of the project and the Specifications and Standards. The contractor shall not be obliged to await the observations on the drawings submitted pursuant here to beyond the said period of 30 (thirty) days and may begin or continue works at its own discretion and risk.

(c) No review and/or observations of the Accepting Officer or their representative and/or its failure to review and/or convey its observations on any Drawings shall relieve the contractor of its obligations and liabilities under this agreement in any manner. If errors, omissions, ambiguities, inconsistencies, inadequacies or other defects are found in the drawings, they shall be corrected, along with the affected works, at the contractor's cost, notwithstanding any review.

(k) Soil Investigation/ Soil Exploration:

Soil investigation report is attached along with this design basis report. The report is for guidance only as the bearing capacity of soil mentioned therein is indicative only. The contractor shall ascertain the actual bearing capacity of the soil at the locations of respective buildings/structures using soil investigation/soil exploration. The soil investigation report shall be submitted by the contractor to the designated Engineer Authority of Accepting Officer and the same shall be got approved prior to preparation of foundation and other structural design.

Points for Soil Investigation/ Soil Exploration:

DESIGN BASIS REPORT (STRUCTURAL)

The following points shall be noted:

- (i) The recommended values include a bearing capacity safety factor of 04.
- (ii) as computed from soil-structure interaction. The appropriate net bearing pressures may be selected for the deflection/settlement
- (iii) Net bearing pressures for foundations at intermediate depths may be interpolated linearly.
- (iv) The gross bearing pressure shall be computed by adding the overburden pressure to the net bearing pressure.
- (v) Foundation shall be seated at least 0.5 m into natural soil.
- (vi) Fill placed above EGL shall be treated as surcharge load.
- (vii) The suggested modulus of sub grade reaction (k) shall be computed based on empirical relationships as given in published literature, and is applicable for minimum 6m size square footing at the Centre of the loaded area.

In case of isolated footings, the lateral edge-to-edge spacing between the foundations shall at least be equal to "0.8B" (where "B" is the width of the larger footing), in order to restrict the influence of adjacent footings on each other. In case this criterion cannot be satisfied combined footings or raft foundations may be provided.

Foundation

- (a) Safe bearing capacity shall be worked out using factor of safety =4
- (b) Contractor shall check for quick sand condition with factor of safety not less than 1.5. Necessary measures to improve the founding soil shall be done to avoid quick sand. Notwithstanding above, the foundation shall be laid over 300mm thick hardcore, thoroughly compacted using mechanical means.

Annexure ‘C’

SI No.	Description of item	Unit	Qty	Remarks
1.	2.	3.	4.	5.
1.	<p>Design, Engineering, Supply, Install, Testing and commissioning of Internal Water Supply system and consisting of necessary pipes, control valves, Pressure release valve & bib taps etc., for uninterrupted water supply to bath rooms, toilets, kitchen as specified under:-</p> <p>(a) CPVC pipe of size as per approved design with all fittings and fixtures of high end quality CP (except bib taps & Pillar taps) including water supply points for all sanitary fittings, bath and Kitchen, provision of water points to be provided as per Scales of Accommodation.)</p> <p>Note:</p> <p>1. Complete design parameters, pipes network, drawings, layouts etc., shall be prepared by Contractor and shall be got approved from CE before execution.</p> <p>2. All internal pipes shall be of CPVC and all external pipes shall be of CPVC pipes of required diameter as per design parameters with respect to maintenance of required pressure and safety criteria.</p>	Job	1.00	

Service Tank details

Sl. No.	Type of Qtr	No. of Qtrs	Requirement of Water in litres	Capacity of Tank	
				1000	500
1	2	3	4	5	6
1	V	11	2000	11	22
2	III	33	1000	33	-
3	II	26	1000	26	-
4	IV (Spl)	01	2000	01	02
5	IV	01	2000	01	02
6	III	04	1000	04	-
7	II	06	1000	06	-

DESIGN BASIS REPORT (INTERNAL ELECTRIFICATION, FITTINGS AND FIXTURES)

SI No.	Description of item	Unit	Qty
1	Design, Engineering, supply, install, testing and commissioning of internal electrification system consisting of concealed wiring for lights, ceiling fans, exhaust fans, switches, sockets, Distribution boards, MCBs, earthing and all necessary items for following buildings all as required and as per specifications/ authorization. All switches, sockets shall be of Modular type to be provided. (i) Office Space with Parking (G+1) (ii) Guard Room (iii) Watch tower (iv) Sentry Box (v) AHU/AC Plant Room (vi) Store room (04 Nos) in specialized bldg. for parking vehicles.		
2	All the building to be fitted with zero halogen, flame retardant wiring PVC insulated copper cables of appropriate sizes as per standard code of practice and to be illuminated with suitable luminaires of LED type fittings. All Internal wiring shall be concealed in walls, ceiling, floors etc. DBs inside the building common area, sub-station shall be recessed in the wall.		
3	Lighting system shall be designed in accordance with National lighting code-2010 and ECBC-2017. Desired average illumination level in various rooms & premises of building shall be minimum as per the scales of NLC-2010 and the revision of higher		
4	Adequate number of ceiling fans, exhaust fans in the Bldg as per requirement of Defence scale of Accommodation -2022. All the Internal fittings and fixtures shall be of more energy efficient and BEE 5 star rated and fans shall be of BLDC type.		
5	5/ 15Amps power sockets are to be provided in Bldg as per marking on Internal Services		
6	The nominal cross-sectional area of copper conductors in circuits shall not be less than the values given in Table 2 here under.		

Note for Item rate schedule: The internal wiring for lighting and power circuits for buildings basic stowage for special vehicles, (excluding store room -1 to 4) CCIS/CT 20 and POL store shall be provided as per drawing marked in bldg Internal services (Electric Supply) and will be measured as **item rate schedule** under relevant items.

Table -2 MINIMUM COPPER WIRE SIZEW IN WIRING CIRCUITS

Sr No	Type of Wiring	Minimum Copper wire size	Remarks
1	Light point only	1.5 Sqmm	One circuit with maximum 8 Points
2	Light point and socket 6A in common circuit	1.5 Sqmm	One circuit with maximum 8 Points. (But not more than 2x 6Amps sockets in one circuit)
3	Socket outlets 6A point only	1.5 Sqmm	One circuit with maximum 4 Points
4	Socket outlets 16A point only	2.5 Sqmm	One circuit of one Point only
5	3 Phase power supply for the equipments	As per site plan	One circuit of one Point only

DESIGN BASIS REPORT (CENTRAL AC PLANT)

SR No	Description of item	Unit	Qty
1	<p>Design, Engineering, supply, install, testing and commissioning of Central 'Air-conditioning plant at CCIS/CT 20 Room of Basic Stowage Bldg of capacity not less than 140 TR with combination of 4x35 TR (2x35 TR as Running and 2x35 TR as standby) to meet the design conditions Round the clock 24x7 of Temp 22+/-2 deg C and Relative Humidity of 60+/-5% at 20°c for Bldg CCIS/CT20 marked as per detailed Line plan/ elevation of building as APPXA and as per equipment load, no. of active persons inside the Bldg and No. of air changes consisting of all necessary equipment's and accessories complete all as specified and as directed as follows.</p> <p>(a) Hermetically sealed type compressor suitable for R-134A refrigerant of capacity not less than 4x35 TR</p> <p>(b) Chilled & Condensed water pumps of suitable capacity</p> <p>(c) Make up water Tank of suitable capacity</p> <p>(d) Air Handling unit of suitable capacity (Efficiency of Filtration Pre-filter Minimum 90% down to 10 microns)</p> <p>(e) Cooling tower of suitable capacity with pumping system</p> <p>(e) Insulated piping for Chilled water system</p> <p>(f) Fittings for Chilled & Condensed water lines like NRV, Y-strainer, balancing valve, Butterfly valves, flexible connections, Ball valves and Fresh air vents, Pressure gauge, Thermometers, Flow switch, 3-way valve, Drain piping and MS Structure material for fixing of piping</p> <p>(g) Galvanised steel ducting of different sizes, Diffusers for Supply & return air, Grills, Dampers (Volume control and fire)</p> <p>(h) ducts Thermal and acoustic insulation for Supply and return air</p> <p>(j) Main control panel Supply for chillers, pumps and cooling tower etc with suitable capacity MCCBs, Starters, contactors, timers, phase preventers etc</p> <p>(k) Control panel for operating AHU and other equipment with all necessary fittings and accessories</p> <p>(l) Earthing shall be provided for all equipment as per standards.</p>	Job	1

Auth: NGMMCB Det 1 Letter No. 100/NG/Wks dated 10 Apr 2026.

Sr No	Description of item	Unit	Qty
1	<p>Design, Installation, testing & Commissioning of Crane electrically operated 6 Ton capacity, 16 mtr span 6 mtr lifting height, double box girder type class-II duty EOT crane as per technical specification, with following equipment's and accessories complete all as specified and as directed:-</p> <p>(a) VFD drive of suitable capacity CT cable with full length plat from, all motion limit switch alongwith DSL system.</p> <p>(b) G.I bus bar PVC insulated, 4 pole R,Y,B, conductor with PVC cover as required.</p> <p>(c) Conductor joint, feed terminal, End Cap, Hanger support bracket complete as required.</p> <p>(d) Anchor clamp, Towing Arm, Bus Bar support Angles copper current collector with spring loaded contact -4 Nos complete all as required</p> <p>(e) Suitable control panel for operating of crane shall be provided with all necessary accessories.</p> <p>(f) Hoisting Mechanism shall be electric wire rope hoist with dual speed, 4-5 m/min as main hoist, upto 0.5 m/min as inching hoist, Brake as electromagnetic fail safe brake.</p> <p>(g) Long travel (LT) Mechanism shall be of speed: ~10-20 m/min, electromagnetic brakes.</p> <p>(h) Cross travel (CT) with speed of 5-10 m/min</p> <p>(j) Safety features shall included overload protection, limit switches in all motion (i.e. hoist upper & lower LT & CT limits) and emergency stop.</p> <p>(k) Earthing shall be provided.</p>	Each	1

SCHEDULE 'A' PART - I
(LIST OF WORKS AND PRICES)
BUILDINGS/ STRUCTURES / RETAINING WALL / SITE CLEARANCE AND LAND DEVELOPMENT

Sl No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8

- 1 Construction of RCC Building for parking of 04 Nos Special Vehicles with maintenance facility and with inspection pit along with 04 Nos attached Store Room and air conditioned CCIS/CT20 stowage room with EOT crane of 6 ton cap having hook height of 5m, on gantry girder and AC Plant Room AHU Building as marked on site plan and shown on line plan with the following specifications by Design, Engineering, Detailing and Supply of detailed Architectural and Structural drawings duly vetted by IIT/NIT and approved by the department as per DBR attached for:-
 - (a) RCC framed structure with M-30 grade concrete
 - (b) Aluminium windows, ventilators, Aluminium doors, motorised/manual operated steel rolling shutters as marked on line plan.
 - (c) AAC Block Masonry (Jointing with chemical mortar as per manufacturer instructions), Anti termite treatement
 - (d) The specifications of flooring and other finishes are as specified in Sch of finishes
 - (e) For CCIS/CT20 building, specifications for EOT crane and air conditioning are as follows
 - (i) Design, installation, testing and commissioning of crane electrically operated 6 ton capacity, 16m span 6m lifting height double box girder type EOT crane as per DBR attached.
 - (ii) Design, engineering, supply, install, testing and commissioning of central airconditioning plant of capacity not less than 140 TR with combination of 4X35 TR (2X35 TR as running and 2X35 TR as stand by) to meet the design conditions as per DBR.
 - (f) Specifications and Qty of Internal electrifications/fittings/fixtures for buildings shall be provided as per drg marked in Building internal services (Electrical Supply) and measured separately under Sch A Part XII (FLAME PROOF LIGHTS, INDUSTRIAL SOCKETS & HIGH BAY LIGHTS)
- 2 Construction of RCC Building for Office space with Parking (G+1) as marked on site plan and shown on line plan with the following specifications by Analysis, Design, Engineering, Detailing and Supply of detailed Architectural and Structural drawings duly vetted by IIT/NIT and approved by the department as per DBR attached for:-
 - (a) RCC framed structure with M-30 grade concrete
 - (b) Aluminium windows, ventilators, Aluminium doors as marked on line plan
 - (c) AAC Block Masonry (Joints are to be filled with chemical mortar as per manufacturer instructions, Anti termite treatement
 - (d) The specifications of flooring and other finishes are as specified in Sch of finishes attached
 - (e) Specifications and Qty of Internal electrifications/fittings/fixtures for Office space with Parking (G+1) shall be provided as per drg marked in Building internal services (Electrical Supply) and as per DBR attached.
 - (f) Internal Water Supply
 Design, Engineering, Supply, Install, Testing and Comissioning of Internal Water Supply ststern consisting of necessary pipes, control valves, Pressure release valve & bib taps, etc for uninterrupted water supply to bathrooms, toilets, kitchen as sepcified under the schedule.
 - (i) CPVC pipe of size as per approved design with all fittings and fixtures of high end quality CP (except bib taps & pillar taps) including water supply points for all sanitary fittings, bath and kitched, provision of water points to be provided as per Scale of Accn.

Note:-

 1. Complete design parameters, pipes network, drawings, layouts etc shall be prepared as per NBC 2016 and SP 35 by the contractor and shall be got approved from CE before execution.
 2. All internal pipes shall be CPVC and all external pipes shall be of GI type/CPVC pipes of required dia as per design parameters with respect to maintenance of required pressure and safety criteria.

- 3 Construction of RCC Building for POL store as marked on line plan and shown on site plan with the following specifications by Analysis, Design, Engineering. Detailing and Supply of detailed Architectural and Structural drawings as per DBR duly vetted by IIT/NIT and approved by the department Appx "A", "B" & "C" for
- (a) RCC framed structure with M-30 grade concrete
 - (b) Aluminium windows, ventilators, Aluminium doors as marked on line plan
 - (c) AAC Block Mansonry (Joints are to be filled with chemical mortar as per manufacturer instructions)
 - (d) The specifications of flooring and other finishes are as specified in Sch of finishes attached
 - (e) Specifications and Qty of Internal electrifications/fittings/fixtures for buildings shall be provided as per drg marked in Building internal services(Electrical Supply) and measured separately under schedule A part XII(FLAME PROOF LIGHTS, INDUSTRIAL SOCKETS & HIGH RAY LIGHTS)
- 4 Construction of RCC Building for Guard Room store as marked on line plan and shown on site plan with the following specifications by Analysis, Design, Engineering Detailing and Supply of detailed Architectural and Structural drawings as per DBR duly vetted by IIT/NIT and approved by the department as per DBR attached - Appx "A", "B" & "C".. for:-
- a) AAC Block Mansonry (Joints are to be filled with chemical mortar as per manufacturer instructions)
 - (b) Aluminium windows, ventilators, Aluminium doors, as marked on line plan
 - (c) Anti termite treatment
 - (d) Flooring as per Sch of finishes attached
 - (e) RCC framed structure with M-30 grade concrete.
 - (f) Specifications and Qty of Internal electrifications/fittings/fixtures shall be provided as per drg marked in Building internal services (Electrical Supply) and as per DBR
 - (g) Internal Water Supply
Design, Engineering, Supply, Install, Testing and Comissioning of Internal Water Supply ststem consisting of necessary pipes, control valves, Pressure release valve & bib taps, etc for uninterrupted water supply to bathrooms, toilets, kitchen as sepcified under :-
 - (i) CPVC pipe of size as per approved design with all fittings and fixtures of high end quality CP (except bib taps & pillar taps) including water supply points for all sanitary fittings, bath and kitched, provision of water points to be provided as per Scale of Accn. contd...
- Note:-
1. Complete design parameters, pipes network, drawings, layouts etc shall be prepared as per NBC 2016 and SP 35 by the contractor and shall be got approved from CE before execution.
 2. All internal pipes shall be CPVC and all external pipes shall be of GI type/CPVC pipes of required dia as per design parameters with respect to maintenance of required pressure and safety criteria.
- 5 Construction of RCC Building for Watch towers (02 Nos) (G+2) as marked on line plan and shown on site plan with the following specifications by Analysis, Design, Engineering. Detailing and Supply of detailed Architectural and Structural drawings as per DBR duly vetted by IIT/NIT and approved by the departmentduly vetted by IIT/NIT and approved by the departmentas per DBR attached - Appx "A", "B" & "C" for :-
- (a) RCC framed structure with M-30 grade concrete
 - (b) Aluminium windows, ventilators, Aluminium doors as marked on line plan
 - (c) AAC Block Mansonry (Joints are to be filled with chemical mortar as per manufacturer instructions, Anti termite treatment)
 - (d) The specifications of flooring and other finishes are as specified in Sch of finishes attached
 - (f) Specifications and Qty of Internal electrifications/fittings/fixtures shall be provided as per drg marked in Building internal services (Electrical Supply)and as per DBR
 - (g) Internal Water Supply
Design, Engineering, Supply, Install, Testing and Comissioning of Internal Water Supply ststem consisting of necessary pipes, control valves, Pressure release valve & bib taps, etc for uninterrupted water supply to bathrooms, toilets, kitchen as sepcified under:-
 - (i) CPVC pipe of size as per approved design with all fittings and fixtures of high end quality CP (except bib taps & pillar taps) including water supply points for all sanitary fittings, bath and kitched, provision of water points to be provided as per Scale of Accn.
- Note:-
1. Complete design parameters, pipes network, drawings, layouts etc shall be prepared as per NBC 2016 and SP 35 by the contractor and shall be got approved from CE before execution.
 2. All internal pipes shall be CPVC and all external pipes shall be of GI type/CPVC pipes of required dia as per design parameters with respect to maintenance of required pressure and safety criteria.

- 6 Construction of RCC Building for Sentry post as marked on line plan and shown on site plan with the following specifications by Analysis, Design, Engineering, Detailing and Supply of detailed Architectural and Structural drawings as per DBR duly vetted by IIT/NIT and approved by the department as per DBR attached -Appx "A", "B" & "C" :-
- (a) RCC framed structure with M-30 grade concrete
 - (b) Aluminium windows, ventilators, Aluminium doors as marked on line plan
 - (c) AAC Block Masonry (Joints are to be filled with chemical mortar as per manufacturer instructions, Anti termite treatment
 - (d) The specifications of flooring and other finishes are as specified in Sch of finishes attached.
 - (f) Specifications and Qty of Internal electrifications/fittings/fixtures shall be provided as per drg marked in Building internal services (Electrical Supply).(01 Nos)and as per DBR
- 7 Construction of RCC Static Water Tank of 225 KL capacity as shown on sitel plan with the following specifications by Analysis, Design, Engineering Detailing and Supply of detailed Architectural and Structural drawings as per DBR duly vetted by IIT/NIT and approved by the department.- Appx "A", "B" & "C" for:-
- (a) RCC framed structure with M-35 grade concrete
 - (b) The specifications of flooring and other finishes are as specified in Sch of finishes attached

Total amount of Schedule 'A' Part - I, SI item No 2 C/o to BOQ

Rs.

(V) RETAINING WALL

- 8 Analysis, design, Engineering, detailing, supply of Architectural & Structural drgs for construction of RCC Retaining walls using M-30 concrete of height upto 4m and length 150 m including concertina coil over retaining wall as required at site and as marked on site plan for the entire area of Site Plan **designed as per IS-14458 & IS 1893 (All parts) and as per the DBR vetted by IIT/NIT and approved by Accepting Officer.**
 Note: **If the actual length of Retaining wall as per the Contractor's design / proposal of site development as shown on site plan turns out to be different the variation in length shall be measured using Pro-rata.**

Total amount of Schedule 'A' Part - I, SI item No 2.1 C/o to BOQ

Rs.

Signature of Contractor

AAD (Contracts)
For Accepting Officer

SCHEDULE 'A' PART - II
(LIST OF WORKS AND PRICES)

SITE CLEARENCE AND LAND DEVELOPMENT, EXCAVATION, EARTH WORK FOR PROVISIONAL ITEMS

Notes:

1. The quantities under column 4 are provisional.

2. The excavation & earthwork, RFR and removal required for the works covered under Schedule 'A' Part - II to XIII shall be measured under this schedule. Earth work required for the items are included in lumpsum under Schedule 'A' Part - I (Buildings, Retaining Wall & Site Clearance and Land Development) shall not be measured under this schedule.

Sl No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount in Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8
1	Surface excavation not exceeding 30cm deep and averaging 15cm deep and getting out in soft / loose soil all as specified and directed.		7005.00	53.10 SQM	371965.50		
2	Excavation in over areas not exceeding 1.5m in depth and getting out in hard/dense soil including cutting of roots/ branches below ground level where ever required complete all as directed.		1777.47	450.00 CUM	799861.50		
3	Rolling and consolidating the formation surfaces cutting/ filling including watering as necessary filling in the depression with approved earth which occur during the process with 8-12 tonne power roller to required gradient and camber complete all as specified.		695.50	26.00 X SQM	18083.00		
4	Forming embankments including raising (or Lowering) earth, spreading in layers n exc. 30 cm thick; watering, ramming/rolling and finishing to required size, shape, etc., n exc. 1.5m high from base. Under optimum moisture condition to achive standard proctor density not less than 95 per cent. complete all as specified and directed.		4787.00	184.91 CUM	885164.17		
5	Excavation in trenches not exceeding 1.5m in depth and getting out in Hard/dense soil including cutting of roots/ branches below ground level where ever required complete all as directed.		13.88	675.00 CUM	9369.00		
6	Excavation in over areas exceeding 1.5m and not exceeding 3.0mtrs in depth and getting out in hard/dense soil including cutting of roots/ branches below ground level where ever required complete all as directed.		41.18	608.70 CUM	25066.27		
7	Returning filling in / back filling, including spreading, levelling, watering and well ramming in layers not exc. 25cm thickness as in soil complete all as specified and directed.		318.83	139.10 CUM	44349.25		

Total carried over to next page

Rs. 2153858.69

SCHEDULE 'A' PART - II
SITE CLEARANCE AND LAND DEVELOPMENT, EXCAVATION, EARTH WORK FOR PROVISIONAL ITEMS

Sl No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount in Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8

B/F from previous page

2153858.69

8	Removing excavated material n exc. 50 m and depositing where directed at a level n exc. 1.5 m above the starting point complete all as specified and directed.		2850.61	<u>320.40</u> CUM	913335.44		
9	M&L for excavation in trenches n.exc.1.50m wide and n.exc. 1.50m deep for fdn of manhole,poles, structures, stay rods, laying of underground cable etc and getting out in soft/ loose soil all as specified and as directed.		277.06	<u>383.70</u> CUM	106307.92		
10	M&L for excavation over areas n.exc.1.5m deep and getting out in soft/loose soil all as specified and as directed.		9.1	<u>258.50</u> CUM	2352.35		
11	Excavation in post holes for fencing posts n.exc 0.5 cum in soft soil including returning filling in after erection of fencing posts and removal of excess excavated earth complete all as specified and directed.		90	<u>259.10</u> EACH	23319.00		

Total amount of Schedule 'A' Part - II C/o to BOQ

Rs. 3199173.40

Signature of Contractor

AAD (Contracts)
For Accepting Officer

SCHEDULE 'A' PART - III

(LIST OF WORKS AND PRICES)

EXTERNAL WATER SUPPLYNotes

1. The quantities under column 4 are provisional.
2. Excavation and earth work shall be measured and paid separately under Schedule 'A' Part-II.

SI No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount in Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8

- 1 Supplying, laying or fixing, GI water tubing, medium grade, of size as shown below confirming to IS-1239[Part-1] including all fittings such as bends, tees, short pieces, connectors, elbows, reducers, etc laid in trenches/ floors or fixed to walls/ ceiling/ roof etc including testing GI tubing with fittings/ connections, in trenches/ ceiling / walls/ roofs etc complete all as specified and directed.

(a) 80mm dia bore	150.00	760.50	114075.00
		RM	

(b) 50mm dia bore	150.00	421.20	63180.00
		RM	

(c) 825m dia bore	60.00	184.60	11076.00
		RM	

- | | | | |
|---|------|---------|----------|
| 2 S&F Sluice valve of size 80mm dia PN 1.6 all as specified and as directed | 2.00 | 9500.00 | 19000.00 |
| | | EACH | |

- | | | | |
|---|------|--------|--------|
| 3 Supply and fix Gun-metal gate valve, with iron wheel head, screwed both ends for iron pipe 50 mm bore dia complete all as specified and directed. | 1.00 | 979.08 | 979.08 |
| | | EACH | |

- | | | | |
|---|------|--------|---------|
| 4 Supply and fix Gun-metal gate valve, with iron wheel head, screwed both ends for iron pipe 25 mm bore dia complete all as specified and directed. | 6.00 | 587.24 | 3523.44 |
| | | EACH | |

Total amount of Schedule 'A' Part - III C/o to BOQ**Rs. 211833.52**

Signature of Contractor
Dated:

AAD (Contracts)
For Accepting Officer

SCHEDULE 'A' PART - IV
(LIST OF WORKS AND PRICES)
EXTERNAL ELECTRIC SUPPLY

Notes

1. The quantities under column 4 are provisional.
2. Excavation and earth work shall be measured and paid separately under Schedule 'A' Part-II.

Sl No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount in Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8
1	S & F Steel tubular swaged poles complete with cast iron base plate, finial taper plug, bolts, nuts and screws as specified type 410 SP-22 (8.5 metres long) complete all as specified and as directed by Engineer-in Charge.		12.00	11505.10 EACH	138061.20		
2	Supply and fixing LED street light fitting 60 Watt 230 V AC outdoor type with high pressure die cast aluminum hosing and heat resistant complete with driver, lamp bracket with impact and corrosion resistant including thermal management in multiple optics complete with IP 66 protection complete fixing arrangement all as specified and directed.		12.00	5459.53 EACH	65514.36		
3	M & L for wiring with single core PVC insulated FRLS multistranded copper conductor cable of size 2 x 1.5 Sqmm drawing into and including rigid non metallic PVC conduit, medium grade not less than 20mm dia ISI marked ivory colour with all conduit fittings and fixing accessories and 1.5 Sqmm FRLS multistranded copper conductor cable as continuous earth wire from PVC sintex box to Street Light fittings complete all as specified and directed.		104.00	163.32 RM	16985.28		
4	Supply and laying PCC(1:2:4) 20mm graded aggregate type B of PCC for coping of steel tubular poles complete all as specified and as directed		0.77	8569.90 CUM	6598.82		
5	Supply and laying PCC(1:2:4) 40mm graded aggregate type B of PCC for foundation of steel tubular poles complete all as specified and as directed.		6.48	6477.80 CUM	41976.14		
6	Supply and fixing post top lantern LED type 40 watt 230 watt volts AC outdoor type with decorative post top for 360 degree indirect light IP 65 protection with impact and corrosion resistant complete with driver and lamp complete all as specified and directed.		2.00	9997.99 EACH	19995.98		
Total carried over to next page					Rs. 289131.78		

SCHEDULE 'A' PART - IV [Contd....]**EXTERNAL ELECTRIC SUPPLY**

Sl No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount in Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8
	B/F from previous page				289131.78		
7	S&L XLPE insulated, screened, PVC bedded, galvanised steen strip or wire armoured power cables (heavy duty) with aluminium conductor, 1100 volts grade, cross sectional area 300 Sqmm, 3.5 core laid in trenches complete all as specified and directed.		20.00	1422.84 RM	28456.80		
8	S&L XLPE insulated, screened, PVC bedded, galvanised steen strip or wire armoured power cables (heavy duty) with aluminium conductor, 1100 volts grade, cross sectional area 185 Sqmm, 3.5 core laid in trenches complete all as specified and directed.		50.00	937.13 RM	46856.50		
9	S&L XLPE insulated, screened, PVC bedded, galvanised steen strip or wire armoured power cables (heavy duty) with aluminium conductor, 1100 volts grade, cross sectional area 120 Sqmm, 3.5 core laid in trenches complete all as specified and directed.		170.00	648.15 RM	110185.50		
10	S&L XLPE insulated, screened, PVC bedded, galvanised steen strip or wire armoured power cables (heavy duty) with aluminium conductor, 1100 volts grade, cross sectional area 70 Sqmm, 3.5 core laid in trenches complete all as specified and directed.		30.00	443.89 RM	13316.70		
11	S&L XLPE insulated, screened, PVC bedded, galvanised steen strip or wire armoured power cables (heavy duty) with aluminium conductor, 1100 volts grade, cross sectional area 16 Sqmm, 4 core laid in trenches complete all as specified and directed.		20.00	193.50 RM	3870.00		
12	S&L XLPE insulated, screened, PVC bedded, galvanised steen strip or wire armoured power cables (heavy duty) with aluminium conductor, 1100 volts grade, cross sectional area 10 Sqmm, 2 core laid in trenches complete all as specified and directed.		418.00	140.61 RM	58774.98		
13	S&F GI pipe 80mm bore light grade with all fittings laid in trenches/on wall / on poles etc/ for protection complete all as specified and directed.		20.00	705.00 RM	14100.00		
	Total carried over to next page				Rs. 564692.26		

SCHEDULE 'A' PART - IV [Contd....]**EXTERNAL ELECTRIC SUPPLY**

Sl No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount in Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8

B/F from previous page**564692.26**

14	S&F GI pipe 50mm bore light grade with all fittings laid in trenches/on wall / on poles etc/ for protection complete all as specified and directed.		12.00	408.00 RM	4896.00		
15	Supply, installation, test and commissioning of transformer, outdoor type, step down 11KV/0.433 KV with HT 3 phase and LT 3 phase 4- wire system copper wound with off load tap changing arrangement on HT side for a variation of secondary voltage +/- 7.5% in steps of 2.5% continious rating of 315 KVA outdoor type confirming to IS 2026 with and including following: a) Lifting lugs/hooks for transformer and tank. b) Earthing terminal and rating and diagram plate. c) Air release device. d) Oil filling inlet pipe with plug. e) Drain outlet pipe with brass gate valve with dummy plug. f) Conservator with level guage. g) Silica gel breather. h) First oil fill up to the recommended level by the manufacturer with new oil conforming to IS 335. i) Type of connection: Delta/Star j) Type cooling: ONAN k) Vector Group: DYN 11 l) Type of Connecting arrangement: Cable termination boxes on HT side and adaptor boxes on LT side. m) Provision of thermometer with pocket Note: (a) In adduo to the above all standard fittings to be provided as per ISI norms. (b) PCC foundation concrete and coping shall		1.00	1189627.90 EACH	1189627.90		
16	Supply, laying and testing cable XLPE, insulated screened PVC bedded galvanized steel strip or wire, armoured electric power cable (heavy duty) with stranded aluminium conductor 11000 Volt grade of size 95 Sqm 3 core all as specified and as directed.		20.00	1067.97 RM	21359.40		
17	Supply & Fix Cable jointing kit for 11 KV (Earthed) grade cable for outdoor termination cold shrink type joint complete with jointing material and accessories suitable for 3 core XLPE armoured aluminium conductor cable of size 95 sqmm all as specified and as directed.		2.00	18387.10 EACH	36774.20		
18	Supply & Fix Steel tubular swaged poles complete with cast iron base plate, finial taper plug, bolts, nuts and screws as specified type 410 SP-55 (11 metres long) all as specified and as directed (For Two pole structure & For HT AB Cable)		7.00	13145.60 EACH	92019.20		

Total carried over to next page**Rs. 1909368.96**

SCHEDULE 'A' PART - IV [Contd....]**EXTERNAL ELECTRIC SUPPLY**

SI No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount in Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8

B/F from previous page**1909368.96**

19	M&L Cross-arms, Bracings, Supports, Clamps and Back Plates fabricated from Structural Steel Sections including Nuts, Bolts, Washer, welding, bending cold or hot, drilling holes for Bolts, in any shape or size as indicated/ directed and inclusive of one coat of Aluminium Primer one Under Coat and One Finishing Coat of Aluminium Paint, complete all as specified and as directed.		0.70	11931.40 QTL	8351.98		
20	Supply & Fix Lightning arresters expulsion type for HT complete with all fittings, transmission class, discharge capacity 65 kilo amp all as specified and as directed		1.00	8456.20 SET OF THREE	8456.20		
21	Supply & Fix HT Pin type, porcelain, vitreous, white, brown or green insulator including one galvanised mild steel spindle, two galvanised iron washers and one galvanised iron nut, 150mm height, 150mm dia for 11000 volts grade all as specified & as directed.		3.00	298.40 EACH	895.20		
22	Supply & Fix Disc type insulator, porcelain, vitreous 145mm high and 255mm dia ball and socket type, white, brown or green for tension with tension clamps for conductors, working pressure 11000 volts all as specified and as directed..		3.00	1433.20 EACH	4299.60		
23	Supply & Fix HT 11 KV outdoor type Triple pole, mechanically operated Gang operated device mounted on insulator and steel frame, with operating mechanism worked from ground level, for current rating upto 200 amps all as specified and as directed		1.00	9435.10 EACH SET	9435.10		
24	S&F Aluminium Conductor Steel Reinforced (ACSR) (sizes as ordered) with permissible Sags and providing Jumper, etc., fixing on Electric Poles and binding to Insulators with Aluminium Binding Wire as in OH Conductors including stringing, tightening, etc., complete all as specified and as directed. NOTE : Cost of Binding Wire is deemed to be included in the quoted Unit Rate.		0.25	17563.10 QTL	4390.78		
25	M&L stay assembly comprising of MS stay plate 6 mm thick and of size 300 x 300 mm and 20 mm dia MS stay rod, 2150 mm long including thimbles GI stay strand 7/3.15 mm dia of required length complete all as shown on electrical plate No.1 on page No.495 of MES SI Part-I 2009 including necessary excavation PCC 1:3:6 Type C2 (using 40mm graded stone aggregate), loop insulator as specified complete all as directed by Engr-in-Charge.		2.00	2305.00 EACH	4610.00		

Total amount of Schedule 'A' Part - IV C/o to BOQ**Rs. 1949807.82**Signature of Contractor
Dated:AAD (Contracts)
For Accepting Officer

SCHEDULE 'A' PART - V
(LIST OF WORKS AND PRICES)
ROAD / PATH / CULVERT/HARD STANDING

Notes

1. The quantities under column 4 are provisional.
2. Excavation and earth work shall be measured and paid separately under Schedule 'A' Part-II.

Sl No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount in Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8
1	Rolling and consolidating the sub grade surfaces to 98% density at optimum moisture content (OMC) including watering as necessary filling in the depression with approved earth which occur during the process with 8-12 tonne power roller to required gradient and camber complete all as specified.		242.13	26.00 X SQM	6295.38		
2	M&L for granular sub base (GSB) of grade II, 150mm thick (compacted thickness) using 63mm size graded stone aggregate, depositing, spreading, interstices filled, surface formed, levelling in single layer, 150mm thick , watering, rolling and consolidated to required gradient and camber using mechanical compactor of capacity exceeding 8 tonne and not exceeding 15 tonne or compaction methodology recommended by soil test agency to achieve the min 98% density of MDD determined under OMC using Modified Compactor Density (MCD) determination method as per IS code and to achieve the required min CBR value of 25% in field complete all as specified. Notes :- (i) Rate shall be quoted for 150mm thick (consolidated thick) in single layer. (ii) Each layer shall be rolled and consolidated seperately. (iii) Compaction of GSB shall be carried out under optimum moisture conditions to achieve 98% of modified proctor density. (iv) Material for Granular Sub Base (GSB) used in the work shall be obtained from approved source of main land (India). (v) Anti weed growth measures in terms of chemical spray shall be adopted during monsoon season/ period, if work stopped for bad/ wet weather conditions.		242.13	4118.28 X SQM	997159.14		

Total carried over to next page

Rs. 1003454.52

SCHEDULE 'A' PART - V
ROAD / PATH / CULVERT/HARD STANDING

Sl No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount in Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8

B/F from previous page

1003454.52

3	M&L For 150mm thick WMM in two layers each of 75mm thick with granite coarse aggregate of grading 2(63 to 40mm size) spread rolled and consolidated to gradient and camber using power roller of capacity exceeding 8 tonne and not exceeding 15 tonne, etc complete all as specified. Notes :- (i) WMM shall be as specified in MoRTH specification Orange book (Fifth revision) (ii) Aggregate used in the work shall be obtained from approved source of main land (India). (iii) Anti weed growth measures in terms of chemical spray shall be adopted during monsoon season/ period, if work stopped for bad/ wet weather conditions.	242.13	<u>4424.52</u> X SQM	1071309.03			
4	M&L for Dry Lean cement Concrete (DLC) with 7 days compressive strength 10 N/mm ² , 150mm thick using cement content (OPC 43 grade) not less than 180kg/Cum, laid in alternate bays, spread, rolled and consolidated to required gradient and camber complete using and tandem vibratory roller of capacity exceeding 8 tonne and not exceeding 12 tonne capacity including necessary formwork for rough finished surface of concrete all as specified in 20.B.6 of SSR Pt-I/ MoRTH specification and as directed. Note : (i) Aggregate used in the work shall be obtained from approved source of main land (India) as approved by GE	363.20	<u>7177.39</u> CUM	2606828.05			
5	M&L for laying 400micron HDPE sheet over tack coat of 2.5kg/ 10Sqm of VG-10 HDPE with 400 micron manufactured by multilayer technology using 100% virgin raw material, confirming to IS-10889:2004 with company logo and IS Code and batch number on at least every 2metres complete all as specified.	2421.30	<u>117.46</u> SQM	284405.90			

Total carried over to next page

Rs. 4965997.50

SCHEDULE 'A' PART - V
ROAD / PATH / CULVERT/HARD STANDING

Sl No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount in Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8

B/F from previous page

4965997.50

6	M&L for 350mm thick pavement quality concrete work in pavement of flexural strength 45kg/sqcm (lower control limit) in field using min 400kg of cement/ Cum (OPC 43 grade) with 20mm nominal size of graded aggregate and super plasticiser if required as per design mix (as per IRC 5th revision) mixed with and including triangular / non circular synthetic fibre reinforcement @ 0.25% by weight of cement with min 12mm length, specific gravity 1.34 to 1.40 (other specification as per IRC/MoRTH) spread and compacted by using slip form paver and all as specified and including necessary form work, bull nosing, rounding of edges, finishing by mechanical brooming/ belting, curing, etc. complete all as specified. Note : (i) Aggregate used in the work shall be obtained from approved source of main land	847.46	<u>8478.02</u> CUM	7184782.83
7	M&L for forming 25mm wide expansion joint (using diamond cutter) filled with compressible synthetic filler board for complete depth of joint, i.e. the thickness of slab (350mm), provision of closed shall back up rod 30mm dia, filled with polyurethane sealant (min depth of sealant above back up rod shall be of 15mm) complying with BS 5212, BS 4254, and EN 41875-2003, priming the sides min MAF +/- 30% with 10 years performance guarantee and applying masking tape on edge of joints to prevent accidental spillage of sealant on top surface to give neat finish to sealant and removing the masking tape after sealant is applied by mechanical applied all as shown on drwing and all as specified.	7.60	<u>4463.90</u> X RM	33925.64
8	M&L for forming construction joints 25mm deep and 10mm wide (using diamond cutter) provision of back up rod 12mm dia, filled with polyurethane sealant (min depth of sealant 12mm) complying with BS 5212, BS 4254, and EN 41875-2003, priming the sides min MAF +/- 30% with 10 years performance guarantee and applying masking tape on edge of joints to prevent accidental spillage of sealant on top surface to give neat finish to sealant and removing the masking tape after sealant is applied by mechanical applied all as shown on drawing and all as specified.	30.00	<u>1819.73</u> X RM	54591.90

Total carried over to next page

Rs. 12239297.87

SCHEDULE 'A' PART - V
ROAD / PATH / CULVERT/HARD STANDING

Sl No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount in Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8
B/F from previous page					12239297.87		
9	M&L for forming dummy joint 1/3 depth of slab (350mm thick) and 8mm wide (using diamond cutter) providing polyuthelene back up rod 10mm dia and sealed with polyurethane sealant (min depth of sealant 12mm) complying with BS 5212, BS 4254, and EN 41875-2003, priming the sides min MAF +/- 30% with 10 years performance guarantee and applying masking tape on edge of joints to prevent accidental spillage of sealant on top surface to give neat finish to sealant and removing the masking tape after sealant is applied by mechanical applied all as shown on drawing and all as specified.		88.00	<u>2180.65</u> X RM	191897.20		
10	M & L for hardcore of gauge n. exe 63mm deposited spread, levelled in layers n. exe 15cm thick, watered rammed to a true surface as specified and directed.		107.04	<u>2070.80</u> CUM	221658.43		
11	M & L for Cement concrete work in pavement/ hard-standing of flexural strength 40 kg/ squire centimeter in field using 400 kg of cement per cubic metre, thickness of concrete 25cm or less complete all as specified and directed.		97.35	<u>7107.10</u> CUM	691876.19		
12	M & L for forming 12mm thick Expansion joint for thickness of concrete slab 150mm sealing compound, Grade A complete all as specified and directed.		1.65	<u>828.00</u> X RM	1366.20		
13	M & L for forming construction joint 30mm deep X 10mm wide filled with sealing compound of Grade A complete all as specified and directed.		2.20	<u>335.90</u> X RM	738.98		
14	M & L for forming contraction (Dummy) joint 65mm deep X 10 mm wide, filled sealing compound of Grade A complete all as specified and directed.		27.10	<u>608.70</u> X RM	16495.77		
Total carried over to next page					Rs. 13363330.64		

SCHEDULE 'A' PART - V
ROAD / PATH / CULVERT/HARD STANDING

Sl No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount in Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8

B/F from previous page

13363330.64

15	M & L for PCC 1:4:8 type D2 using 40 mm graded stone agg 100 mm thick as in paving complete all as specified and directed.	50.00	<u>533.00</u> SQM	26650.00		
16	M&L for screed bed or bedding layer of mortar 15 mm thick for laying floor finish in CM (1:6) complete all as specified and directed.	50.00	<u>205.29</u> SQM	10264.50		
17	M&L for Chequered cement concrete tiles with grey cement and pigment 30 cm x30cmx 25mm thick set and jointed and pointed in neat cement slurry complete all as specified and directed.	50.00	<u>1100.30</u> SQM	55015.00		
18	M&L for PCC 1:4:8 type D2 using 40 mm graded stone aggregate in foundations filling and mass concrete for angle iron post complete all as specified and directed.	11.02	<u>5483.10</u> CUM	60423.76		
19	M&L for Pre-cast cement concrete block masonry type C1 1:3:6 using 20 mm graded stone aggregate with solid blocks, exc. 10 cm in width and setting in mortar 1:6, complete all as specified and directed by the Engineer In charge.	3.20	<u>8439.60</u> CUM	27006.72		
20	M & L for rendering 15 mm thick in CM 1:4 on fair faces of brick work or concrete surfaces, finished even and smooth without using extra cement complete all as specified and directed.	14.00	<u>304.24</u> SQM	4259.36		
21	M & L for RCC M30 using 20mm graded aggregate Foundations, including rafts, footings, foundation beams; plinth beams; bases for columns, etc.; basement slabs, under-reamed piles and mass concrete complete all as directed	22.05	<u>7721.87</u> CUM	170267.23		
22	M & L for Formwork flat to sides of concrete foundations, footings, bases of columns, raft and raft beams, sides and soffits (if any) of foundation and plinth beams; and similar work; vertical or to batter complete all as directed	30.10	<u>316.72</u> SQM	9533.27		

Total carried over to next page

Rs. 13726750.48

SCHEDULE 'A' PART - V
ROAD / PATH / CULVERT/HARD STANDING

Sl No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount in Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8

B/F from previous page

13726750.48

23	M & L for RCC M30 using 20mm graded aggregate Slabs supported on walls, roofs, landings, balconies, canopies, deck slabs and in shelves and the like complete all as specified and directed.		11.58	7592.53 CUM	87921.50		
24	M & L for Formwork flat to soffits of suspended slabs such as roof slabs, floor slabs, landings, and similar work; complete all as specified and directed.		23.22	495.26 SQM	11499.94		
25	M & L for Formwork in Formwork to faces of walls, retaining walls, abutments, parapets and staircase railings and similar work including attached pilasters, buttresses, etc.; vertical or to batter complete all as specified and directed.		224.27	493.55 SQM	110688.46		
26	M & L for RCC M30, using 20mm graded aggregate Walls, retaining walls, basement walls, ballast walls and the like; any thickness; above top of footings; including attached pilasters and buttresses complete all as directed.		26.35	8240.42 CUM	217135.07		
27	M&L for RCC M30, using 20mm graded aggregate Fins, fascias, curbs, parapets, and railings exc. 60cm in height, newels, balustrade, and the like complete all as directed.		3.92	8810.90 CUM	34538.73		
28	M & L for CRS TMT bars 10 mm dia and over ,cut to length bent to shape required incl cranking, bending, spirally hooping for columns and binding with MS wire (annealed) not less than 0.90mm dia wire etc complete all as directed		4586.00	84.55 KG	387746.30		
29	M & L for 100mm thick PCC type D-2, 1:4:8 (40mm graded stone aggregate) laid in floor sub base cement concrete surface even and smooth without using extra cement complete all as directed		21.90	564.90 SQM	12371.31		

Total amount of Schedule 'A' Part - V C/o to BOQ

Rs. 14588651.79

Signature of Contractor
Dated:

AAD (Contracts)
For Accepting Officer

SCHEDULE 'A' PART - VI
(LIST OF WORKS AND PRICES)
AREA DRAINAGE

Notes

1. The quantities under column 4 are provisional.
2. Excavation and earth work shall be measured and paid separately under Schedule 'A' Part-II.

Sl No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount in Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8
1	M & L for PCC 1:4:8 type D2 using 40 mm graded stone aggregate in foundations filling and mass concrete complete all as specified and directed.		56.00	5483.10 CUM	307053.60		
2	M & L for M&L for Pre-cast cement concrete block masonry type C1, 1:3:6, (using 20mm graded aggregate) with solid blocks, exc. 10 cm in width and setting in cement mortar 1:6, complete all as specified and directed by the Engineer In charge.		122.00	8439.60 CUM	1029631.20		
3	M&L cement concrete 1:2:4 (Type B-0) using 12.50mm graded aggregate, as in coping including necessary form work complete all as specified and directed.		9.00	9259.40 CUM	83334.60		
4	M & L for cement concrete 1:2:4 (Type B-0) using 12.50mm graded aggregate in surface channels and drains complete all as specified and directed.		11.30	6638.10 CUM	75010.53		
5	M & L for extra for forming fair finished drain or channel of 45 cm inner girth in cement concrete using extra cement including forms moulds etc complete all as specified and directed.		470.00	59.43 RM	27932.10		
6	M & L for rendering 15 mm thick in CM 1:4 on fair faces of brick work or concrete surfaces, finished even and smooth without using extra cement complete all as specified and directed.		940.00	304.24 CUM	285985.60		
7	M & L for Precast Reinforced cement concrete cover slabs for drains, water trough, mangers, shelves and similar articles with plain faces, including providing weep holes as per the directions without any extra cost, type 1:2:4, B1, set in CM 1:4, using 20 mm graded stone aggregate as all as specified and directed.		10.00	11053.80 CUM	110538.00		
8	M & L for Mild steel CRS TMT reinforcement bars of 5 mm dia and over up to 10 mm dia in stirrups, spacers and binders, cut to length bent to shape required including cranking, binding spirally for hooping for columns hooking ends and binding with and including MS wire annealed not less than 0.9 mm dia or securing with clip all as specified and directed.		700.00	85.18 KG	59626.00		

Total carried over to next page**Rs. 1979111.63**

SCHEDULE 'A' PART - VI**AREA DRAINAGE**

Sl No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount in Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8

B/F from previous page**1979111.63**

9	M & L for Mild steel CRS TMT bar 10mm dia and over, cut to length, bent to shape required, including cranking, bending spirally for hooping columns, hooking ends and binding with and including mild steel wire (annealed) not less than 0.9mm dia or securing with clips. complete all as specified and directed.	200.00	82.60 KG	16520.00			
---	---	--------	-------------	----------	--	--	--

Total amount of Schedule 'A' Part - VI C/o to BOQ**Rs. 1995631.63**Signature of Contractor
Dated:AAD (Contracts)
For Accepting Officer

SCHEDULE 'A' PART -VII
(LIST OF WORKS AND PRICES)
SEWAGE DISPOSAL

Notes

1. The quantities under column 4 are provisional.
2. Excavation and earth work shall be measured and paid separately under Schedule 'A' Part-II.

Sl No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount in Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8
	1 M & L for PCC 1:3:6 type C2 using 40mm graded stone aggregate as in foundation filling and mass concrete complete all as specified and directed.		4.23	5862.00 CUM	24796.26		
	2 M & L for PCC 1:3:6 type C2 as in bed to drain pipes incl packing under and haunching against the sides of pipes after they are laid and tested for CI pipe 150mm bore all as specified and as directed		55.25	466.89 RM	25795.67		
	3 M & L for PCC 1:2:4 type B1 as in coping, surface channels, benchings, etc., of manholes finished fair and even all as specified and as directed		0.65	9259.40 CUM	6018.61		
	4 M & L for pre-cast cement concrete block masonry PCC 1:3:6 (using 20mm graded stone aggregate), type C1 with solid blocks exc.10cm in width and setting in cement mortar 1:6 complete all as specified and as directed.		9.43	8532.50 CUM	80461.48		
	5 M & L for precast manhole covers with plain faces using RCC 1:2:4 type B1(20 mm Aggregate) and set in CM 1:4 including formwork all as specified and as directed		1.63	11036.80 CUM	17989.98		
	6 M & L for CRS TMT bars 6 to 8mm dia, cut to length, bend to shape reqd incl cranking and binding with mild steel wire (annealed) not less than 0.90 mm dia complete all as specified and directed.		187.20	84.55 KG	15827.76		
	7 M&L for 150mm dia NP3 pipe in any length with (or) without ear laid in trenches and jointed in CM 1:1 complete all as specified and directed		65.00	400.00 RM	26000.00		
	8 M & L for Extra for forming fair finished channel or drain 30cm girth (inner girth) in cement concrete using extra cement incl forms, moulds, stopped end, etc., complete all as specified and directed.		8.45	43.35 RM	366.31		
	9 M & L for 15mm thick rendering in CM 1:4 on concrete surfaces finished fair and even complete all as specified and directed.		32.50	304.24 SQM	9887.80		
	10 M & L for MS work such as rungs, handles to manholes, etc.complete all as specified and as directed		3.25	181.08 KG	588.51		
Total carried over to next page				Rs.	207732.38		

SCHEDULE 'A' PART -VII
SEWAGE DISPOSAL

Sl No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount in Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8

B/F from previous page **Rs. 207732.38**

11 Supply only Integral waterproofing compound 8.45 46.10 389.55
complete all as specified and directed. KG

Total amount of Schedule 'A' Part - VII C/o to BOQ **Rs. 208121.93**

Signature of Contractor
Dated:

AAD (Contracts)
For Accepting Officer

SCHEDULE 'A' PART -VIII

(LIST OF WORKS AND PRICES)

COMPOUND WALL, FENCING AND GATES**Notes**

1. The quantities under column 4 are provisional.
2. Excavation and earth work shall be measured and paid separately under Schedule 'A' Part-II.

Sl No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount in Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8
1	M & L for PCC 1:4:8 in fdn type D2 using 40 mm graded aggregate. In foundation, filling and mass concrete complete all as specified and directed.		0.39	5483.10 CUM	2138.41		
2	S&F CRS TMT bars 10 mm dia and over cut to length bent to shape required, including cranking, bendingspirally for hooping for columns, hooking ends and binding with and including ms wire annealed not less than 0.9 mm dia complete all as specified and directed.		126.86	82.60 KG	10478.64		
3	S&F TMT bars 8 mm dia and over cut to length bent to shape required, including cranking, bendingspirally for hooping for columns, hooking ends and binding with and including ms wire annealed not less than 0.9 mm dia complete all as specified and directed.		47.08	85.18 KG	4010.27		
4	M & L for Use and waste of form works to sides of concrete foundations, footing, bases of columns, raft and raft beams, sides and soffits of foundation and plinth beams, and similar works, vertical or to batter rough finished surfaces of finished concrete flat complete all as specified and directed.		2.88	316.72 SQM	912.15		
5	M & L for Use and waste of formwork to square, rectangular or polygonal sides of pillars, posts, struts, piers, columns and stanchions for fair finished surfaces of concrete complete all as specified and directed.		14.40	598.08 SQM	8612.35		
6	M & L RCC in footing concrete, plinth beam in M-30 using 20 mm graded aggregate complete all as specified and directed.		0.86	7721.87 CUM	6640.81		
7	M & L RCC in column M 30 using 20 mm graded aggregate complete all as specified and directed.		1.80	8854.74 CUM	15938.53		
8	S&F framed worked as in doors or gates of angle or other section with gusset plates, rails, braces etc.. Complete, drilled for fixing of steel sheeting or other covering, doors etc.. To be prepared for hanging or sliding with and including either hooks and hinges or steel hanging door fittings and hanging also fastening and fixing complete confirming to Fe410-W(Gde-E-250) quality-A complete all as specified and directed.		1073.14	117.70 KG	126308.58		

Total carried over to next page**Rs. 175039.74**

SCHEDULE 'A' PART -VIII
COMPOUND WALL, FENCING AND GATES

Sl No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount in Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8
	B/F from previous page				175039.74		
9	M & L for Rendering 10 mm on brick or concrete surfaces in CM 1:4, finished even and smooth without using extra cement complete all as specified and directed.		14.40	245.92 SQM	3541.25		
10	M & L for preparing of new plasterd surfaces on wall and applying two coats of cementbased paint over a coat of primer complete all as specified and directed.		14.40	70.50 SQM	1015.20		
11	M&L for preparation of new or steel surfaces of any description exc 10 cm width or girth, not otherwise described any applying two coats of synthetic enamel paint over a coat of red oxide primer complete all as specified and as		21.00	141.30 SQM	2967.30		
12	M & L for PCC 1:3:6 type C2 using 40 mm graded aggregate. In foundation, filling and mass concrete all as specified		11.00	5862.00 SQM	64482.00		
13	S&F mild steel sections of any description conforming to grade E 165 fixed as in posts and struts in fencing, including flat iron fillets for security wire mesh etc with all necessary drilling holes, bolting or revetting etc. complete all as specified and as directed		3575.00	103.18 KG	368868.50		
14	Fixing only chain link fencing including line wires, any mesh, size and ttype to any type of standard, rails straining bolts etc including provision binding wire complete all as specified and directed.		690.00	6.35 SQM	4381.50		
15	S&F Galvanised 2 strand steel barbed wire 2.24 mm dia barbed with 2 mm dia barbs at 90mm to 110mm spacing and straing and fixing to any type of standard rails straining bolts, incluing securing or typing a crossings with an provision of galvanize mild steel wire, staples or steel pins, etc all as directed (each line wire to be measured) completed all as specified and as directed		27.60	1342.01 100 RM	37039.48		
16	S&F MS round bars conforming to Grade E-250 quality A , 10 mm dia cut to length bent to shape required and fixing as directed in fencing complete all as specified and directed		710.00	81.87 KG	58127.70		
17	S&F mild steel screw bolts n exc 5 cm long of 11 to 15 mm diameter (machine made) with hexagonal or square heads at one screwed the other each screwed end to be fitted with washers and one hexaganal or square nut complete all as specified and directed		39.00	129.46 KG	5048.94		

Total carried over to next page

Rs. 720511.61

SCHEDULE 'A' PART -VIII
COMPOUND WALL, FENCING AND GATES

Sl No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount in Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8

B/F from previous page

720511.61

18	M&L for preparation of new or steel surfaces of any description exc 10 cm width or girth, not otherwise described any applying two coats of synthetic enamel paint over a coat of red oxide primer complete all as specified and directed		108.00	141.30 SQM	15260.40		
19	M&L for preparation of new or steel surfaces of any description nexc 10 cm width or girth, not otherwise described any applying two coats of synthetic enamel paint over a coat of red oxide primer complete all as specified and directed		183.00	144.10 X RM	26370.30		

Total amount of Schedule 'A' Part - VII C/o to BOQ

Rs. 762142.31

Signature of Contractor
Dated:

AAD (Contracts)
For Accepting Officer

SCHEDULE 'A' PART -IX**(LIST OF WORKS AND PRICES)****COOLING APPLIANCES**

Sl No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount in Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8

- | | | | | |
|---|---|------|--|-----------|
| 1 | Supply and fix install water coolers electric driven single phase, having nominal cooling capacity of 40 Ltrs per hour and storage capacity of 80 Ltrs complete all as specified and directed | 2.00 | <div style="border-bottom: 1px solid black; display: inline-block; width: 100px; text-align: center;">40539.04</div>
EACH | 81078.08 |
| 2 | Supply & install hiwall split units indoor / outdoor complete with cordless remote control unit and with in built cooling arrangements and digital inverter twin rotary of capacity 1.5 TR 5 star rating complete all as specified & directed by Engineer-in-Charge | 4.00 | <div style="border-bottom: 1px solid black; display: inline-block; width: 100px; text-align: center;">60815.37</div>
EACH | 243261.48 |

Total amount of Schedule 'A' Part - VII C/o to BOQ**Rs. 324339.56**
 Signature of Contractor
 Dated:

 AAD (Contracts)
 For Accepting Officer

SCHEDULE 'A' PART -X
(LIST OF WORKS AND PRICES)
CONDUITS

Sl No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount in Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8

1	Supply and Fix Rigid non-metallic PVC conduit of size 25 mm dia inclusive of boxes (junction/terminal) but inclusive of all tees, bends, elbows, reducers, bell mouth tube ends and fixing accessories such as couplers, lock nuts, saddles, pipe hooks etc for Telephone and LAN Connectivity all as specified and as directed	500.00	84.30 RM	42150.00			
---	---	--------	-------------	----------	--	--	--

Total amount of Schedule 'A' Part - VII C/o to BOQ

Rs.42150.00

Signature of Contractor
Dated:

AAD (Contracts)
For Accepting Officer

SCHEDULE 'A' PART -XI
(LIST OF WORKS AND PRICES)
CHEMICAL EARTHING

Sl No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount in Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8

1	Earth continuity conductor or main earthing lead fixed to wall on batten or recess or chases or buried in ground or drawn in conduit/pipe or fixed to poles or any other indicated situation for loop earthing of copper strip 20 x 3 mm complete all as specified and directed.	70.00	426.80 RM	29876.00			
---	--	-------	--------------	----------	--	--	--

Total amount of Schedule 'A' Part - VII C/o to BOQ

Rs.29876.00

Signature of Contractor
Dated:

AAD (Contracts)
For Accepting Officer

SCHEDULE 'A' PART - XII

(LIST OF WORKS AND PRICES)

FLAME PROOF LIGHTS, INDUSTRIAL SOCKETS & HIGH BAY LIGHTSNotes

1. The quantities under column 4 are provisional.
2. Excavation and earth work shall be measured and paid separately under Schedule 'A' Part-II.

Sl No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount in Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8
1	S & F MCCB 4 Pole, 415 V, Adjustable type, 160Amps with breaking capacity 36 KA complete all as specified and as directed		1.00	8395.60 EACH	8395.60		
2	S & F MCCB 4 Pole, 415 V, Adjustable type, 200Amps with breaking capacity 36 KA complete all as specified and as directed.		2.00	14543.10 EACH	29086.20		
3	S & F MCB DB TPN 4 way with 200 amps rated bus bar 415 volts double door with magnetic locking system suitable for MCB TPN as incomer and MCB TP/SPs as Outgoing complete all as specified and as directed.		3.00	2642.70 EACH	7928.10		
4	S&F MCB single pole 5 Amp to 32 Amps complete all as directed by Engr-in-charge		20.00	294.00 EACH	5880.00		
5	S&F MCB TPN 415 Volts 40 to 100 Amps C Curve complete all as specified and as directed.		7.00	2360.74 EACH	16525.18		
6	S&F MCB TPN 415 Volts 32 Amps C Curve complete all as specified and as directed.		10.00	1721.04 EACH	17210.40		
7	S&F MCB TP 415 Volts 40 to 63 Amps complete all as specified and as directed.		21.00	1697.60 EACH	35649.60		
8	Supply & Fixing submain wiring alongwith earth wire with sizes 2x 2.5sqmm +1x2.5sqmm of FRLSH in PVC insulated copper continuity conductor in PVC conduit (For Flood Lights) complete all as specified and as directed.		684.00	185.21 RM	126683.64		
9	Supply & Fixing submain wiring alongwith earth wire with sizes 4 x 4 sqmm +1x 4 sqmm of FRLSH in PVC insulated copper continuity conductor in PVC conduit (For Plug & Socket 32 Amps & 63 Amps) complete all as specified and as directed.		420.00	304.27 RM	127793.40		
10	Supply & Fixing submain wiring alongwith earth wire with sizes 4 x 16 sqmm +1x 16 sqmm of FRLSH in PVC insulated copper continuity conductor in PVC conduit (For MCB TPN DB) complete all as specified and as directed.		150.00	835.93 RM	125389.50		

Total carried over to next page**Rs. 500541.62**

SCHEDULE 'A' PART - XII
FLAME PROOF LIGHTS, INDUSTRIAL SOCKETS & HIGH BAY LIGHTS

Sl No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount in Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8

B/F from previous page

500541.62

11	M&L for light/fan point wiring complete with 1.5 Sqmm PVC insulated unsheathed single core multi standard copper conductor 1100 V grade drawn through in and including 20 mm dia steel conduit concealed on walls/on Ceiling and Terminated to flame proof switch including 1.5 Sqmm PVC insulated Copper conductor cable as earth continuity conductor and connecting to common earth dolly complete all as specified and directed.		3.00	1267.50 EACH	3802.50		
12	Supply and fixing LED light fitting 1x16 Watt flame proof, CMRI certified recommended for gas/ vapor group of IIA & IIIB, Zone 1 & 2 and IP 65 protection with die cast aluminum housing with heat resistant toughened glass with LED tube light fixtures driver complete all as specified and as directed.		2.00	7791.59 EACH	15583.18		
13	Supply & Fix Switch flame proof rotary type with termination box in LM6, 16A, single pole 250V all as specified and directed		3.00	1609.00 EACH	4827.00		
14	S & F Sheet metal enclosure MCB DB SPN 4 way with 200 Amps rated bus bar 240 volts double door with magnitic locking system including fixing of incoming & outgoing MCBs complete all as specified.		1.00	1329.34 EACH	1329.34		
15	S&F MCB single pole 5 Amp to 40 Amps complete all as directed by Engr-in-charge.		2.00	284.20 EACH	568.40		
16	S&F MCB SPN 230 Volts 40 Amps C Curve complete all as specified and as directed.		1.00	1330.39 EACH	1330.39		

Total amount of Schedule 'A' Part -VIII C/o to BOQ

Rs. 527982.43

Signature of Contractor
Dated:

AAD (Contracts)
For Accepting Officer

SCHEDULE 'A' PART - XIII
(LIST OF WORKS AND PRICES)
LIGHTNING PROTECTION

Notes

1. The quantities under column 4 are provisional.
2. Excavation and earth work shall be measured and paid separately under Schedule 'A' Part-II.

Sl No	Description of items of work	Drg Nos	No. of units reqd	Rate per unit in Rs.	Amount in Rs.	Period of completion of individual items from the date of handing over site	Remarks
1	2	3	4	5	6	7	8
1	M & L for single pointed air termination Aluminium rod 12 mm dia , 300 mm long complete all as specified and directed		25.00	278.90 EACH	6972.50		
2	Supply and fix Aluminium strip 25mm x 3 mm complete with saddles and fixing screws for fitting the strip complete all as specified and as directed.		415.00	122.10 RM	50671.50		
3	S & F test point terminal block made of gun metal or phosphorus bronze 75mm x 75mm x 25mm drilled and screwed incl. 3 nos 8mm dia 25 mm long hex head screw complete all as specified and directed		8.00	689.70 EACH	5517.60		

Total amount of Schedule 'A' Part -VIII C/o to BOQ

Rs. 63161.60

Signature of Contractor
Dated:

AAD (Contracts)
For Accepting Officer

SCHEDULE - 'B'**(ISSUE OF MATERIALS TO CONTRACTOR)**

(See condition 10 of IAFW 2249)

SI No.	Particulars	Rate at which material will be issued to the Contractor		Place of issue of material	Remarks
		Unit	Rate in `		
1	2	3	4	5	6
----- NIL -----					

SCHEDULE - 'C'**(LIST OF TOOLS AND PLANTS (OTHER THAN TRANSPORT) WHICH WILL BE HIRED TO CONTRACTOR)**

(See conditions 15, 34 and 35 of IAFW 2249)

SI No.	Quantity	Particulars	Details of MES crew supplied	Hire charges per unit per working day in `	Standby charges per unit per off day in `	Place of issue by name	Remarks
1	2	3	4	5	6	7	8
----- NIL -----							

SCHEDULE - 'D'**(LIST OF TRANSPORT WHICH WILL BE HIRED TO CONTRACTOR)**

(See conditions 16 and 35 of IAFW 2249)

SI No.	Quantity	Particulars	Rate per unit per working day in `	Place of issue by name	Remarks
1	2	3	4	5	6
----- NIL -----					

Signature of the Contractor

AAD (Contracts)
for Accepting Officer

ANNEXURE –“C”**LETTER OF INTENT FROM BIDDER**
(To be given on Company Letter Head)

Date:

From:

To,
The Chief Engineer A&N Zone

Name of Work: **ENGINEERING PROCUREMENT AND CONSTRUCTION (EPC) FOR ENGINEERING PROCUREMENT AND CONSTRUCTION (EPC) FOR CONSTRUCTION OF MARRIED ACCOMMODATION FOR OFFICERS ENROLLED PERSONNEL AND CIVILIAN STAFF AT MAYABUNDER**

Sir,

1. Having examined the Tender Documents for the subject work as set out in your Notice Inviting Tender, Instructions to Bidders, Scope of Work, Design Basis Report, Particular Specifications, Line Plan of Buildings, Typical Drawings, Special Conditions of the Contract, General Conditions of Contract (IAFW -2249), MES Standard Schedule of Rates (Part –I & Part –II), Payment schedule, BOQ, Integrity Pact we undertake to Design and Construction of the subject work for the Lump Sum Price and payment schedule.
2. If our tender is accepted we will provide performance guarantee for the due performance of the contract as stipulated in the General Conditions of Contract hereto.
3. Unless and until a formal Agreement is prepared and executed this tender together with your written acceptance thereof shall form a binding Contract between us.
4. We agree to abide by this bid for the period of 90 days (Ninety days) from the end date of Submission of bid and it shall remain binding upon us and may be accepted any time before expiration of that period.
5. We understand fully that you are not bound to accept the lowest or any bid received.

Yours faithfully,

Signature with office seal
Full Name:
Designation:

Note: The signatory of this letter should be duly authorised by the Firm/Company to bind the Firm/Company to such legal commitment.

ENGINEERING, PROCUREMENT AND CONSTRUCTION AGREEMENT

THIS AGREEMENT is entered into on this the day of, 20....

BETWEEN

The President of India through the Military Engineer Service (MES) represented by Chief Engineer A&N Zone (MES), Sri Vijaya Puram (hereinafter referred to as the "Employer/Client" which expression shall, unless repugnant to the context or meaning thereof, include its administrators, successors and assigns) of One Part;
AND

{-----}, means the selected bidder having its registered office at, (hereinafter referred to as the "Contractor" which expression shall, unless repugnant to the context or meaning thereof, include its successors and permitted assigns) of the Other Part.

WHEREAS:

(A) The Government of India had entrusted to the Employer the "CONSTRUCTION OF MARRIED ACCOMMODATION FOR OFFICERS ENROLLED PERSONNEL AND CIVILIAN STAFF AT MAYABUNDER", on EPC Mode.

(B) The Employer had resolved to Design & Construction of "CONSTRUCTION OF MARRIED ACCOMMODATION FOR OFFICERS ENROLLED PERSONNEL AND CIVILIAN STAFF AT MAYABUNDER" (hereinafter called the "Project") on Engineering, Procurement, Construction Mode ("EPC") basis in accordance with the terms and conditions to be set forth in an agreement to be entered into.

(C) The Employer had prescribed the technical and commercial terms and conditions, and invited bids (as covered in NIT) from the bidders.

(D) After evaluation of the bids received, the Employer had accepted the bid of the selected bidder and issued its Letter of Acceptance of Contract bearing No.dated (hereinafter called the "**AoC / LoA**") to the selected bidder for CONSTRUCTION OF MARRIED ACCOMMODATION FOR OFFICERS ENROLLED PERSONNEL AND CIVILIAN STAFF AT MAYABUNDER at the contract price specified hereinafter, requiring the selected bidder to inter alia:

(i) to disclose the name of contractor's authorised representative who will enter into this Agreement and the enforceability of the provisions thereof, within 10 (ten) days of the date of issue of LOA,

and

(ii) Execute this Agreement within 15 (fifteen) days of the date of issue of LOA.

(E) The Contractor has fulfilled the requirements specified in Recital as above, NOW THEREFORE in consideration of the foregoing and the respective covenants and agreements set forth in this Agreement, the sufficiency and adequacy of which is hereby acknowledged, the Employer hereby covenants to pay the Contractor, in consideration of the obligations specified herein, the Contract Price or such other sum as may become payable under the provisions of the Agreement at the times and in the manner specified by the Agreement and intending to be legally bound hereby, the Parties agree as follows:

The following documents attached hereto shall be deemed to form an integral part of this Contract,

- (a) NIT & Instruction to Bidder
- (b) Scope of Work
- (c) Design Basis Report
- (d) Particular specifications
- (e) Special Conditions of the Contract
- (f) Payment schedule
- (g) Line Plan of Buildings, Layout plan and Typical Detail drawings
- (h) Schedule „A“ (BOQ) Notes & BOQ
- (j) MES Standard Schedule of Rates (Part-I Specifications) -2009 with amendment Nos 1 to 3 and MES Standard Schedule of Rates (Part-II Rates) - 2020 together with amendment/errata Nos 1 to 122 and Section 30 (here-in-after and in General Conditions of Contract (IAFW-2249) referred to as the "MES Schedule") as applicable to the above said schedule.
- (k) General Conditions of Contracts (IAFW-2249) (1989 Print) together with Amendment Nos.1 to 49 and Errata 1 to 20.

In witness whereof the parties hereto have caused this Agreement to be signed in their respective hands as of the day and year first before written.

FOR & ON BEHALF OF CONTRACTOR

FOR & ON BEHALF OF PRESIDENT OF INDIA

Signature.....

Name.....

Address.....

CE A&N ZONE

Witness

1. _____

2. _____

TENDER

To
The President of India,

Having examined and perused the following documents:

1. Specifications signed by the AAD (Contracts) for the Chief Engineer (A&N) Zone, Brichgunj, Sri Vijaya Puram-744 103
2. Drawings detailed in the specifications
3. BOQ and Schedules- 'B', 'C' and 'D' attached hereto.
4. MES Standard **Schedule of Rates-2009, Part-I** (Specifications) including amendments 1(a), 1(b), 2 & 3 and **MES Standard Schedule of Rates-2020, Part-II (Rates)** including amendments 1 to 122 and Section 30 {hereinafter and in IAFW-2249 referred to as the MES Schedule} together as applicable to the above said Schedule.
5. General Conditions of Contracts IAFW-2249 [1989 Print] together with Errata 1 to 20 and Amendments 1 to 49 and Schedule of Minimum Wages.

6. WATER: CONDITION 31 OF IAFW-2249: GENERAL CONDITIONS OF CONTRACTS

Water will not be supplied by MES.

7. Should this tender be accepted, I / We agree:

*****(a)** That the sum of **Rs.15,00,000/-** forwarded as Earnest Money which shall be refunded by the Government on receipt of the appropriate amount of **Performance Security** all as per Condition – 19 of IAFW – 2249.

(b) To execute all the works referred to in the said documents upon the terms and conditions contained or referred to therein and as detailed in the BOQ and to carry out such deviations as may be ordered vide Condition 7 of IAFW - 2249 upto a maximum of **(±)10% (Ten Percent)** and further agree to refer all disputes (in case of disagreement with the decision of competent engineer authority) to **Dispute Resolution Board (DRB)** as per Condition 71 of General Conditions of Contracts (IAFW-2249) as required by Condition 70 and further in case of non-acceptance of the decision of DRB, in part/full, to the arbitration by a Sole Arbitrator to be appointed by the Engineer-in-Chief, or in his absence the officer officiating as the Engineer-in-Chief, or the Director General of Works if specially delegated in writing by the Engineer-in-Chief, Army HQ, New Delhi whose decision shall be final, conclusive and binding.

*** Delete where not applicable

TENDER (Contd.,)

Signature _____ in the capacity of _____
_____ duly authorised to sign the tender for and on behalf
of _____.

Name of signatory : _____
(IN BLOCK CAPITALS)

Date : _____

Postal address : _____

Witness:

Address _____ Telegraphic address _____

Telephone _____

ACCEPTANCE

_____ Alterations have been made in these documents and as evidence that these alterations were made before the execution of the Contract Agreement these have been initialled by the Contractor and **Shri R P Joshi, AAD (Contracts)**

The said Officer is hereby authorised to sign and initial on my behalf, the documents forming part of this contract.

The above tender was accepted by me on behalf of the President of India for the lump sum of _____ Rs _____
(Rupees _____)

_____ only) on _____ day of _____ 2026.

Signature:

BRIG
CHIEF ENGINEER
ACCEPTING OFFICER

Dated this _____ day of _____ 2026.

Appointment: Chief Engineer (A&N) Zone
Sri Vijaya Puram – 744 103
for and on behalf of the President of India

{in lieu of IAFW-2159 (Revised 1947)}

GENERAL CONDITIONS OF CONTRACTS {IAFW-2249 (PRINT - 1989)}
FOR LUMP SUM CONTRACTS (IAFW-2159)

A copy of the MES GENERAL CONDITIONS OF CONTRACTS (IAFW-2249: Print-1989) with Errata and Amendments has been supplied to me/us, has been perused by me / us and is in my/our possession. I / We have read and understood the Provisions contained in the aforesaid GENERAL CONDITIONS OF CONTRACTS before submission of this tender and I/We agree that I/We shall abide by the terms and conditions thereof, as modified if any, elsewhere in these tender documents.

It is hereby further agreed and declared by me/us, that the GENERAL CONDITIONS OF CONTRACTS (IAFW-2249: Print-1989) including Condition 70 & 71 thereof pertaining to settlement of disputes by Arbitration with errata 1 to 20, amendment Nos. 1 to 49 and corrections hereinafter form part of these tender documents.

Notes:

- [a] The documents mentioned above can also be seen in the office of the **Chief Engineer A&N Zone, Sri Vijaya Puram – 744 103** or in any other MES office during working hours.
- [b] In case of difference in interpretation due to wordings of English and Hindi versions, the English version will prevail as per Article 348 of Constitution of India.

*Delete whichever is not applicable.

Signature of the Contractor

**AAD (Contracts)
for Accepting Officer**

ANNEXURE

CORRECTION SLIP TO GENERAL CONDITIONS OF CONTRACT (IAFW -2249)

Corr ectio n No.	Condition No.& location	Particulars
1.	1 1(a)	Add the words „and Design Development Report“ after the words „and the drawings“ in line 4
2.	1(m)	Condition is deleted.
3.	6A, Sub Para 2	The description mentioning the order of precedence shall be substituted with the following description : “In case of discrepancy among various documents forming part of the contract, the following order of precedence shall be observed : (a) provisions as contained in Notes to Schedule “A” (b) provisions as contained in the Scope of Work (c) provisions as contained in the Design Basis Report (DBR) (d)provisions as contained in Design Development Report (e) provisions as contained in Particular Specifications (f) provisions as contained in the Schedule of Finishes (g) provisions as contained in the MES Standard Schedule of Rates (SSR) (Part –I) (h) provisions as contained in the relevant Indian Standard of BIS (j) provisions as contained in the TD (Typical Details) drawings (k) provisions as contained in the General Conditions of Contract (GCC)”
4.	07, Para 1	The existing description under first paragraph shall be substituted as under : “The contractor shall not make any alteration in, addition to or omission from the Works as described in the contract except in pursuance of the written instructions of the G.E.”
5.	07, Note at the end of third Para	The existing description shall be substituted as under : “Individual trade means the different Annexures into which the Scope of Work has been divided under of Scope of Work, or, in the absence of any such division, the individual Sections of M.E.S. Standard Schedule of Rates such as Excavation and Earthwork, Concrete, Wood Work & Joinery etc.”
6.	07, Fourth Para, line 1 &11	Words “Condition 62” shall be substituted with the words “Condition 62 as Corrected hereinafter”.
7.	25	Following shall be the details of persons to be employed by the Contractor to supervise the works and to receive instructions from the Engineer-in-Charge : (a) 2 Nos Graduate Engineers having degree certificate from a Government recognized Institution with minimum experience of 5 years. (b) 3 Nos Diploma Engineers having diploma certificate from Government recognized Institution with minimum experience of 8 years. (c) Any one of the Engineers should have the capability to use Project Management Software like MS Projects / Primavera in all projects.

CORRECTION SLIP TO GENERAL CONDITIONS OF CONTRACT (IAFW -2249)(Contd..)

8.	38	The description is revised as under : "The contractor will prepare necessary dimensioned drawings, levels and other information necessary to set out the works. The Contractor shall set out the works and provide and fix all setting out apparatus required and shall be solely responsible for the correctness and maintenance of the setting out. Further work shall not commence till the setting out is approved by the Engineer-in-Charge."
9.	61, First & second Para	The descriptions are revised as under : "All items mentioned in various Annexure of Scope of Work as developed finally in the Design Development Report by the Contractor except those covered under Annexure – „I“, „II“, „IV“ and „VI“ shall be entered in the M.E.S. Measurement Book I.A.F.W.-2261. Building etc. covered under Annexure – „I“ as a unit lump sum will be entered by number as the unit lump sum."
10.	62	The descriptions are revised as under : "The value of items of work covered by deviation orders shall be ascertained by measurements or lump sum assessment in the following order of precedence:- (a) At applicable rate in the M.E.S. Schedule ; (b) At pro-rata rate based on analogous items in the M.E.S. Schedule. The rates at (a) and (b) above shall be subject to the percentage inserted in tender documents for pricing deviations. If any Work, the rate for which cannot be obtained by any of the methods referred to above, has been ordered on the Contractor, the rate shall be decided by the G.E. on the basis of the cost to the Contractor at Site of Works plus 15% to cover all overheads and profit. Provided that if the Contractor is not satisfied with the decision of the G.E., he shall be entitled to represent the matter to the C.W.E. within seven days of receipt of the G.E.'s decision and the decision of the C.W.E. thereon shall be final and binding. If any alterations or additions (other than those authorized to be executed by day work or for an agreed sum) have been covered up by the Contractor without his having given notice of his intention to do so, the Engineer-in-Charge shall be entitled to appraise the value thereof and in the event of any dispute the decision of the G.E. thereon shall be final and binding."
11.	70	<u>Arbitration :-</u> (a) <u>Arbitration Where Applicability of Section 12 (5) of the Arbitration and Conciliation Act Has Been Waived Off :-</u> All disputes, between the parties to the Contract (other than those for which the decision of the CWE or any other person is by the Contract expressed to be final and binding) shall, after written notice by either party to the Contract to the other of them, be referred to the Arbitral Tribunal of a Sole Arbitrator (in case of contract sum less than or equal to Rs.100 Crore) or to Arbitral Tribunal of three Arbitrators (in case of contract sum exceeding Rs.100 Crore) from MOD Panel of Arbitrators. The officers so considered for appointment of Arbitrator, either as sole Arbitrator or for Arbitral Tribunal, shall be having degree in Engineering or equivalent or having passed Final/Direct Final Examination of Sub-Division II of Institution of Surveyor (India) or similar other Institutes recognised by the Government of India.

CORRECTION SLIP TO GENERAL CONDITIONS OF CONTRACT (IAFW -2249)(Contd..)

	<p>In case of arbitration by Sole Arbitrator, the Arbitrator shall be appointed by the Authority mentioned in the contract document within a period of thirty days of having received the notice from any of the parties to Contract, out of MoD Panel of Arbitrators. In case of Arbitral Tribunal consisting of panel of three Arbitrators, both the parties will be asked by the Appointing Authority to suggest at least two names out of MoD Panel of Arbitrators within thirty days. The Appointing Authority will appoint two Arbitrators, one Arbitrator each out of the suggested names. The two Arbitrators so appointed will select one Arbitrator from the MOD Panel of Arbitrators who will be the 'Presiding Arbitrator'. The Serving Officer(s) so appointed as Arbitrator(s), either as Sole Arbitrator or as one of the three Arbitrators in the Arbitral Tribunal, can continue as Arbitrator even after retirement, provided both the parties to the Contract give written consent to this effect. In such case, however, the Arbitrator shall not be entitled for any fee even after retirement.</p> <p>(b) <u>Arbitration Where Applicability of Section 12 (5) of Arbitration & Conciliation Act Has Not Been Waived Off.</u></p>
	<p>All disputes, between the parties to the Contract (other than those for which the decision of the CWE or any other person is by the Contract expressed to be final and binding) shall, after written notice by either party to the Contract to the other of them, be referred to the Arbitral Tribunal of a Sole Arbitrator (in case of contract sum less than or equal to Rs.100 Crore) or to Arbitral Tribunal of three Arbitrators (in case of contract sum exceeding Rs.100 Crore). The Officers so considered for appointment as Arbitrator, either as Sole Arbitrator or for Arbitral Tribunal, shall be having degree in Engineering or equivalent or having passed Final/Direct Final Examination of Sub Division II of Institution of Surveyor (India) or similar other Institutes recognised by the Government of India.</p> <p>In case of arbitration by sole Arbitrator, the Arbitrator shall be appointed by the authority mentioned in the contract document from the MoD Panel of Arbitrators within a period of thirty days of having received the notice from any of the parties to Contract. In case of Arbitral Tribunal consisting of panel of three Arbitrators, both the parties shall be asked by the Appointing Authority to suggest at least two names out of MOD Panel of Arbitrators within thirty days. The Appointing Authority will appoint two Arbitrators, one Arbitrator each out of the suggested names. The two Arbitrators so appointed shall select one Arbitrator from the MoD Panel of Arbitrators who will be the Presiding Arbitrator'.</p> <p>(c) <u>Common For All Arbitration</u></p> <p>Unless both parties agree in writing, such reference shall not take place until after the completion or alleged completion of the works or termination or determination of the contract under Condition No. 55, 56 and 57 hereof.</p> <p>Provided that in the event of abandonment of the works or cancellation of the Contract under Condition No. 52, 53 or 54 hereof, such reference shall not take place until alternative arrangements have been finalised by the Government to get the works completed by or through any other Contractor or Contractors or Agency or Agencies.</p> <p>Provided always that commencement or continuance' of any arbitration proceeding hereunder or otherwise shall not in any manner militate against the Government's right of recovery from the Contractor as provided in Condition 67 hereof.</p>

CORRECTION SLIP TO GENERAL CONDITIONS OF CONTRACT (IAFW -2249)(Contd..)

		<p>If the sole Arbitrator or one or more Arbitrators of the Arbitral Tribunal so appointed resign(s) from his/her appointment or vacate(s) his/her office or is unable or unwilling to act due to any reason whatsoever, the Authority appointing him/her will appoint a substitute Arbitrator to act in his/her place in the manner specified hereinabove. In case the Arbitrator resigning in this manner is the Presiding Arbitrator, the other two Arbitrators of the Arbitral Tribunal shall appoint the substitute Presiding Arbitrator.</p>
		<p>The Arbitral Tribunal may proceed with the arbitration, ex parte, if either party, in spite of a notice from the arbitrator fails to take part in the proceedings.</p>
		<p>The Arbitral Tribunal may from time to time with the consent of the parties, enlarge the time for making and publishing the award subject to the limit laid down in the Arbitration & Conciliation Act 1996 as amended upto the date on which arbitration proceedings commence.</p>
		<p>The Arbitral Tribunal shall make the award within the period as provided in the Arbitration & Conciliation Act 1996 (as amended upto the date on which arbitration proceedings commence) from the date of entering on the reference or within the extended period as the case may be on all matters referred to it and shall indicate findings along with sums awarded separately on each individual item of dispute. The Arbitral Tribunal shall give reason for the award in each and every case irrespective of the value of claims or counter claims.</p>
		<p>The venue of Arbitration shall be such place or places as may be fixed by the Arbitral Tribunal in its sole discretion.</p> <p>(d) The Award of the Arbitral Tribunal shall be final and binding on both parties to the Contract.</p>

SCHEDULE OF MINIMUM FAIR WAGES
[See Condition – 58 of IAFW – 2249]

1. It is hereby agreed that the "Schedule of Minimum Fair Wages" [SMFW] as published vide Government of India Notification dated 10 March 1992 and further Notification and as amended subsequently from time to time by the orders of the competent Central / State Governments / Local Authorities till last date of submission of Bids, forms part of these tender documents.
2. My/Our signature hereunder amounts to my/our having read and understood the provisions contained therein and I/we agree that I/we shall abide by the same and that aforesaid documents form part of this tender.
3. It is also agreed by me/us that although latest notification, as available with the Accepting Officer, has been formed part of the contract, in case the Government has further revised the wages, the latest revised wages for labour shall only be applicable.
4. Schedule of Minimum Fair Wages is not enclosed along with tender but the contractor is deemed to have full knowledge regarding the minimum wages payable to labourers as legally effective on the last date of submission of Bids and his tendered rates shall be deemed to have been based on the same.
5. The minimum wage legally effective referred to above is the minimum wages notified in Gazette / governed by any local regulations or by Central Government, whichever is higher.
6. In case of difference in interpretation due to wordings of English and Hindi versions, the English version will prevail as per Article 348 of Constitution of India.

Signature of the Contractor

**AAD (Contracts)
for Accepting Officer**

SPECIAL CONDITIONS**1. GENERAL**

- 1.1 The subject work will be executed at Campbell Bay and the work under this contract shall be carried out in accordance with DBR, Particular Specifications, Drawings, other provisions in MES Schedule and as defined under scope of work etc.,
 - 1.1.1 The Special Conditions of Contract which include various deviations from General Conditions of Contracts and certain other Conditions particular to this Contract shall be read in conjunction with the General. Conditions of Contract, particular Specifications, Conditions particular to various works & specific scope of each work as specified together with particular Specifications, Drawings etc.,
 - 1.1.2 The term 'General Specifications' referred to hereinbefore, as well as referred to in General Conditions of Contracts (IAFW-2249) shall mean the specifications contained in the MES schedule.
 - 1.1.3 General Rules, Specifications, Special Conditions and all preambles in the MES Schedule shall be deemed to apply to the works under this contract. In case of any discrepancy, the provisions in these tender documents shall take precedence over the aforesaid provisions in the MES Schedule.
 - 1.1.4 The detailed Design Basis Report (DBR), Particular Specifications and Drawings for each function like Civil, Electrical, HVAC, Plumbing, External Development, Street lighting etc., are attached as various Volumes to the tender documents. The same also includes specific scope of each work & conditions particular to the work. Indicative Items of Civil, Electrical, HVAC, Plumbing, Fire, STP, MTP, all External Development Works, etc., are given in Particular Specification for reference purpose only. The bidders, before quoting the tender are deemed to have ascertained/verified/worked out all the items & quantities etc., from the Design Basis Report, drawings and site of work, particular specifications for complete scope of work. The contractor shall submit their detailed Items and quantities of each item within laid down time-line to MES from the date of award of work for MES reference & records. No claim on account of any discrepancies, left over items etc. in Indicative Items given in the tender, and submitted by the contractor, and as actually executed at site and essentially required for completion of the work, shall be admissible. Thus the contractor is required to execute all the works/items and quantities as per Scope of work, Design basis reports (DBR)/specifications, particular Specifications, Drawings, site requirement etc. and to quote their amount financial bid accordingly.
 - 1.1.5 The Comprehensive 'Design Basis/Brief Report is also enclosed for reference of the bidders in their Design obligations. The Design Basis/Brief Reports are the minimum standards that the construction agency has to fully comply with, subject to deviations/variations, if any, approved as per provisions of the contract.
 - 1.1.6 The contractor is required to complete the project on Design & Build basis as specified in the Scope of Work, particular Specification & Drawings covering the entire site including all internal services and the contractor's quoted rates are deemed to include everything from the award of work upto & including handing over of completed project, defect liability period. However, the contractor is required to connect all the external services like Water Supply, Sewerage, Drainage, Electric Supply, road etc. to the main lines of the authorities/service providers which shall be integral part of his Scope of work and deemed to be included in his quoted price. All mandatory approvals required for occupation and completion of the project shall be obtained by the Contractor. Contractor shall assist the Deptt. and project consultant appointed by MES in obtaining all mandatory approvals required for commencement of work.
 - 1.1.7 It shall be deemed that the contractor has satisfied himself as to the nature and location of the work, general and local conditions and particularly those pertaining to transport including restriction of movement of traffic/ vehicles etc., handling, availability and storage of materials, availability of labour, weather conditions at site and general ground/sub soil conditions and the contractor has to quote his rates accordingly and nothing extra shall be payable on any reason whatsoever.
 - 1.1.8 MES will bear no responsibility for the lack of such knowledge and also the consequences thereof to the contractor. The information and site data shown in the drawings and mentioned in the tender documents are furnished for general information and guidance only. The Engineer-in-Charge in no case shall be held responsible for the accuracy thereof or/and deductions, interpretations or conclusions drawn there from by the contractor and no claim shall be entertained whatsoever on this account, if the site conditions/information is different or otherwise incorrect. It will be presumed that the contractor has satisfied himself for all possible contingencies, situations, bottlenecks and acts of coordination which may be required between the different agencies.

SPECIAL CONDITIONS**2. ADMISSION TO SITE BY CONTRACTOR AND RESPONSIBILITY TO ASCERTAIN HIS OWN INFORMATION**

- 2.1 The tenderer is advised to inspect the site, by prior appointment with Garrison Engineer, to ascertain the nature of site, access thereto, local facilities for procurement of materials, working hours and labour rates prevalent in the area and all other matters affecting his price in the tender for execution and the completion of the work. The tenderer shall be deemed to have full knowledge of the site (s) whether or not he actually visits it / these. For the purpose of collection of materials and execution of the works, the site will be considered as lying in area as mentioned in clauses hereinafter.
- 2.2 The tenderer shall be deemed to have visited the site(s) and made themselves familiar with the working conditions, whether they actually inspect the site(s) or not.

3. SECURITY AND PASSES

- 3.1 Refer Conditions 25 of IAFW-2249. The contractor shall employ only Indian Nationals as his representatives, servants and workmen and verify their antecedents and loyalty before employing them for the works. He shall ensure that no person of doubtful antecedents and nationality is, in any way, associated with work. If for reasons of technical collaboration or other consideration, the employment of any foreign national is unavoidable, the contractor shall furnish full particulars to this effect to the Accepting Officer at the time of submission of his tender.
- 3.2 The contractor shall, on demand by the Engineer-in-Charge, submit list of his agents, employees and work people concerned and shall satisfy the Engineer-in-Charge as to the bonafide of such people.
- 3.3 The Engineer-in-Charge shall at his discretion have the right to issue passes as per rules and regulations of the installation/Area in force to control the admission of the contractor, his agents, and employees and work people to the site of the work or any part thereof. Passes should be returned at any time on demand by the Engineer-in-Charge or the authorities concerned and in any case on completion of work. The GE shall have full powers and without giving any reason, order the Contractor immediately to cease to employ, in connection with his contract, any agent, servant or employee whose continued employment is, in his opinion, undesirable. The Contractor shall not be allowed any compensation on this account.
- 3.4 The contractor and his agents, employees and work people shall observe all the rules promulgated by the authority controlling the installation/area in which the work is to be carried out e.g., prohibition of smoking and lighting, fire precautions, search of persons on entry and exit, keeping to specific routes, observing specified timing etc. Nothing extra shall be admissible for any man-hours etc. lost on this account.
- 3.5 The Contractor shall furnish the following documents in respect of the workers being employed by him in order to enable the GE to recommend to the pass issuing authorities. A copy of the following mentioned documents shall also be carried by the individual and shall be produced at the time of entry into or exit from the restricted area and also any time or number of times inside Defence area or during surprise checks.
- [a] Police verification with photo in case of local workers.
- [b] Voter ID card/ ration card of native place in case of migrant workers along with photo or certificate with photo from Gram Panchayat / village administration officer/ BDO/ competent Government officials.
- [c] In case of workers / individuals not in possession of either (a) or (b) above, the Contractor shall issue a certificate to each individual containing photo, father's name and known local / permanent address.

SPECIAL CONDITIONS

4. **CONDITIONS FOR WORKING:** All works lies in **Restricted Area**. The restrictions for entry to work site and conditions of working in restricted area shall be as under:-
- 4.1 **Entry and Exit.** The contractor/his agents/representatives/workmen etc. and his materials, carts, trucks or other means of transport etc., will be allowed to enter through and leave from only such gate or gates and at such times as the GE or authorities in charge of the restricted area may at their sole discretion permit to be used. Contractor's authorised representative is required to be present at the places of entry and exit for the purpose of identifying his carts, trucks etc., to the person in charge of the security of the restricted area.
- 4.2 **Identity of Workmen:** Every workman shall be in possession of an identity card. The identity card shall be issued after a thorough investigation of antecedents of the labourers by the contractor and attested by Officer-in- charge of the unit concerned in accordance with the standing rules and regulations of the unit. Contractor shall be responsible for the conduct of his workmen, agents or representatives.
- 4.3 **Identity Card or Passes:** The contractor, his agents and representatives are required individually to be in possession of an identity card or pass which will be examined by the security staff at the time of entry into or exit from the restricted area and at any time or number of times inside a restricted area.
- 4.4 **Search:** Thorough search of all persons and transport shall be carried out at each gate and for as many times the gate is used for entry or exit and may also be carried out any number of times at the site within the restricted area.
- 4.5 **Working Hours:** The units controlling restricted areas usually work during six days in a week and remain closed on the 7th day. The working hours available to the contractor's labour and staff are however appreciably reduced because of the time of entry and exit during working hours. The exact working hours, working days and number of working days observed for these restricted area(s) where works are to be carried out shall be deemed to have been ascertained by the contractor before submitting his tender. The tenderer's attention is invited to the fact that the number of working hours for a unit are prescribed in regulations and that these cannot be increased by the Garrison Engineer or authorities controlling the restricted area. The definition of "working days" as given under Condition 1(t) of IAFW-2249 does not apply in cases where the works are carried out in restricted areas.
- 4.6 **Working on Holidays:** The contractor shall not carry out any work on gazette holidays, weekly holidays and other non-working days except when he is specially authorised in writing to do so by the Garrison Engineer. The GE may at his sole discretion declare any day as holiday or non-working day without assigning any reasons for such declaration.
- 4.7 **Fire Precautions:** The contractor, his agents, representatives, workmen etc., shall strictly observe the order pertaining to fire precautions prevailing within the restricted area. Motor transport vehicles, if allowed by the authorities to enter the restricted area, must be fitted with a fire extinguisher in working condition.
- 4.8 **Female Searcher:** If the contractor desires to employ female labour for works to be carried out inside the area of factory, depot, park etc., and a female searcher is not borne on the authorised strength of the factory, depot, park etc. at the time of submission of tender, he shall be deemed to have allowed in his tender for pay and allowances etc. for a female searcher (Group D employee) calculated for the period female labour is employed by him inside that area. If more than one contractor employs female labour during any month and female searcher (s) has/have to be employed in addition to the authorised strength of the factory, depot, park etc., the salary and allowances paid to the additional female searcher(s) shall be distributed on equitable basis among the contractors employing female labour taking into consideration the values and periods of completion of their contracts. The GE's decision in regard to the amount payable on this account by any contractor shall be final and binding.
5. **DAMAGE TO EXISTING STRUCTURES**
- 5.1 Any damage to the existing structures, any existing road etc., during the execution of work shall be made good by the contractor at his own expense. Rectification, replacement, making good and touching up etc., shall be carried out, conforming to the materials and workmanship originally provided and to the satisfaction of the Engineer-in-Charge. In case of any dispute on this account the decision of the GE shall be final, binding and conclusive.

SPECIAL CONDITIONS**6. APPROACHES**

- 6.1 The contractor shall make arrangements for and provide at his own cost all temporary approaches, if required to the site (s), after obtaining approval in writing of the GE to the layout of such approaches.

7. LOCATION OF BUILDINGS AND WORKS

- 7.1 There may be some changes in location/siting of buildings shown in the site (layout) plan(s) to suit local conditions and/or departmental requirements. The contractor shall have no claim what-so-ever consequent to such changes in the location/siting of works.

8. COORDINATION WITH OTHER AGENCIES

- 8.1 The contractor shall permit free access and afford normal facilities and usual convenience to other agencies or Departmental workmen to carry out connected works or services under separate arrangements. The contractor will not be allowed any extra payment on this account and no compensation shall be admissible to the contractor on this account.

9. RECORD OF MATERIALS

- 9.1 The quantity of materials such as bitumen, filler, anti-striping agents, paints, water proofing compound, chemicals and the like, as directed by the Engineer-in-charge (the quantity of which cannot be checked after incorporation in the works), shall be recorded in measurement books and signed by the Contractor and the Engineer-in-charge as a check to ensure that the required quantity has been brought to site for incorporation in the work.
- 9.2 Materials brought to site shall be stored as directed by the Engineer-in-charge and those already recorded in measurement book shall be suitably marked for identification.
- 9.3 Original purchase vouchers shall be defaced by the Engineer-in-Charge and photocopies shall be kept in record. Genuineness of purchase voucher shall be verified by the Engineer in Charge before considering the same for making payment. Initially JE may verify the vouchers after taking confirmation on phone or through e mail. The contractor shall ensure that the materials are brought to site in original sealed containers/ packing, bearing manufacturer's marking except in the cases of the requirement of materials being less than smallest packing.
- 9.4 Bitumen shall be purchased directly from main manufacturers only. In case of small quantity, the Accepting Officer may allow procurement of Bitumen from authorised dealers of main manufacturers. Purchase vouchers for the same shall be defaced by the Engineer-in-Charge, indicating reference to the Contract number under his dated signature and photocopies thereof shall be kept on record so as to avoid their being used again.
- 9.5 The vouchers will clearly indicate the Contract number and the IS No and specific alternative to which the material conforms in case of various alternatives in IS. In case the contractor procures the Bitumen mix from Hot Mix Plant, the copy of voucher of Bitumen provided by the main manufacturer to the Hot Mix Plant shall be submitted by the contractor.

10. **WATCH/LIGHTING:** The contractor shall, at his own cost, take all possible precautions to ensure safety of life and property by providing necessary fencing, barrier, light, watchmen etc., during the progress of work and as directed by the Engineer-in-Charge.

11. **CLEANING DOWN:** Refer Condition 49 of IAFW-2249. The contractor shall clean all floors, remove cement, lime or paint drops, clean joinery, glass panels etc., touch up all paint work and carry out all necessary items of work in connection therewith and have the whole premises clean and tidy to the entire satisfaction of Engineer-in-Charge before handing over the items/works. No extra payment shall be admissible to the contractor for his operation.

12. MINIMUM WAGES PAYABLE

- 12.1 Refer Condition 58 of IAFW-2249. The contractor shall not pay wages lower than minimum wages for labour as fixed by the Government of India/State Govt/Union territory, whichever is higher. Contractor's attention is also drawn, amongst other things, to the 'explanations' to the schedule of minimum wages referred to above.
- 12.2 The fair wages referred to in Condition 58 of IAFW-2249 will be deemed to be the same as the minimum wages referred to above as updated from time to time.

SPECIAL CONDITIONS

- 12.3 Schedule of minimum wages are not enclosed along with tender documents. However, the contractor shall be deemed to have verified the minimum fair wages payable as on the bid submission end date. The contractor shall have no claim whatsoever, if on account of local factors and/ or regulations, he is required to pay the wages in excess of minimum wages as described above during the execution of work.
13. **MATERIALS AND SAMPLES**
- 13.1 Refer condition 10 of IAFW-2249.
- 13.2 The materials and articles, which have been specified from certain makers/manufacturers, shall be of makes/manufactures as specified. If the manufacturers specified in tender documents make both ISI marked and conforming to ISI, the materials/articles shall be ISI marked.
- 13.3 The materials and articles, which have not been specified in tender documents by makes/manufacturers, shall be as under:
- [a] If ISI marked materials are being manufactured, the same shall be ISI marked. For a list of ISI marked manufacturers refer to the website of BIS ie www.bis.org.in.
- [b] If ISI marked materials are not being manufactured, the same shall be conforming to IS Specifications.
- 13.4 Materials of local origin shall be as specified and conforming to samples kept in GE's office. The tenderer is advised to inspect samples of materials which are displayed in the office of GE before submitting his tender. The tenderer shall be deemed to have inspected the samples and satisfy himself as to the nature and quality of materials he is required to incorporate in the work irrespective of whether he has actually inspected them or not.
- 13.5 The contractor shall not procure materials and articles unless the samples are first got approved by the GE.
14. **HANDING OVER OF SITE:** Site for execution of work will be available as soon as the work is awarded. In case it is not possible to make the entire site available on the award of work, the contractor will have to arrange his working programme accordingly. No claim whatsoever, for not giving the entire site on award of work and for giving site gradually, will be tenable.
15. **SECURITY OF CLASSIFIED DOCUMENTS**
- 15.1 Contractor's special attention is drawn to Conditions 2A and 3 of General Conditions of Contracts (IAFW-2249). The Contractor shall not communicate any classified information regarding works either to sub-contractors or others without prior approval of the Engineer-in-Charge. The Contractor shall also not make copies of the design/drawings and other documents furnished to him in respect of works and he shall return all documents on completion of the works or on earlier determination of the Contract. The Contractor shall along with final bill attach a receipt from the Engineer-in-Charge in respect of his having returned the classified documents as per Condition 3 of General Conditions of Contracts (IAFW-2249).
16. **PERIOD FOR KEEPING TENDER OPEN**
- 16.1 The tender shall remain open for acceptance for a period of **90 (NINETY)** days from the next day subsequent to the bid submission end date'
17. **NETWORK ANALYSIS**
- 17.1 The Time and Progress Chart to be prepared as per condition 11 of General Conditions of Contracts (IAFW-2249) shall consist of detailed network analysis and a time schedule. The critical path network will be drawn jointly by the GE and the contractor soon after acceptance of the tender. The time scheduling of the activities will be done by the contractor so as to finish the work within the stipulated time. On completion, a firm calendar date schedule will be prepared and submitted by the contractor to the GE who will approve it after due scrutiny. Four copies of the schedule will be submitted within two weeks from the date of handing over the site.

SPECIAL CONDITIONS

- 17.2 During the currency of the work the contractor is expected to adhere to the time schedule and this adherence will be a part of the contractor's performance under the contract. During the execution of the work the contractor is expected to participate in the reviews and updating of the network undertaken by the GE. These reviews may be undertaken at the discretion of the GE either as a periodic appraisal measure or when the quantum of work ordered on the contractor is substantially changed through deviation orders or amendments. Any revision of the schedule as a result of the review will be submitted by the contractor to the GE within a week who will approve it after due scrutiny. The contractor will adhere to the revised schedule thereafter. In case of a contractor disagreeing with the revised schedule, the same will be referred to the Accepting Officer whose decision will be final, conclusive and binding. GE's approval to the revised schedule resulting in a completion date beyond the stipulated date of completion shall not automatically amount to a grant of extension of time. Extension of time shall be considered and decided by the appropriate authority mentioned in condition 11 of IAFW-2249 and separately regulated.
- 17.3 The contractor shall mobilise and employ sufficient resources to achieve the detailed schedule within the broad framework of the accepted methods of working and safety.
- 17.4 No additional payment will be made to the contractor for any multiple shift work or other incentive methods contemplated by him in his work schedule even though the time schedule is approved by the Department.
18. **WATER SUPPLY**
- 18.1 Refer condition 31 of General Conditions of Contracts IAFW-2249 and clause 1.13 of Standard Schedule of Rates 2009 Part-I specifications.
- 18.2 Water will not be supplied by MES. The tenderers are advised to visit the site of works to ascertain availability of water from civil sources or from nearby natural sources outside MoD land. The contractor shall be allowed, if he so desires, to install hand pumps, tube wells at site of work at places as approved by Engineer-in-Charge and nothing shall be charged from the contractor. The contractor shall remove the hand pumps, tube wells as and when asked to do so by Engineer-in-Charge/GE and in any case on completion of the work and before issue of completion certificate, unless GE desires that these hand pumps, tube wells be left in position and the contractor agrees to do so without claiming cost thereof from department. No compensation whatsoever shall be admissible to the contractor, if he is required to remove the pumps(s), tube wells before completion of work. Use of water from such sources shall be permitted only if found potable after testing and fit for use in the work. The water from such sources shall be got tested by the contractor from a laboratory approved by the GE, who shall, after satisfying himself, permit the contractor to use the water from such sources. Testing charges shall be borne by the contractor. GE shall also carry out the independent testing of water.
19. **ELECTRIC SUPPLY**
- 19.1 Electricity will not be supplied by MES. Electric supply required for the work shall be made available by Contractor under his own arrangements.
20. **LAND FOR TEMPORARY WORKSHOP, STORES ETC**
- 20.1 The contractors shall be permitted to store his materials including erecting temporary sheds for storage/temporary workshop, office/labour huts at the area of land to be decided by GE. The contractor shall be allotted free of charges, the area of land as decided by the GE, for the purpose of erection of temporary work shop, stores etc. Plot of land so allotted shall not be used for accommodation of labour and canteen for which the contractor shall make his own arrangements, at his own expenses.
21. **REIMBURSEMENT/REFUND ON VARIATION IN PRICES:
(Refer Condition 63 of IAFW-2249)**
- 21.1 Refer Condition 63 of the General Conditions of Contracts (IAFW-2249) / Re-imbursement/ Refund on Variation of Prices. The Condition 63 of General Conditions of Contract shall be deemed to be modified to the extent mentioned hereinafter. Increase or decrease in prices of Cement, Steel and other materials shall be adjusted on the basis stipulated hereinafter irrespective of the actual variation in prices (to the contractor):

SPECIAL CONDITIONS

(a) Cement: The cement cost component for the contract as a whole shall be taken as Kc% of the value of works executed under the contract. Accordingly value/cost of cement consumed in the work as well as that lying at site for which reimbursement/refund is applicable shall be:-

$$VMc = \frac{(Kc \times Vg)}{100} + Vc$$

Variation in prices of cement shall be worked out by applying the following formula:-

$$EMc = (Vmc2 - Vmc1) \times \frac{(C1-Co)}{Co}$$

EMc = Variation in prices of cement to be adjusted

Kc = Constant representing the percentage cost of Cement as compared to the total value of work under the contract as a whole. The value of Kc for this work shall be 07 (SEVEN) only.

Vg= Amount of work done priced at the contract rates up to for the last date of the period of reckoning excluding amount payable to the contractor towards items on star rate and PC sum.

Vc = Cost of all cement lying at site for incorporation in the work excluding cement issued under Schedule 'B' and excluding cement brought and paid or payable to contractor under Price Cost Sum and/or Star Rate(s).

C1 = Wholesale Price Index for Cement (Base Year 2011-12=100) published by Economic Adviser to the Government of India as on the date of commencement of the period of reckoning. In case the original contract period is extended under condition 11 of General Conditions of Contracts (IAFW-2249), the Price Index as applicable on the date of commencement of the last period of reckoning before the original completion date(s) (phase wise except where phasing has been done only for sample quarter/block) shall only be applicable during the extended period. If phasing has been done for only sample quarter/sample block, the price index as applicable on the date of commencement of the last reckoning period before the original completion date of the project as a whole shall only be applicable during the extended period.

Co = As per C1 but the index as on the last due date of Bid Submission.

Vmc2 = Amount of cement up to the last date of the period of reckoning for which variation is adjustable as worked out as per formula for VMC.

Vmc1 = As per Vmc2 but as on date of immediate preceding period of reckoning.

(b) Steel: The Steel cost component for the contract as a whole shall be taken as Ks% of the value of works executed under the contract. Accordingly value/cost of steel consumed in the work as well as that lying at site for which reimbursement/refund is applicable shall be

$$Vms = \frac{(Ks \times Vg)}{100} + Vs$$

Variation in prices of cement shall be worked out by applying the following formula:-

$$Ems = (Vms2 - Vms1) \times \frac{(S1-So)}{So}$$

EMs = Variation in prices of steel to be adjusted

Ks = Constant representing the percentage cost of Steel as compared to the total value of work under the contract as a whole. The value of Ks for this work shall be 33 (THIRTY THREE) only.

Vs = Cost of all steel lying at site for incorporation in the work excluding steel issued under Schedule 'B' and excluding steel brought and paid or payable to contractor under Prime Cost Sum and/or Star Rate(s).

SPECIAL CONDITIONS

S1 = Whole Price Index for Mild steel (Long Products) (Base Year 2011-12=100) published by Economic Adviser to the Government of India as on the date of commencement of the period of reckoning. In case the original contract period is extended under Condition 11 of General Conditions of Contracts (IAFW-2249), the Price Index as applicable on the date of commencement of the last period of reckoning before the original completion date(s) (phase wise except where phasing has been done only for sample quarter/block) shall only be applicable during the extended period. If phasing has been done for only sample quarter/sample block, the price index as applicable on the date of commencement of the last reckoning period before the original completion date of the period as a whole shall only be applicable during the extended period.

So = As per S1 but the Index as on the last due date of Bid Submission.

Vms2 = Amount of steel up to the last date of the period of reckoning for which variation is adjustable as worked out as per formula for VMS.

Vms1 = As per Vms2 but as on date of immediate preceding period of reckoning.

(c) Other materials (except Cement & Steel): The Material cost component except cement & steel for the contract as a whole shall be taken as KoM% of the value of works executed under the contract. Accordingly value/cost of other materials consumed in the work as well as that lying at site for which reimbursement/refund is applicable shall be:

$$Vm = \frac{(KoM \times Vg)}{100} + (VoM - Vb)$$

Variation in prices of materials (except cement & steel) shall be worked out by applying the following formula

$$Em = (Vm2 - Vm1) \times \frac{(W1 - Wo)}{Wo}$$

Wherein,

Em = Variation in prices of material to be adjusted except cement & steel.

KoM = Constant representing the percentage cost of other material except cement & steel as compared to the total value of work under the contract as a whole. [The value of KOM for this work shall be 11 \(ELEVEN\) only.](#)

Vg = Gross value of work done at contract rates up to the last Date of period of reckoning excluding amount payable to the contractor towards items on Star Rate and PC sum.

VoM = Value of all materials (except cement & steel) lying at site for incorporation in the work including materials (except cement & steel) issued under schedule 'B' and including materials (except cement & steel) brought and paid or payable to contractor under Prime Cost Sum and/or Star Rate (s).

Vb = Value of all materials (out of Vg and VoM) (except cement & steel) issued under schedule 'B' plus value of all materials (except cement & steel) brought and paid or payable to contractor under Prime Cost Sum and/or Star Rate (s).

W1 = Wholesale Price Index for All Commodities (Base Year 2011-12=100) published by Economic Advisor to the Government of India, as on the date of commencement of the period of reckoning. In case the original contract period is extended under Condition 11 of General Conditions of Contracts (IAFW-2249), the price index as applicable on the date of commencement of the last period of reckoning before the original completion date (s) (phase wise except where phasing has been done only for sample quarter/block) shall only be applicable during the extended period. If phasing has been done for only sample quarter/sample block, the price index as applicable on the date of commencement of the last reckoning period before the original completion date of the period as a whole shall only be applicable during the extended period.

Wo = As for W1 but the index as on the last due date of bid submission

Vm2 = Value of material (except cement & steel) upto the last date of the period of reckoning for which price variation is adjustable as worked out as per formula for Vm.

Vm1 = -do- but as on date of immediate preceding period of reckoning

SPECIAL CONDITIONS

Notes:

1. No adjustment, whatsoever, due to variation in prices of materials on account of coming into force of any fresh law or statutory rule or order as provided in Condition 63 of IAFW-2249 or otherwise than provided in this condition shall be made.
2. No adjustment in prices shall be made for any work done with materials brought at site after the original date of completion of the work as mentioned in work order No 01 under contract except as contemplated under definition of C1, S1 and W1 hereinbefore.
3. Periodicity of working out the escalation on account of variation in prices will be three months. The last calculation shall however be done for the value of work at contract rates and materials lying at site for incorporation in the work as on date of completion or extension thereof as mentioned in Note 2 above. Valuation of RARs is to be timed in such a manner that relevant date required for quarterly calculation under this condition is available from RARs. In case on these dates no RAR is preferred by the contractor, dummy RAR would be prepared & shall be kept on record duly technically checked and audited. Amount payable relevant to work done and materials collected in quarter will be worked out after firm whole sale price indices for the relevant quarter are available. Once the amount adjustable for any quarter is worked out, the same shall be adjusted as and along with advance on account payment in the subsequent RAR(s).
4. Any dispute arising out of interpretation or application of this Special Condition shall be referred to the Accepting Officer whose decision shall be final and binding.
5. For the purpose of calculation of retention money, liquidated damages, GST on works contracts deduction of income tax at source and recovery of water charges (in case of un metered supply) the value of contracts as revised by the above price variation will be taken into account.
6. In cases, where value of VM2 - VM1 works out to minus on account of higher utilization of schedule 'B' stores (i.e value of Sch 'B' stores under contract as a whole is higher than KOM value) and the reimbursement on account of variation in prices of materials (except Cement & Steel) works out to be negative in spite of the Wholesale Price Index for All Commodities published by Economic Adviser to Government of India going up from Wo, reimbursement on account of variation in prices of materials shall be treated as "Nil".

21.2 **REIMBURSEMENT/REFUND ON VARIATION IN PRICES IN WAGES OF LABOUR (Condition 63 of IAFW-2249 will not be applicable):**

- 21.2.1 Refer Condition 63 of the General Conditions of Contracts (IAFW-2249)/ Reimbursement/Refund on Variation of Prices. The Condition 63 of the General Conditions of Contracts shall be deemed to be modified to the extent mentioned hereinafter. Increase or decrease in prices consequent on variation in wages of labour shall be adjusted on the basis stipulated hereinafter irrespective of the actual variation in prices- wages of labour to the contractor.
- 21.2.2 LABOUR: The labour component for the work under the contract as whole shall be taken as KL% of the value of the work executed under the contract. Variation in labour wages shall be worked out by applying the following formula:

$$EL = \frac{KL \times Vg1}{100} \times \left(\frac{L1 - L0}{L0} \right)$$

Wherein,

EL = Variation in wages of Labour reimbursement to be made to the Contractor or refund to be made by the Contractor

KL = Constant representing the percentage cost of labour element as compared to the total value of the work under the contract as a whole. **The value of KL for the work shall be 20 (TWENTY)**

VG1 = Gross value of work done at contract rates during the period of reckoning less value of work paid or payable to the Contractor based on actual cost (e.g. star rate(s), work executed under prime cost sum, etc.) during the period of reckoning.

L1 = Minimum wage in rupees of an unskilled adult male mazdoor as fixed under any law, Statutory rule or order as on the date of commencement of the period of reckoning.

SPECIAL CONDITIONS

L0 = As for L1 but the minimum wage in rupees of an unskilled adult male mazdoor as on the bid submission end date. If labour wage on the bid submission end date is increased afterward with retrospective effect, value of L0 shall be fixed keeping in view the following aspects:-

(a) If the increase/decrease in wages of labour are made known to the public by any means of media before the bid submission end date but the same is officially notified thereafter giving retrospective effect, the value of "L0" shall be as per notification though made subsequently.

(b) If a net-wage comprises a fixed basic wage and the living allowance revised from time to time based on Consumer Price Index (CPI) and increased CPI is made known to the public by any means before the bid submission end date, the "L0" will be revised wage corresponding to revised CPI, though the formal notification for the net-wage (considering the revised living allowance corresponding to revised CPI) is made subsequent to bid submission end date.

(c) In case the labour enforcement officer makes the announcement before the bid submission end date but Gazette Notification is made subsequently making wages applicable with retrospective effect, the value of "L0" shall be as per Gazette Notification though subsequently made.

(d) If the increase/decrease in wages of labour is notified/announced subsequent to the bid submission end date with retrospective effect without making the same publicly known by means of publicity/media prior to the bid submission end date, then the value of "L0" shall be as per wage known at the time of bid submission end date.

Notes:

1. The contractor shall within a reasonable time of his becoming aware of any alteration to the payment of wages of labour consequent on fixation of minimum wages under any law, statutory rule or order, give written notice thereof to the GE stating that the same is given pursuant to this Special Condition together with all information relating thereto which he may be in a position to supply.

2. Irrespective of the variation in minimum wages for any category of labour, for the purpose of adjustment under this Special Condition, the variation in minimum wage fixed under any law, statutory rule or order for an unskilled adult male mazdoor, if any, shall only form the basis.

3. Periodicity of working out the variation in wages of labour will be three months commencing from the bid submission end date. The last adjustment for variation in wages of labour shall however, be done for the period upto the date of completion or extended date of completion. Valuation of price adjustment due to increase/decrease in minimum wages under any law, statutory rule or order for the purpose of making reimbursement/refund in RARs, will be timed in such manner that relevant data required for quarterly calculation under this Special Condition is available from the RARs. The first price adjustment in respect of variation in wages of labour will be worked out for the relevant quarter during which alteration to the wages of labour took place. For implementing this provision, the period of reckoning in such quarters will have to be divided into two periods ie the first period up to the RAR payable immediately after the date of variation and the other up to the end of the quarter. Value of L1 at the beginning of the other period shall be the altered wage. If there is more than one change in wages in a quarter, there will be more than two periods of reckoning on a similar basis. Amount payable relevant to work done for any quarter will be worked out after the minimum wage of an unskilled adult male mazdoor as fixed under any law, statutory rule or order for the relevant quarter is available. Once the amount adjustable for any quarter is worked out, the same shall be adjusted in subsequent RAR as "advance on account" adjustments along with adjustment for 'Materials'.

4. No adjustment in prices shall be made for any work done after the due date of completion or extended date of completion on account of extension of time granted under Condition 11 of IAFW-2249 (whichever is later) for the work under the contract.

5. No adjustment, whatsoever due to variation in wages of labour on account of coming into force of any fresh law or statutory rule or order as provided in Condition 63 of IAFW-2249 or otherwise, than provided in this Special Condition shall be made.

SPECIAL CONDITIONS

6. Any dispute arising out of interpretation or application of this Special condition shall be referred to the Accepting Officer whose decision shall be final and binding.

7. For purposes of calculation of retention money, liquidated damages, GST on works contract, deduction of income tax at source and recovery of water charges (in case of unmetered supply) the value of contract as revised by the above price variation will be taken into account.

22. ADVANCES ON ACCOUNT AGAINST MATERIALS WHICH DOES NOT LOSE IDENTITY

22.1 The contractor may be paid advance on account of the full value of the under-mentioned materials brought on the site, on his furnishing Guarantee Bond(s) from a Schedule Bank for the amount of retention money which should otherwise be recoverable from him under the contract.

- [i] Steel
- [ii] Aluminium doors, windows
- [iii] Galvalume sheet
- [iv] SS railing
- [v] Ceramic / Vitrified tiles
- [vi] Steel doors
- [vii] Electrical appliances
- [viii] Sanitary and plumbing items
- [ix] Any other non-perishable item as decided by GE

22.2 The Bank Guarantee Bond(s) shall be executed for a period and on a form as directed by the Accepting Officer. The contractor shall further arrange to extend the period of Guarantee Bond(s) if and when necessary, as directed by the Accepting Officer or shall furnish fresh Guarantee Bond(s) of similar value in lieu.

22.3 It shall be noted that advance on account to the full value to materials brought on the site is permissible only in respect of fittings and fixtures and other manufactured items which do not lose their identity after incorporation in the work.

23. RE-IMBURSEMENT/REFUND ON VARIATION IN "TAXES DIRECTLY RELATED TO CONTRACT VALUE"

23.1 The rates quoted by the Contractor shall be deemed to be inclusive of all taxes (including GST on materials, GST on Works Contracts, Labour Welfare cess/tax, etc.), duties, Royalties, Octroi & other levies payable under the respective Statutes. No reimbursement/refund for variation in rates of taxes, duties, Royalties, Octroi & other levies, and/or imposition/abolition of any new/existing taxes/cesses, duties, Royalties, Octroi & other levies shall be made except as provided in sub para **23.2** below.

23.2 The taxes which are levied by Government at certain percentage rates of Contract Sum/Amount shall be termed as "taxes directly related to Contract value" such as GST on materials, GST on Works Contracts, Labour welfare cess/tax and the like but excluding Income tax. The tendered rates shall be deemed to be inclusive of all "taxes directly related to Contract value" with existing percentage rates prevailing on the bid submission end date. Any increase in percentage rates of "taxes directly related to Contract value" with reference to prevailing rates on the bid submission end date shall be reimbursed to the Contractor and any decrease in percentage rates of "taxes directly related to Contract value" with reference to prevailing rates on the bid submission end date shall be refunded by the Contractor to the Govt/deducted by the Government from any payments due to the Contractor. Similarly imposition of any new "taxes directly related to Contract value" after the bid submission end date shall be reimbursed to the contractor and abolition of any "taxes directly related to Contract value" prevailing on the bid submission end date shall be refunded by the Contractor to the Govt/deducted by the Government from the payments due to the Contractor.

23.3 The Contractor shall within a reasonable time of his becoming aware of variation in percentage rates and/or imposition of any further "taxes directly related to Contract value" give written notice thereof to the GE stating that the same is given pursuant to this Special Condition, together with all information relating thereto which he may be in a position to supply. The Contractors shall also submit documentary proof/information as the GE may require.

SPECIAL CONDITIONS

- 23.4 The Contractor shall, for the purpose of this condition, keep such books of account and other documents as are necessary and shall allow inspection of the same by a duly authorized representative of Government, and shall further, at the request of the GE furnish, verified in such a manner as the GE may require any documents so kept and such other information as the GE may require.
- 23.5 Reimbursement for increase in percentage rates/imposition of "taxes directly related to contract value" shall be made only if Contractor necessarily and properly pays additional "taxes directly related to contract value" to the Government, without getting the same adjusted against any other tax liability or without getting the same refunded from the concerned Government Authority and submits documentary proof for the same as the GE may require.

24. MOBILISATION ADVANCE OPERATED THROUGH ESCROW ACCOUNT

- 24.1 The joint Escrow account for mobilization advance shall be opened in any Nationalised/Scheduled Bank and it shall be operated by the employer's representative i.e. Garrison Engineer (GE) and authorised representative of the contractor. The mobilisation advance into the Escrow account shall be made against a Non-revocable Bank Guarantee (s) for an amount at least 110% of the amount of the mobilisation advance. The mobilisation advance shall be made in two instalments as per the stipulated conditions of the contract agreement.
- 24.2 The employer's representative i.e. GE shall be responsible to operate the account on behalf of Accepting officer and the authorised representative of the contractor will be co-signatory to the account.
- 24.3 Escrow account will be opened by the contractor with the Escrow Agent (Nationalised/Scheduled Bank) with the mobilisation advance paid to the contractor after acceptance of the Bank Guarantee bond(s) of requisite value. The amount of mobilisation advance can be transferred by GE to the Escrow account through digital route.
- 24.4 The payment from Escrow account shall be made to meet bonafide expenditure on the project including the following:-
- [i] Procurement of construction material, stores, equipment and machineries required for the project.
 - [ii] Hiring of service of any nature including skilled/unskilled labour to be employed on the project/muster rolls for payment made on this account.
 - [iii] Repair and maintenance of machinery, tools, plant, vehicle etc., used on the project.
 - [iv] Any other bonafide expenditure, unforeseen but related to the project and verified by the GE.
- 24.5 The payment by the contractor from the Escrow account shall be released by the bank on receipt of written authorisation from GE.
- 24.6 The cash book and e-summary of transaction shall be maintained by the GE office and it will be signed by both the GE and contractor's representative authorized to receive payment.
- 24.7 The internal audit of the Escrow account shall be co-responsibility of GE and the contractor.
- 24.8 The bank charges for opening and operation of Escrow account shall be borne by the contractor.
- 24.9 The cheque shall be issued in the form of crossed cheque to payee's account only. In case of digital transfer of amount of mobilisation advance, an authority letter will be issued by GE to the Accounts Officer.
- 24.10 The Escrow account shall be operated within the provision of terms and conditions of the Escrow agreement. In case of any conflict between the contractor and GE for Escrow account procedure, this agreement shall prevail and the decision of Chief Engineer shall be final and binding.

SPECIAL CONDITIONS

- 24.11 The Escrow account shall be closed immediately on recovery of Mobilisation Advance through and agreed instrument of closure signed by both parties. Government will not bear any liability due to failure to close the account.
- 24.12 By operation of the Escrow account, the contractor is not relieved of his obligations under the contract agreement with respect to completion of the project on time within the amount mentioned in the contract agreement.
- 24.13 The role of Escrow account is limited to ensure smooth flow of finance to the project in hand by channelling project payment for speedy execution of the project. Every Escrow account will be specific to a project and will in no case be used for any other project.
- 24.14 Escrow agreement shall remain in full force and effect so long as amount remain outstanding from the contractor in respect of the mobilization advance or its obligations to Government, unless terminated earlier by the mutual consent of both parties or otherwise in accordance with the provisions contained in this agreement.
- 24.15 An interest free advance of 10% of contract shall be paid into the escrow account by the Department on production of Bank Guarantee(s) on approved form from a nationalized / Scheduled Bank for an amount equal to 110% of the advance. The Bank Guarantee(s) shall indemnify the Government against the Non-refund of Advance and also against default on the Contractor's part in performance of contract.
- 24.16 The first instalment of mobilisation advance shall be 50% of advance and shall be paid to Contractor within 30 days of acceptance of Bank Guarantee(s) of 110% of the same amount furnished by him, by the Accepting Officer. The second instalment of the balance amount shall be paid to the Contractor after 6 month of payment of the first instalment provided bank Guarantee(s) for corresponding amount increased by 10% has /have been furnished by the Contractor, at least one month in advance and accepted by the Accepting Officer.
- 24.17 The total amount of mobilisation advance, together with interest shall be recovered from the payments made to the contractor against "Advance on Account", under condition 64 of IAFW-2249, MES General Conditions of Contracts.
- 24.18 The amount of mobilisation advance shall be recovered in monthly instalments as stipulated hereinafter:-
- [i] Against the first instalment of mobilisation advance, the first instalment of recovery shall be effected from the 'Advance on Account' payment made immediately following the payment of mobilisation advance and the last instalment of recovery shall be effected during the third month preceding the month in which the due date of completion stipulated in the first Work Order falls. The various instalments of recovery shall be of equal amounts.
 - [ii] Against the second instalment of mobilisation advance of the first instalment of recovery shall be effected from the 'Advance on Account' payment made immediately following the payment of mobilisation advance and the last instalment of recovery shall be effected during the third month preceding the month in which the due date of completion stipulated in first Work order falls. The various instalments of recovery shall be of equal amounts. The recovery in instalments of this mobilisation advance shall be in addition to the recovery in instalments of the mobilisation advance (first instalment) vide sub para [i] above.
- 24.19 The Contractor may furnish one Bank Guarantee or a number of Bank Guarantees equal to number of instalments for recovery, each to match the quantum of recovery to be effected from the 'Advance on Account'. In case recovery is not possible to be effected from any particular 'Advance on Account' for reasons of non-submission of claim for payment of 'Advance on Account' or for any other reasons whatsoever, the recovery due shall be made by encashing the Bank Guarantee.
- 24.20 Although interest free advance shall be paid to the contractor by the department, but if contract is terminated due to default of the contractor, the mobilisation advance shall be deemed as interest bearing advance at an interest rate of **12%** to be compounded quarterly.
- 24.21 Before applying mobilisation advance, contractor shall submit the recovery schedule duly signed, to GE who in turn shall scrutinise, certify and submit to Accepting Officer duly recommended for acceptance of Bank Guarantee(s) before making payment.

SPECIAL CONDITIONS**25. QUALIFIED TRADESMEN**

- 25.1 In compliance with Condition 26 of IAFW-2249 (General Conditions of Contracts), the contractor shall employ skilled /semi-skilled tradesmen who are qualified and possessing certificate in particular trade from Industrial Training Institute (ITI)/National Institute Of Construction Management and Research (NICMAR)/National Academy of Construction (NAC) Hyderabad and similar reputed and recognized Institutes by State/Central Government, to execute the works of their respective trades. The number of such qualified tradesmen shall not be less than 25% of total skilled/semi-skilled tradesmen required in each trade. The contractor shall submit a list of such tradesmen along with requisite certificates to GE for verification and approval. Notwithstanding the approval of such tradesmen by GE, if the tradesmen are found to have inadequate skill to execute the work of their trades leading to unsatisfactory workmanship, the contractor shall remove such tradesmen within a week after written notice to this effect by the GE and shall engage other qualified tradesmen after prior approval of GE. GE's decision whether a particular tradesman possesses requisite qualification, skill and expertise commensurate with the nature of work, shall be final and binding. No compensation whatsoever on this account shall be admissible.

26. DISPUTE RESOLUTION BOARD

- 26.1 During execution of the works or after completion or after determination/cancellation/termination of the contract, all disputes between the parties to contract arising out of the contract (except those for which decision of Accepting Officer or any other officer (CWE and/or GE) is expressed to be final and binding), including any disagreement by either party with any action, inaction, opinion, instruction, certificate or valuation by the Accepting Officer or his nominee, the matter in dispute shall, in the first place be referred to the Dispute Resolution Board (DRB). In case of disagreement with the decision of such DRB, any party may invoke arbitration as per contract conditions.
- 26.2 The constitution of the DRB shall be a three member body as under :-
- (i) **Chairman:** Jt DG (C) of the concerned Command Chief Engineer/ADG. Where Jt DG (C) is not posted in the Command/ADG office, any other Chief Engineer/ Brig level Officer posted in CE Command/ADG shall be nominated by Command CE at his sole discretion.
 - (ii) **Member 1:** Col/Director level officers of command/ADG office or any other Zonal CE to be nominated by Command CE/ADG.
 - (iii) **Member 2:** Col/Director level officers of command/ADG office or any other Zonal CE to be nominated by Command CE/ADG.
- 26.3 The name of Chairman and Members shall be notified by the Accepting officer within one month of the date of acceptance of contract. Once the DRB is constituted, the Chairman and Members shall disclose in writing their neutrality and impartiality about any personal interest in the work.
- 26.4 The dispute shall be referred to the Chairman of the DRB by the concerned party after giving notice to the other party for invoking of this clause. The DRB shall decide the dispute in accordance with the terms of the contract, principle of natural justice, equity and fair play. The DRB may fix oral hearing at a place, date and time as decided by the Chairman.
- 26.5 The requisite administrative support to the DRB shall be provided by the Accepting Officer. All the contract documents pertaining to the case shall be provided by the Accepting Officer for reference by the DRB.
- 26.6 DRB shall give its decision on the disputes within three months of notice from any party invoking the DRB clause. This period can be extended by one month with the consent of the parties. All the decisions given by the DRB shall be by majority and such decisions shall be communicated in writing by the Chairman to the parties. If the decision of the DRB is not to the satisfaction of either party or if the DRB fails to give decision within the laid down time, either party shall indicate his reservations to the other party within 30 days of such decision and to refer that dispute for arbitration within the provisions of Condition 70 of IAFW-2249 General Conditions of Contract. It shall be mandatory for the party invoking arbitration on any particular dispute to have first exhausted the remedy provided under the DRB clause for that particular dispute.

SPECIAL CONDITIONS

- 26.7 The mandate of the DRB shall terminate on completion of one year from the date of completion/ determination/ cancellation/ termination of the contract.
- 26.8 If any member or Chairman of the DRB is unable to function due to any reason whatsoever, or he resigns his appointment, Chief Engineer Command/ADG as the case may be, shall fill the vacancy so caused within 15 days of the occurrence of such vacancy. Any dispute referred to the DRB and having been decided by the DRB and not objected to by either party within 30 days shall attain finality and shall not be referable to arbitration.
- 26.9 Accepting Officer shall ensure implementation of the decisions of the DRB which attain finality, ie except those which are objected to by him or by contractor within 30 days as per Para 12 above. The amount so decided shall be processed as per AIP and the authority be mentioned as 'decision of DRB'.
- 26.10 Findings and decision of DRB shall be admissible as evidence, to the extent permissible as per law, in the subsequent arbitration and/or litigation. DRB Chairman/members shall not, in any case, be liable to be called as witness or to produce any evidence in any Arbitration or departmental proceedings of any kind.
- 26.11 During execution of work the disputes may be referred to the DRB as per the requirement of each party after having exhausted the decision making process provided in the contract. In case of completion of work or after determination/cancellation/termination of the contract all the disputes including payment/ non-payment /delay in final bill shall be simultaneously referred to the DRB within six months of completion/determination/ cancellation/termination of the contract.

27. EMPLOYMENT OF PERSONNEL:

- 27.1 Contractor shall employ only Indian Nationals as his representatives, servants and workmen after verifying their antecedents and loyalty. He shall ensure that no person of doubtful antecedents and nationally is, in any way, associated with the work. As a proof that the contractor has employed only Indian Nationals, he shall render a certificate to GE within one month from the date of acceptance of tender to this effect. In case the GE desires, the contractor will have the police verification done of personnel employed by him. If for reasons of technical collaboration or other considerations the employment of foreign national(s) is unavoidable, the contractor shall furnish full particulars to this effect to the Accepting Officer at the time of submission of the tender.
- 27.2 The GE shall have full powers and without giving any reason to order the contractor immediately to cease to employ, in connection with his contract, any agent, servant or employee whose continued employment is, in his opinion, undesirable. The contractor shall not be allowed any compensation on this account.
- 27.3 The contractor's attention is also drawn to condition 25 of IAFW-2249 in this connection.

28. STACK MEASUREMENTS

- 28.1 Aggregates required for the work shall be stacked at suitable level places and their measurements recorded in measurement book and signed and dated by the MES representative and the contractor as a check to ensure that the required quantities have been brought to site for incorporation in the work. No deductions shall be made in the stack measurement for unevenness of ground.
- 28.2 This provision, however, shall not absolve the contractor from providing more materials required to complete the work to the required specification and satisfaction of GE.

29. RECORD OF CONSUMPTION OF CEMENT

- 29.1 The contractor shall maintain a well bound register with serially numbered pages with all pages initialled by Engineer-in-Charge against numbering showing quantities of cement received, used in work and balance at the end of each day. The form of record shall be as approved by Engineer-in-Charge. The register shall be signed daily by representatives of MES and the contractor in token of verification of its correctness and will be checked by Engineer-in-Charge, at least once a week and on the days cement is brought to site by the contractor.
- 29.2 The aforesaid provision will not however, absolve the contractor of his responsibility to justify the consumption of cement at the time of finalisation of his accounts.

SPECIAL CONDITIONS

29.3 The register shall be kept at site in safe custody of the contractor's representative during the progress of the work and shall on demand be produced for verification to the inspecting officer(s).

29.4 On completion of the work the contractor shall deposit the cement register with the Engineer-in-Charge for record.

30. ROYALTIES

30.1 Reference Condition 14 of General Conditions of Contracts (IAFW-2249). No quarries on Defence land are available.

31. LABOUR (REGULATION & ABOLITION) ACT

31.1 Contract labour (Regulation & Abolition) Act 1970 is applicable to MES Contractors. Rates quoted by the tenderer shall be deemed to take into account the cost, etc., required to comply with the provisions contained in the said act and the rules framed under the said act.

31.2 Refer Condition 58 of IAFW-2249. The 'Schedule of Minimum Wages' as published vide Govt. of India Notification as applicable on date of receipt of tender forms part of these tender documents. However, the Contractor shall not pay wages lower than minimum wages for labour as fixed by the Govt. of India/ Union territory under Minimum Wages Act or Contract Labour (Abolition and Regulation Act), whichever is higher.

31.3 The fair wages referred to in condition 58 of IAFW-2249 will be deemed to be the same as the minimum wages referred to above as upto date from time to time.

31.4 Schedule of Minimum Wages is not enclosed along with the tender documents. However Contractor shall be deemed to have verified the minimum fair wages payable as on the last due date of the receipt of the tender.

31.5 The Contractor shall have no claim whatsoever, if on account of local factors and/or regulations, he is required to pay the wages in excess of minimum wages as described above during the execution of work.

32. MINOR CONSTRUCTIONAL DETAILS

32.1 Unit rates / lump sum quoted by the Contractor shall be deemed to allow for all minor constructional details which are not specifically shown on drawings or given in the Particular Specifications but are essential for the execution of work and services in workman like manner and sound construction. In case of difference of opinion between the Contractor and the Garrison Engineer as to whether or not certain items of work constitute 'Minor Constructional Details' which are deemed to have been included in the Contractor's quoted lump sum, the decision of the Accepting Officer shall be final, conclusive and binding.

33. LOCATION OF BUILDINGS AND WORKS

33.1 There may be some changes in location/ siting of buildings shown in site (layout) plan(s) to suit local conditions and/ or departmental requirements. The Contractor shall have no claim what-so-ever consequent to such changes in the location/ siting of works.

34. OFFICIAL SECRETS ACT

34.1 The Contractor shall be bound by the Official Secrets Act, 1923

35. SIGNING OF TENDER

35.1 The person signing the tender on behalf of another partner or on behalf of a firm shall attach with the tender a proper power of attorney duly executed in his favour by such other person or by all the partners, stating that he has authority to bind such other person(s) or the firm as the case may be in all matters pertaining to the contract including arbitration clause.

36. OUT OF POCKET EXPENSES

36.1 No out of pocket expenses incurred by the tenderer in submitting his tender shall be reimbursed whether his tender is accepted or not.

SPECIAL CONDITIONS

37. MATERIALS IN METRIC SIZES

37.1 If the material (other than those issued under Schedule 'B') are not available in metric sizes as shown on drawings, the contractor shall provide materials in equivalent inch sizes which would not be less than the metric size dimension under any circumstances, at no extra cost to the Government.

38. INTER STATE MIGRANT WORKMAN ACT 1979

38.1 The tenderer shall be fully conversant with the above act and take necessary steps to implement the same effectively. The tenderer shall intimate the number of workmen (skilled/ unskilled) to be inducted/ imported and total number of labour employed locally at site immediately after issue of work order. Immediately after completion of the work, workmen inducted from mainland shall be repatriated. Prior permission shall be obtained if the imported/ inducted workmen are required to stay back for rectification of work if any after the date of completion and handing over the work to the department. The tenderer shall produce necessary documents for verification and authentication of having repatriated the imported labour. Suitable amount shall be retained in the final bill and will be released only after the Accepting Officer is fully satisfied for the return of the imported labour to main land. Decision of the GE shall be final and binding on this account.

39. LABELING OF ARTICLES

39.1 Contractor shall provide aluminium label of not less than 75mmx25mm and of adequate gauge with brass screws on major E/M articles (like Transformer, Panel board, Generating set, VCB etc.,) indicating there on the name of the firm, the contract No. and year, as directed by GE. The cost of such aluminium labels shall be deemed to be included in the quoted rates against respective item of Schedule 'A'.

40. PHOTOGRAPHY AT WORK SITE

40.1 The contractor shall submit colour photographs of various stages of construction at the work site in properly bound album (No of sets – 03 (Minimum 36 photographs in each set, Size of Photograph – 4" x 6", CD/DVD) all as directed by GE.

41. PROJECT INFORMATION

41.1 The contractor shall provide a stone engraved plaque of adequate dimensions indicating the following information at work site as directed by GE: Job No, CA No and year, Name of work, Name of Contractor, Name of GE, Name of EIC/JE, Date of Commencement, Date of Completion phase wise, Date of expiry of defects liability period.

- [i] Job No.
- [ii] CA No.
- [iii] Name of work.
- [iv] Name of contractor.
- [v] Name of GE.
- [vi] Name of Engineer-in-Charge.
- [vii] Date of commencement.
- [viii] Detail of completion phase wise.
- [ix] Date of expiry of defects liability period.
- [x] Date of expiry of warranty period given against ATT, water proofing etc.

42. DIGITAL RECORDS

42.1 During execution of works, records of all hidden works, deviation and important stages of work shall be maintained using digital photography duly signed by AGE, GE and Contractor. All such records shall be submitted to higher authorities when called for and/or for verification during finalization of DOs. These records need to be produced as a proof by the GE/AGE in case of disputes. The decision of the GE with regard to recording of part/portion or full details of hidden works, deviation and important stages of works shall be final and binding. In case of dispute between the GE and Contractor with regard to measurements/finalization of DO's (in respect of recorded works) the decision of Accepting Officer shall be final and binding.

42.2 Contractors shall consider all such provisions in their quotation before quoting the tender and their quoted rates shall deemed to include all the incidental expenses (direct or indirect) required for such provisions and nothing extra will be entertained on this account.

SPECIAL CONDITIONS

43. SUPERVISORY STAFF

- 43.1 The contractor has to engage following staff to supervise and execute the work in terms of contract provisions:-
- [a] One Degree holder in Civil Engineering from Government recognized Institution with at least 8 years practicable experience in similar works
 - [b] One Degree holder in Electrical Engineering from Government recognized Institution with at least 5 years practicable experience in similar works
 - [c] Three Diploma holders (02-Civil, 01- Electrical / Mechanical) from Government recognized Institution with at least 5 years practical experience of works
 - [d] One of the engineer should have capability to use Project Management Software like MS Projects/Primavera in all projects with minimum experience of 5 years
 - [e] One Qualified / Experienced Lab Technician
- 43.2 Contractor shall obtain approval from Engineer in Charge/GE for the above Engineering Establishments before commencement of work.
- 43.3 The above does not absolve the responsibility of the contractor for deploying more Engineering / supervisory staff as per actual requirement to complete the project within the stipulated time. No additional payment will be made if more staff / establishment is utilized for execution of work by the contractor.
- 43.4 The other provisions given in condition 25 of General Condition of contracts shall hold good and shall be binding on the contract.

44. TOOLS & PLANTS

- 44.1 Contractor shall mobilise the following T&P at site for execution of work:-

<u>Ser No</u>	<u>T&P Required</u>	<u>Minimum Quantity</u>
[a]	Computerised semi-automatic concrete batching plant of 20 Cum/ hour output with printing facility	01 No
[b]	Vibrators (Needle and Plate type)	10 Nos
[c]	Steel shuttering with spans, props etc. (sqm)	3000 Sqm
[d]	Trucks/Tippers	02 Nos
[e]	Concrete cube testing machine (Hydraulically operated)	01 No
[f]	Transit Mixers	01 No
[g]	Concrete Pumps	02 Nos
[h]	Concrete mobile weigh batchers	02 Nos
[j]	Loader cum excavator	01 No

- 44.2 The above list does not absolve the responsibility of the contractor for deploying more T&P as per actual site requirement to achieve desired progress so as to complete the project within the stipulated time. No additional payment will be made if more T&P is utilized for execution of work by the contractor.

SPECIAL CONDITIONS**45. DEFECT LIABILITY PERIOD**

- 45.1 Refer Condition – 46 of IAFW – 2249, General Conditions of Contracts. The Defects Liability Period for this work shall be **24 [Twenty Four] Calendar Months** from the certified date of final completion of the work.

46. TESTING OF MATERIALS

- 46.1 If facility for testing of building materials for any particular test is not available in the site laboratory, the same shall be got tested in the Command testing laboratory (CTL) and if not available in CTL, the same shall be got tested in National Test House/SEMT WING/Engineering collage at the discretion of Garrison Engineer. All expenses for testing shall be borne by the contractor.

- 46.2 TESTING FREQUENCY: The materials listed in Appendix 'A' shall be tested as per the frequency indicated therein.

- 46.3 Level of testing shown in legend as A,B & C are defined as under:-

46.3.1 Level 'A':

- [a] "Site Lab" means own site lab established by contractor at the work site for such tests. This lab shall house all the facilities including T & P, machinery, equipment, and manpower etc, required for conducting tests. Competent technical representative as approved by the GE shall be employed by the contractor to man the laboratory. This lab shall be operative for the entire duration of the contract till its completion. Tests shall be carried out in the presence of Engineer-in-Charge or any other departmental official to be nominated by the GE. Random check of compliance of frequency of testing shall be done by GE. Setting up site laboratory is mandatory for all works costing Rupees One Crore and above. The contractor may at his option set up site laboratory for works costing less than Rs.1 Crore (Rupees one crore) also without any extra cost to Government.
- [b] Record of these tests shall be maintained at work site. These test result shall be signed by contractor or his authorised representative and aforesaid departmental official. Random check shall be done by GE also and shall sign the same in token of the check.
- [c] Within 15 days of placement of work order No 1, site lab shall be established and fact reported by the contractor to GE in writing who will verify the fact and satisfy himself of the facilities provided. Thereafter, GE shall issue a certificate to this effect in writing listing out equipment particulars etc., of each material test. Only after issue of this certificate by GE, the tests shall be carried out and materials so approved shall be incorporated in the work.
- [d] Manpower, material and infrastructure like electricity etc, required for conducting these tests shall be provided by the contractor.
- [e] Tenderer is deemed to cater for above provisions in his quoted rates.
- [f] Remedial measures, if any, required to achieve/obtain desired results for each tests shall be taken promptly by the contractor. Quoted rates are deemed to be included for this eventuality and nothing extra shall be payable to the contractor. No extension of time shall be admissible on this account.
- [g] Rate per test given are applicable for recovery in case of unavoidable circumstances where some tests as per laid down frequency could not be done and in the opinion of the GE non-performance of these tests do not affect quality control. However, in case GE in his opinion considers that contractor is purposely not adhering to laid down frequencies of tests, he shall reserve the right to get it tested in Zonal lab or any other lab as deemed fit and make penal recovery form RAR which shall be double the rate of testing charges indicated or testing charges actually paid to lab whichever is higher. GE's decision, in this regard, shall be final and binding.

SPECIAL CONDITIONS

46.3.2 **Level 'B':**

- [a] "Zonal Lab" means any Command testing laboratory of MES.
- [b] The tests shall be conducted as per frequencies laid down for these tests in these labs for which contractor shall provide all requisite facilities like samples, cubes, material etc, transportation to these labs for testing purpose. It will be contractor's responsibility to adhere to the laid down frequency of testing. Test results shall be sent by lab to the GE whose copies can be made by contractor at his own expense. Testing charges for the tests so conducted shall be recovered at the rates indicated from the running payments. The contractor's quoted rates are deemed to include for above provisions.
- [c] Provision of Para [g] above of level 'A' shall be applicable to level 'B' also.

46.3.3 **Level 'C':**

- [a] Level 'C' stands for National Test House / SEMT Wing Pune located in CME Pune – 31 / Govt Approved Laboratories / NABL Accredited Laboratories / Regional Research Laboratories / IIT / National Institute of Technology where such facilities exist.
- [b] Test provisions contained in Para [b] of level 'B' above shall be applicable here except that contractor shall make necessary arrangement for transportation etc, to hand over the samples to these labs. Test results shall be forwarded to GE by these labs directly. The testing charges payable to these labs for conducting these tests shall be borne by the contractor and his quoted rates are deemed to include this provision.
- [c] Provision of Para [g] above of level 'A' shall be applicable to level 'C' also.

- 46.4 In case the contractor has not set up the site laboratory and the tests are carried out in Zonal or any other laboratory, the recovery shall be made at the applicable rates indicated hereinafter.
- 46.5 In case non-availability of testing facilities in MES Lab, the tests shall be conducted in any outside approved labs. Testing charges of materials/cubes carried out in approved laboratory shall be as per actual and shall be directly borne by the contractor.

47. **OUTPUT OF ROAD ROLLER:** (Reference Condition 15 OF IAFW - 2249).

- 47.1 The contractor shall maintain a logbook for each road roller and shall be maintained by him for recording hours of working of the road roller. Entries in the logbook shall be signed by the Contractor or his authorised representative and by the Engineer-in-Charge.
- 47.2 To ensure proper consolidation, roller must work for at least the number of days assessed, on the basis of output given hereinafter. If the roller has not worked for the number of days so assessed, recovery shall be effected from the contractor for the number of days falling short of the days assessed on the basis of output stipulated. The recovery shall be effected at Rs.2500.00 per working day of 8 hours for 8 to 12 tonne roller.
- 47.3 The above provision shall not, however, absolve the contractor of his responsibility of properly consolidating surfaces as required under the provisions of the contract.
- 47.4 Output of Road Roller per day of Eight hours.

(a)	Consolidation of formation surfaces/sub grade.	:	1850 Sqm
(b)	Consolidation of water bound macadam (stone metal) 10cm compacted thickness including spreading and consolidation with binding material.	:	165 Sqm
(c)	-do- but 7.5cm -do-	:	248 Sqm
(d)	Consolidation of premixed carpet 2.50cm thick	:	600 Sqm
(e)	Consolidation of soling of crushed or broken stone- spread thickness 100mm	:	1200 Sqm
(f)	Consolidation of soling of crushed or broken stone- spread thickness 200mm	:	518 Sqm

SPECIAL CONDITIONS

(g)	Consolidation of 20mm thick premixed carpet including seal coat	:	744 Sqm
(h)	Premix bituminous macadam	:	15 Cum

47.5 Regarding output of Road Roller in respect of other items catered in CA, GE shall order a board of Officers and ascertain the required output of Road roller to achieve the desired / specified compaction over a trial area which will be the basis for the remaining corresponding works.

SIGNATURE OF CONTRACTOR

AAD (Contracts)
For Accepting Officer

SPECIAL CONDITIONS

Appendix 'A'

MATERIALS & TESTS

Sl No	Material	Tests	Method of testing	Frequency of tests	Level of test	Rate	Remarks												
1	2	3	4	5	6	7	8												
1.	Brick	1) Compressive strength	IS-3495 (Part-II)	As per IS-5454 as given under: -	A	180/-	Checks for visual and Dimensional characteristics shall also be carried out as per IS:5454												
		2) Water Absorption	IS-3495 (Part-II)	Lot Size.	A	150/-													
		<table><tr><td>Lot Size</td><td>Sample size</td><td>Permissible Nos of defective bricks</td></tr><tr><td>1001 to 10000</td><td>5</td><td>0</td></tr><tr><td>10001 to 35000</td><td>10</td><td>0</td></tr><tr><td>35001 to 50000</td><td>15</td><td>1</td></tr></table>			Lot Size	Sample size		Permissible Nos of defective bricks	1001 to 10000	5	0	10001 to 35000	10	0	35001 to 50000	15	1		
Lot Size	Sample size	Permissible Nos of defective bricks																	
1001 to 10000	5	0																	
10001 to 35000	10	0																	
35001 to 50000	15	1																	
		3) Efflorescence	IS-3495 (Part-I)	10001 to 35000	A	180/-													
				35001 to 50000	15	1													
2.	Coarse Aggregate	1) Sieve Analysis	IS: 2386(Part-I)	One test for every 15 cum of aggregates or part there of brought to site.	A	120/-													
		2) Flakiness Index	IS: 2386(Part-I)	One test for every 100 cum of aggregates or part there of brought to site.	A	90/-													
		3) Estimation of deleterious materials	IS: 2386(Part-I)	One test for every 100 cum of aggregate or part thereof.	A	120/-													
		4) Organic impurities	IS: 2386(Part-I)	One test per source of supply	C	120/-													
		5) Moisture content	IS: 2386 (Part-II)	Regularly as Required.	A	120/-													
		6) Specific gravity	IS: 2386 (Part-II)	One test for each source of supply.	B	120/-													
3.	Fine aggregate	1) Sieve Analysis	IS: 2386 (Part-I)	One test for every 15 cum of FA or part thereof when brought to site.	A	180/-													
		2) Test for clay, silt and impurities.	IS: 2386 (Part-I)	One test for every 15 cum of FA or part thereof when brought to site.	A	90/-													
		3) Specific gravity	IS: 2386 (Part-II)	One for each source of supply	B	180/-													
		4) Test for organic impurities	IS: 2386 (Part-II)	One test for each source of supply.	C	180/-													
		5) Moisture content	IS: 2386 (Part-II)	Regularly as required subject to 2 tests/per day when being used.	A	180/-													
4.	Cement	1) Setting time	IS-4031-63 Reaffirmed 1980	Once for each consignment or as and when Required.	B	180/-													
		2) Soundness	IS-4031-63 Reaffirmed 1980	Once for each consignment or as and when Required.	B	120/-													
		3) Compressive strength	IS-4031-63 Reaffirmed 1980	Once for each consignment or as and when Required.	B	360/-													
		4) Fineness	IS-4031-63 Reaffirmed 1980	Once for each consignment or as and when Required.	B	120/-													

SPECIAL CONDITIONS

Appendix 'A' (Contd.....)

MATERIALS & TESTS

1	2	3	4	5	6	7	8												
5.	Structural concrete	1) Slump test or compacting factor test or VEE-BEE time	IS-1119	The Min frequency of sampling of concrete of each grade shall be as under :-	A	180/-	(1) Random sample shall be carried out to cover mixing units. (2) As per IS-456-2000 Clause. 14 for frequency of sampling.												
		2) Compressive strength	IS-516		A	120/-													
		<table><tr><td>Qty of Conc. in the work (M³)</td><td>No of samples</td></tr><tr><td>1 - 5</td><td>1</td></tr><tr><td>6 - 15</td><td>2</td></tr><tr><td>16 - 30</td><td>3</td></tr><tr><td>31 - 50</td><td>4</td></tr><tr><td>51 and above</td><td>4+1 for each Addl 50 Cu M. or part thereof</td></tr></table>			Qty of Conc. in the work (M³)	No of samples	1 - 5	1	6 - 15	2	16 - 30	3	31 - 50	4	51 and above	4+1 for each Addl 50 Cu M. or part thereof			
Qty of Conc. in the work (M³)	No of samples																		
1 - 5	1																		
6 - 15	2																		
16 - 30	3																		
31 - 50	4																		
51 and above	4+1 for each Addl 50 Cu M. or part thereof																		
6.	PCC Blocks for walling (Hollow blocks)	1) Compressive strength	IS: 2156-1984 (Appx 'B')	8 Blocks out of 14	A	60/-	Samples: 14 blocks from consignment of every 5000 blocks or part thereof.												
		2) Water absorption	IS: 2156-1984 (Appx 'E')	3 Blocks out of 14	B	120/-													
		3) Density	IS: 2156-1984 1237 (Appx 'A')	3 Blocks out of 14	B	90/-													
7.	PCC Blocks for walling (Solid blocks)	1) Compressive strength	IS: 2185	12 Blocks out of 18	A	60/-	Samples: 18 blocks from consignment of every 1000 blocks or part thereof. These blocks to be checked for dimension and weight												
		2) Water absorption	IS: 2185	3 Blocks out of 18	B	120/-													
		3) Density	IS: 2185	3 Blocks out of 18	B	120/-													
8.	Cement flooring Tiles/ Terrazzo tiles	1) Water absorption	IS: 1237 (Appx 'D')	6 Tiles out of 18	B	180/-	Samples: 18 Tiles from each source of supply selected at Random.												
		2) Wet Transverse strength	IS: 1237 (Appx 'E')	6 Tiles out of 18	B	144/-													
		3) Resistance to wear	IS: 1237 (Appx 'F')	6 Tiles out of 18	C	540/-													
9.	Timber	1) Specific gravity and weight	IS: 1708-1960	Minimum 3 samples from a lot of 4 Cum or 250 pieces of seasoned timber.	B	120/-													
		2) Moisture content	IS: 1708-1960		A	120/-													
10.	Water for Construction purpose	1) Test for acidity	IS: 456 & 3015	Once at the stage of approval of source of water	B	240/-	Also refer clause 4.3 of IS-456 and its subsequent sub clauses regarding suitability of water.												
		2) Test for alkalinity	IS: 456 & 3015		B	240/-													
		3) Test for Solid content	IS-456 & 3015		C	300/-													

SPECIAL CONDITIONS

Appendix 'A' (Contd....)

MATERIALS & TESTS

1	2	3	4	5	6	7	8
11.	Welding of steel work	Visual inspection Test.	IS:822-1970 Clause-7.1	100% by visual inspection	Work site	360/-	Specialised tests, their method and frequency to be decided on consideration of their importance by the Accepting Officer.
12.	Timber panelled and glazed Door /window shutters (including factory made shutter)	a) Dimensions, sizes workmanship and finish	IS:1003-1977 (Pt-I)	Frequency of sampling from each lot shall be as under: -	A	180/-	
				Lot size	Sample Size		
				26 to 50	5		
				51 to 100	8		
				101 to 150	13		
				151 to 300	20		
				301 to 500	32		
				501 to 1000	50		
				1001 and above	80		
		b) STRENGTH TEST					
		1) Slamming	IS: 1303-1990	From each lot 5% of the factory made shutter shall be Manufacture tested for strength tests.			
		2) Impact Indentation	IS: 1303-1990				
		3) Shock Resistance	IS: 1303-1990				
		4) Edge Loading	IS: 1303-1990				
13.	Ply Wood (IS:303-1989)	a) Moisture content	IS: 1734-1983 (Pt-I)	Six test pieces cut from each of the boards selected as per table-I shall be subjected to tests.	C	240/-	SAMPLING shall be as per IS-7835-1975 Table-2.
14.	Wood Particle Board (Medium Density) IS: 3097	a) Density	IS: 635 (Pt-I)	3 test specimen from each sample (Size 150mm x 75mm)	A	60/-	Sampling shall be done as per IS: 3487-83 clause 2 with moisture meter.
		b) Moisture content	IS: 2360 (Pt-3)	3 test specimen from each sample (Size 150x75mm)	A & B	60/-	
		c) Water absorption	IS: 2360 (Pt-16)	3 test specimen from each sample Size 300x300mm)	A	60/-	
		d) Swelling due to surface absorption	IS: 2360 (Pt-17)	3 test specimen from each sample (Size 125x100mm)	A	60/-	
		e) Swelling in water	IS: 2360 (Pt-17)	3 test specimen from each sample Size 200x100mm)	A	60/-	
		f) Modulus of rupture	IS: 2360 (Pt-IV)	Three test specimens as per IS: 2380-1977	B	90/-	
		g) Screw withdrawal strength	IS: 2360 (Pt-IV)	Three test specimens as per IS: 2385	C	120/-	
15.	Ceramic tiles/glazed tiles	(i) Water absorption Test		6 Tiles out of 18	B	180/-	Samples: 18 tiles from each source of supply selected at random

PARTICULAR SPECIFICATIONS**1. GENERAL**

- 1.1 Work under this contract shall be carried out in accordance with Schedule 'A', Particular Specifications, Drawings and general specifications and other provisions in MES Standard Schedule of Rates (here-in-after called MES Schedule) **2009 Part-I (Specifications) & 2020 Part-II (Rates)** read in conjunction with each other including amendments and errata.
- 1.2 Term "General Specifications" referred to herein before as well as referred to in IAFW-2249 (General Conditions of Contracts) shall mean the specifications contained in the MES Schedule 2009 Part-I (Specifications).
- 1.3 General Rules, Specifications, Special Conditions and all preambles in the MES Schedule shall be deemed to be applicable to the work under this contract, unless specifically stated otherwise in these documents in which case the provisions in these documents shall take precedence over the aforesaid provisions in the MES Schedule. The term 'as specified' wherever appears in tender documents and drawings, relates to relevant particular specifications and in its absence general specifications. All references to MES Schedule (Standard Schedule of Rates) in these specifications relate to 2009 Part-I (Specifications) of MES Schedule unless otherwise mentioned. References to only some paragraphs of MES Schedule have been made in these particular specifications but other paragraphs and provisions as applicable are also to be followed for all sections/parts of Schedule 'A' even though not particularly mentioned hereinafter.
- 1.4 Where specifications for any item of work are not given in MES Schedule or in these particular specifications, specifications as given in relevant Indian Standard or Code of Practice or specification given by MoRTH's as applicable shall be followed.
- 1.5 Any drawing, which is mentioned on the drawings forming part of the tender but not specifically mentioned in the list of drawings, shall be deemed to be forming part of the tender. The tenderer shall see such drawings/details in the office of Accepting Officer/GE.
- 1.6 Rate quoted for a particular item and/or Lumpsum quoted by the tenderer shall be deemed to include for any minor details/items of work and/or constructions which are obviously and fairly intended and which may not have been included in these documents but which are essential for the execution and entire completion of the work. Decision of the Accepting Officer as to whether any minor details of work and/or construction is obviously and fairly intended to be included in the contract or not shall be final, conclusive and binding.

2 RESPONSIBILITY FOR CARRYING OUT / SETTING OUT THE WORKS

- 2.1 The responsibility for carrying out the works and the methods to be adopted under this contract shall solely rest with the contractor, subjected always to the approval of contractor's proposals by GE. Such approvals shall not however relieve the contractor in any way of his responsibility for proper execution of work, in accordance with contract.
- 2.2 The contractor shall be responsible for the proper setting out of the works in relation to fixed units, lines and levels of reference given by the GE. If at any time during the progress of works, any errors appear on alignment of any part of the works, the contractor shall rectify such errors at his own expenses, to the satisfaction of the Engineer-in-Charge. The checking of any setting out or any line or level by the Engineer-in-Charge shall not, in any way relieve the contractor of his responsibility for the correctness thereof. All the necessary instruments, survey instruments, materials such as strings, nails & pegs etc., and labour required in connections with the setting out shall be provided by the contractor. The contractor shall carefully protect and preserve all benchmarks, site rails, pegs and other things used in setting out the works for the period as directed by GE.

3 EXCAVATIONS AND EARTH WORK

- 3.1 **PREPARATORY WORK/ SITE CLEARANCE** Before commencement of excavation work, the contractor shall take the existing ground levels of the entire site at an interval of 3.00m grid. Permanent bench marks at floor level of existing permanent buildings or any permanent structures shall be taken and permanently marked. Intermediate bench marks as required shall also be marked in the existing or any permanent structures and recorded for reference purpose. Photographs showing these marks shall be taken and kept on record.

PARTICULAR SPECIFICATIONS

The level sheets shall be prepared for each building site in separate level sheets showing original ground levels at 3 m grid intervals. Building location shall be marked on these level sheets showing the proposed GL to be achieved for construction of building/Structures. The proposed finished GL (after cutting or filling) shall be finalized, in such a way that earth work in cutting/filling are balanced.

Proposed GL and FFL for each building and external services such as roads, culverts, sewage disposal, area drainage and information such as invert level of manholes, drains, culverts etc, required for proper execution of the work shall also be marked in the level sheet in different colours for easy identification. Calculation of approximate quantities of filling and cutting shall be worked out separately taking the average GL for filling/cutting areas and considering the proposed GL to be achieved. Approximate quantities shall be worked out based on average levels at this stage for obtaining approval of building levels/ layout expeditiously. However, after execution of work for the purpose of payment final calculation for arriving the quantity of earth work shall be worked out using Simpson's formula.

Detailed photographs of site shall be taken including permanent/intermediate, bench mark locations and prints made for record showing the existing site duly marking the layout of buildings with flags on all boundaries/four comers.

Level sheets as described here in before duly signed by both parties i.e, Engineer in Charge, GE and the contractor shall be submitted duly countersigned by CWE to the Accepting Officers for approval.

Final decision of the Accepting Officer on proposed levels shall be decided based on the quantities so calculated. Existing ground levels will not be altered till written approval of Accepting Officer on the levels to be followed is given, based on the level sheets and calculation of approximate quantities of earth work submitted as above.

Finalisation and approval of building levels shall be completed as phase-I of the work within a period as per phasing given under Sch 'A' Notes. Accordingly the level sheets as mentioned here-in-before shall be submitted to Accepting Officer for approval prior to the completion period of Phase-I, leaving adequate time for scrutiny and approval.

3.2 SURFACE EXCAVATION & SURFACE DRESSING Before setting out the building and structures and commencing the construction, the contractor shall carry out the preparatory work, such as removal of grass, vegetation etc., to the entire satisfaction of Engineer-in-Charge. This will be carried out to a distance of upto 3M beyond plinth protection/ramp/hard standing outside building and structures (whichever is applicable), as may be necessary, including removal of rubbish upto a distance of 50metres beyond the periphery of area under clearance the cost of which is deemed to be included in surface excavation/surface dressing, which shall be included in lumpsum quoted.

3.3 EXCAVATION - GENERAL

(a) Lumpsum quoted against Schedule 'A' Part-I shall include excavation and earthwork in any type of soil or soft disintegrated rock. If any other strata are met with in excavation, the same shall be adjusted through DO. The surplus soil shall be removed to a distance not exceeding 50metres.

(b) Excavation shall consist of excavation, removal and satisfactory disposal of materials as included in relevant schedule and with all lift necessary for the works covered under Schedule 'A' meeting requirements of specifications here-in-after. These works shall include the hauling and stacking of or hauling to sites of embankment and sub grade construction of suitable cut materials in the specified manner and the trimming and finishing of the ground to the specified dimensions and as directed.

(c) Where the excavated materials is directed to be used in the construction of embankment, it shall be directly deposited at the required location complying with the requirements of embankment and sub grade that the capacity of cutting, haulage and compaction equipment is nearly the same.

(d) **PREPARATION OF CUT FORMATION**: The cut formation, which serves as a foundation base, shall be prepared to proper line and level as directed by GE. Any loose pockets shall be well compacted. Any unsuitable material encountered at the formation level shall be removed to

PARTICULAR SPECIFICATIONS

a depth indicated by the GE and replaced with suitable material as approved and directed by GE and compacted in accordance with embankment and sub grade construction.

(e) Bailing/pumping of water where required shall be carried out as described in clause 3.17 of MES Schedule 2009 Part-I (Specifications). The cost of such work as may be necessary shall be deemed to be included in the contractor's lumpsum.

(f) In case timbering to excavation is required and specifically ordered by the GE in writing, it shall be paid as deviation.

(g) If rock (soft/disintegrated and hard) is met at site, contractor shall immediately notify the fact to the GE in writing, who will after due verification, regularise the change through a proper deviation order.

(h) Excavation in hard rock shall be done by chisel cutting or by using mechanical plant. Blasting shall not be permitted. Hard rock shall be stacked separately. The hard rock shall become contractor's property after measurements of the stacks are recorded in MB and approved by GE. Recovery for the hard rock becoming contractor's property shall be made at the supply only rates enhanced by the deviation percentage over SSR for boulders 7 to 15cm dia irrespective of the actual size of boulders/aggregate obtained. Measurement of stone for credit purpose shall be stack measurements without deduction for voids

(j) If, during excavation for foundations, black cotton soil is met with, the matter shall be brought to the notice of the GE immediately in writing by the Contractor. Any additional work in foundation and plinth, necessitated as a result of presence of black cotton of soil shall be specifically and separately ordered in writing by the GE and the same shall be regularized as deviation order.

(k) Surface excavation shall not be more than 30cm deep and averaging 15cm deep and getting out. The GL (Ground Level) marked in drawings shall be that obtained after surface excavations.

- 3.4 **DEWATERING:** No extra payment over subject work shall be admissible for dewatering, if water is met with or accumulated in the foundations or any other excavations due to any cause whatsoever and for excavation in mud. Bailing and pumping of water, if required, shall be done as described in Para 3.17 of MES Schedule Part-I.

PARTICULAR SPECIFICATIONS

3.5 For buildings/structures catered under Schedule 'A' Part-I, where building are to be constructed on made up ground level i.e. ground level shown in drawings as MGL, all earth work and excavation i.e., cutting and filling etc., required to bring the natural ground level to made up ground level; shall be measured and paid separately under Schedule 'A' Part-II.

3.6 **DISPOSAL OF SOIL**: Surplus soil/useless soil obtained from excavation in foundation of buildings and soil obtained from surface dressing shall be removed to outside of MoD land without any extra cost to Department.

3.7 **HARD CORE** : The material for hard core shall be broken granite stone of size not exceeding 63 mm from the quarries approved by the GE. The hard core shall be watered and well rammed. It shall be provided all as per specification laid down in Para 3.27 of MES Schedule Part-I (2009). Hard core shall be provided at location and to the thickness as indicated on drawings. Thickness of hard core shown on drawings shall be the consolidated thickness.

3.8 FILLING IN TRENCHES/UNDER FLOORS

3.8.1. Approved soil obtained from excavation (Other than those obtained from surface excavation and surface dressing) shall be used for filling in foundation up to ground level of developed area and under floor. No charges shall be levied for the use of soil obtained from excavation for filling. Nothing extra is payable on this account. Filling shall be spread, levelled, watered and well rammed in layers not exceeding 25 cm thick.

3.8.2. Any additional earth required for purpose of filling shall be arranged by the Contractor from outside MD land at no extra cost to the Department. Expansive or other unsuitable soil obtained from excavation shall not be used in filling. The decision of Engineer-in-Charge as to whether the soil obtained from excavation is suitable or not for filling, either partly or fully, shall be final and binding. If the quantity of suitable soil obtained from excavation falls short of the filling required, the contractor shall bring the requisite quantity of approved earth, without any extra cost to the Government.

3.9 TRENCHES FOR FOUNDATION AND PIPES

3.9.1 The excavation shall be restricted to dimensions shown on the drawings and as specified in MES Schedule. Excavation made, if any in excess of required depth/width, shall be made good by the contractor with cement concrete (1:4:8), type D2 without extra cost to the Govt.

3.9.2 The beds of the trenches shall be watered and well rammed and any depressions thus formed shall be filled with approved earth as required to the level and slope as directed by Engineer-in-Charge.

3.10 DRESSING AROUND BUILDINGS AND STRUCTURES

3.10.1 After constructions and before handing over any building and structures, the area beyond edge of the building up to 3.0M shall be dressed as directed by Engineer-in-Charge, which shall be deemed included in quoted lumpsum.

3.11 METHOD OF MEASUREMENTS AND CALCULATION FOR EXCAVATION AND EARTH WORK FOR PAYMENT

3.11.1 The area of cutting/filling in each cross section shall be separately computed by Simpson's Rule as described here-in-after. The volume (Cubic contents) of cutting and filling shall be separately computed by Prismoidal Formula as described here-in-after.

3.11.2 For computing area of cross sections the interval between two ordinates shall be as decided by the Engineer-in-Charge to suite the site conditions but in no case it should exceed 2m.

(a) Computation of Area (Simpson's Rule)

(i) Simpson's Rule given below shall apply for the computation of areas where the total number of ordinates is odd and the ordinates are spaced at equal intervals.

$$A = d/3[h_1 + h_n] + 2(h_3 + h_5 + \dots + h_n - 2) + 4(h_2 + h_4 + \dots + h_n - 1)]$$

Where

A = Area of cross section in square metre.

d = Distance between successive ordinates in metres.

PARTICULAR SPECIFICATIONS

h_1 = Height of first ordinates in metres.

h_n = Height of last ordinates in metres.

$(h_3 + h_5 + \dots + h_n - 2)$ = Sum of the heights of odd ordinates in metres between h_1 and h_n .

$(h_2 + h_4 + \dots + h_n - 1)$ = Sum of the heights of even ordinates in metres between h_1 and h_n .

(ii) In case of odd number of divisions, (i.e, where the number of ordinate is even) the area of the end division shall be computed as per the formula given below and added to the area of the divisions computed by the Simpson's Rule. Similarly where the distance between any two parallel ordinates is different, then area between these ordinates shall be computed by the Simpson's Rule.

$$A_x = d/2 [h_x + (h_x + 1)]$$

Where

A_x = Area to be computed between any two ordinates in square metres.

h_x = Height of first ordinates in metres.

$(h_x + 1)$ = Height of other ordinate in metres.

d = distance between the two ordinates in metres.

(b) Computation of Volume (Prismoidal Formula)

(i) Prismoidal Rule given below shall apply for the computation of volumes where the total number of cross-sections is odd and the cross-sections are spaced at equal intervals.

$$V = D/3 \times \{a_1 + a_n + 2(a_3 + a_5 + \dots + a_{n-2}) + 4(a_2 + a_4 + \dots + a_{n-1})\}$$

Where

V = Volume in cubic metres.

D = Distance between cross section.

a_1 = Area of the first cross section.

a_n = Area of the last section.

$(a_3 + a_5 + \dots + a_{n-2})$ - Sum of areas of odd cross sections in square metres in between a_1 and a_n .

$(a_2 + a_4 + \dots + a_{n-1})$ - Sum of areas of even cross sections in square metres in between a_1 and a_n .

(ii) The formula shall be applicable only in case where number of cross section is odd. In case where the number of cross sections is even, volume covered by last two Sections shall be calculated by applying the formula (given here-in-after and added to the volume of the remaining sections calculated by application of Prismoidal Formula.

$$V = L/2 (A_1 + A_2)$$

Where

V = Volume in cubic metres.

L = Distance in metres between two cross sections.

A_1 = Area in square metres of cross section at one end.

A_2 = Area in square metres of cross section at other end.

3.11.3 The quantity for payment shall be based on theoretical quantity (based on formation levels) or actual quantity (based on actual levels) whichever is less. The deduction for voids as per MES SSR as applicable shall be carried out for calculation of quantity for payments.

4.0 PRE-CONSTRUCTION ANTI TERMITE TREATMENT

4.1 The work of anti-termite treatment (pre-construction except mound treatment) shall be carried out all as specified in Para 3.26 of MES Schedule Part I, to all the buildings/structures covered under the scope of the subject contract agreement except Septic tanks, Soakage Wells, Overhead tanks, underground sumps etc. It shall be got executed through a specialist firm or agency who is a member of Indian pest Control Association holding valid license as per clause 13 of insecticides Act 1968 and persons employed to do the work of anti-termite treatment shall be qualified as per Rule 10 of Insecticides Rules 1971. The cost of the anti-termite including application at site in all respect shall be deemed to include in lump sum quoted amount.

4.2 Anti termite treatment shall be got done through any one of the specialist agency who holds valid licence as per clause 13 of Insecticides Act 1968 and is a member of Indian Pest Control Association after approval from GE. Persons employed to do the anti-termite treatment shall be qualified as per rule 10 of the rules framed under the Inspection rules 1971. Before selecting the firm for anti-termite Treatment, GE shall ensure that all the requirements for carrying out anti-termite treatment are fulfilled by the selected firm and antecedents of the firm are verified by him. However, the contractor himself may be permitted by GE to carryout anti termite treatment, provided contractors himself is holding a valid license under Insecticide Act to carry out anti-termite treatment. The decision of GE shall be final, conclusive and binding with regard to selection of firm and persons employed for carrying out antitermite treatment.

PARTICULAR SPECIFICATIONS

- 4.3 Anti termite treatment shall be carried out with emulsion of **Chloropyriphos 20% EC** conforming to IS-8944 (2005) purchased directly from the manufacturer or his authorised agents. Purchase vouchers and test certificates for each consignment shall be produced before the GE for verification and defacement against this contract.
- (a) Chemicals brought to site in sealed containers bearing IS certification marks shall only be permitted to be used in the work.

(b) Chemicals shall be stored carefully at site. Seals of containers shall be broken only in the presence of Engineer-in-charge. Empty containers shall be removed off the site promptly, on any particular day if the contents of full container could not be used in the work, the container shall be sealed at the end of a day in the presence of the Engineer-in-Charge and opened when required also in the presence of Engineer-in-Charge.

(c) Total quantity of chemical required for the work as per specification shall be worked out in order to ensure that full quantity is brought to site and used in the work. For this purpose, entries shall be made in the measurement book (not for payment/not to be abstracted) indicating the brand name, quantity brought etc; and signed by Engineer-in-Charge as well as the representative of the agency executing the work and contractor.

(d) Copy of IS-6313 (Part-II) for antitermite treatment shall be made available at site by the contractor.

(e) Tests shall be carried in recognised laboratory or test house at the discretion of GE of the chemical brought by the agency executing the work. The cost of test shall be borne by the contractor.
- 4.4 The defects liability period of anti-termite treatment shall be 10 years and the contractor shall be responsible to keep the entire buildings free from termite infestation for a period of 10 years after the date of taking over the completed buildings from the contractor. The contractor may obtain a similar guarantee from the specialist firm engaged by him for the purpose. **(Specimen of this guarantee certificate is att as Appendix ‘G’)**
- 4.5 A sum equal to the amount as per scales given below enhanced by 25% shall be retained out of the contractor’s bill as security deposit during the Guarantee period of 10 years, which shall be refunded to him after expiry of this period. Alternatively, the contractor may give a separate interest bearing security deposit pledged in favour of GE **valid for 10 years for this amount.**

Cost of Anti termite at contract rate	Scales of Individual Security Deposit
Upto Rs.50 Lakh	2% of the amount subject to a minimum of Rs.5,000.00
Over Rs.50 Lakh and upto 100 Lakh	Rs.1,00,000.00+1.5% of amount exceeding Rs.50 Lakh
Over Rs.100 Lakh and upto Rs.500 Lakh	Rs.1,75,000.00+1% of amount exceeding Rs.100 Lakh

- 4.6 The liability of the contractor under this condition shall not however extend beyond the period of the 10 years from the certified date of completion, unless the notice was served on the contractor previously to rectify such defects.
- 4.7 Should the GE at any time during the construction or prior to the expiration of said Guarantee period of 10 years find that the buildings have been infected with termite, the contractor, on demand in writing from the GE, specifying the buildings complained of, notwithstanding the same may have been inadvertently passed, certified and paid for, forthwith undertake to carry out such treatment which may be necessary to render the buildings free from termite infestation at his own expense till expiry of the Guarantee period of ten years. In the event of his failing to do so within a period to be specified by the GE in his demand aforesaid, the GE may undertake such treatment at the risk and expense in all respects of the contractor.
- 4.8 The contractor shall provide a plaster plate of requisite size in situation as decided by the Engineer-in-Charge on the wall of each of the building. The plate shall be 10mm thick in cement mortar (1:4) to indicate the CA No., Name of the contractor, name of agency who executed the work, the date of completion of the work and the date of expiry of 10 years guarantee for anti-termite treatment by engraving and painting (black). The cost of plaster plates is deemed to be included in the unit rates of the buildings.

PARTICULAR SPECIFICATIONS

5. CONCRETE WORKS

5.1 **FINE AGGREGATE:** Fine aggregate for concrete work shall conform to material specifications and grading within the limits of Grading Zones II all as specified in clause 4.4 of MES Schedule 2009 Part-I (Specifications) and shall be approved quality of natural river sand obtained from **Main Land India** as approved by GE. The sand shall be washed with clean and fresh water if percentage of deleterious materials exceeds the limit of 5% specified in IS.

5.2 **COARSE AGGREGATES:** For all cement concrete work coarse aggregate shall be graded machine crushed or broken hard stone conforming to specifications as given in clause 4.4.1 to 4.4.7 of MES Schedule 2009 Part-I (Specifications).

Note: Source of aggregate shall be as specified in Schedule ‘A’ Notes, Clause No 28.

5.3 **GRADING OF COARSE AGGREGATE:** Coarse aggregate shall be graded conforming to IS 383. Graded Aggregate of nominal sizes given hereunder shall be used, unless specified otherwise, in the specifications hereinafter:

(a) Plain or reinforced cement concrete except in Foundation of Brick or PCC solid block walls or Stone Walls/Pillars, Floors and Sub base to Floors.

(i)	For structural elements of depth/thickness more than and including 80mm	-	20mm
(ii)	For structural elements of depth/thickness less than 80mm	-	12.5mm

Note: However, in no case the nominal size of aggregate shall be greater than one-fourth the minimum thickness of the member.

(b) Plain Cement concrete in Foundation of Brick/PCC solid block walls/Stone Walls, Pillars, Floors and Sub Base to Floors

(i)	Under 30mm thickness	-	12.5 mm
(ii)	30 to 80mm thickness	-	20 mm
(iii)	Exceeding 80mm thickness	-	40 mm

5.4 **WATER:** Water used in the work shall be clean, fresh, potable and non-saline all as specified in IS-456 and in clause 4.9 of MES Schedule Part-I.

5.4.1. **TESTING OF WATER :** **Water will not be supplied by department.** However contractor shall follow the procedure as per special condition here-in-before. Arrangement shall be made for storage of potable water to ensure adequate supply at all times during execution of work so that concreting and curing operations are not interrupted. Water stored for execution of work shall not be used for any other purpose.

5.4.2. Water shall conform to clause 5.4 of IS: 456-2000 and necessary tests shall be performed by the contractor to ascertain its quality as per IS 456 including the following:

- (a) Test for Acidity
- (b) Test for Alkalinity
- (c) Test for Solid Contents

5.4.3. The water to be used in construction shall conform to the following permissible limit of solid contents:

S No	Description	Permissible Limit (mg/L)	Test Reference
1	Organic	200	IS 3025 (Part 18)
2	Inorganic	3000	
3	Sulphate (as So3)	400	IS 3025 (Part 24)
4	Chloride (as Cl)	2000	IS 3025 (Part 32)
5	Suspended Matter	2000	IS 3025 (Part 17)

PARTICULAR SPECIFICATIONS

- 5.4.4 The storage tanks shall be cleaned on regular basis every fortnight and water sample shall be tested in Govt. approved lab every 03 months. Adequate number of storage tanks of required capacity shall be kept at site by the contractor without any cost to the department.
- 5.4.5. These tanks shall be removed by the contractor from site after completion of works. Construction of water storage tanks for various purposes shall be constructed by the contractor without any cost to the department as mentioned here-in-before.

CEMENT

6.1 **GENERAL** : Cement required for the work under the contract shall be procured, supplied and incorporated in the works by the contractor under his own arrangement. Cement shall be of tested quality and shall comply with the requirements mentioned in the drawings, SSR, IS specifications as amended and particular specifications given herein after. Type of cement for the subject work shall be Ordinary Portland cement **Grade 43 (Forty Three)** in accordance with IS 8112-1989 unless otherwise mentioned in structural drawings forming part of the tender documents. Use of OPC 53 grade cement for runway work shall not be permitted.

6.2 SOURCES OF PROCUREMENT

(a) **MANUFACTURERS** The following are the approved manufactures for MES works on Pan India level:

SI No.	Company name	Address	Cement Grades
1	2	3	4
1.	M/s Ultra Tech Cement Ltd Brand: <u>ULTRATECH</u>	<u>B</u> ' Wing, 2 nd Floor, Mahakali Caves Road, Andheri (East), Mumbai- 400093 Ph: 022-66917800	All
2.	M/s Dalmia Cement (Bharat) Ltd. Brand: <u>DALMIA INFRA PRO</u>	Dalmiapuram Dist-Truchirappalli, Tamil Nadu – 621 651	All
3	M/s Chettinad Cement Corporation Pvt Ltd. Brand: <u>—CHETTINAD Cementll</u>	4th Floor, Rani Seethai Hall Building, 603, Anna Salai Hall, Chennai-600006 Tel No. 044-42951800 Fax No. 044-28291558 Email:- info@chettinadcement.com Website- www.chettinadcement.corn	OPC 43 grade & PPC
4	BLANK		
5	BLANK		
6	M/s The Ramco Cements Ltd. (Formerly Madras Cement) Brand: <u>—RAMCO</u>	Auras Corporate Centre, 98-A, Dr. Radhakrishnan Salai Mylapore, Chennai-600 004 Ph: 044-28478666	All
7	M/s SauraShtra Cement Brand: <u>—SAURASHTRA</u>	Gala No A-1, Ground Floor, Udhyog Sadan No 3 MIDC, Central Road, Andheri (East) Mumbai-400 093 Ph: 022-32955557/67, Mob: 9320290081	All
8	M/s Nuvoco Vistas Corporation Ltd (formerly Lafarge Cement) Brand: <u>—NUVOCO</u>	Equinox Business Park Tower-3, East Wing, 4th Floor LBS Marg, Kurla (West), Kurla Mumbai, MaharaSheetra- 400070	All
9	M/s The Associated Cement Companies Ltd Brand: <u>—ACC</u>	414-421, Splendor Forum (4th Floor), 3, District Centre, Jasola, New Delhi – 110044 Ph: 011 46583600	All
10	M/s The India Cement	Dhun Building, 827, Anna Salai Chennai – 600002	All

PARTICULAR SPECIFICATIONS

11	M/s Century Cements Brand: —CENTURYI	Industry House, 159 Church Gate, Reclamation, Mumbai- 400020 Ph: 022-22023936	All
12	M/s Mangalam Cement Ltd Brand: _MANGALAM‘	PO Adityanagar, Morak, Dist-Kota, Rajasthan-326520 Ph: 9351468076	All
13	M/s Birla Corporation Ltd Brand: _BIRLA‘	Birla Building (3rd & 4th Floor) 9/1, RN Mukherjee Road, Kolkata – 700001 Ph: 033-30573700	All
14	M/s Orient Cement Brand: _ORIENT‘	5-9-22/57/D, 2nd & 3rd Floor, GP Birla Centre, Adarsh Nagar, Hyderabad – 500063 Ph: 044-23688600	All
15	M/s Shree Cement Brand: _SHREE‘	Bangur Nagar, Beawar, Dist-Ajmer, Rajasthan-305901 Ph: 01462-228101-06	All
16	M/s J K Cement Brand: _J K‘	Kamla Tower, Kanpur - 208001	All
17	M/s JK Lakshmi Cement Ltd Brand: _JK LAKSHMI‘	Jaykaypuram, Dist-Sirohi, Rajasthan Ph: 02971-244409/10	All
18	M/s Jaypee Rewa Cement Brand: _JAYPEE‘	Jaypee Nagar, P.O. – Jaypee Nagar, Rewa – 486450, M.P.	All
19	M/s Ambuja Cement Ltd Brand: _AMBUJA‘	Kodinar, PO-Ambujanagar, Taluka-Kodinar, Dist- Junagadh, Gujarat-362715 Ph: 02795-237000	All
20	M/s Wonder Cement Ltd. Brand: “WONDER CEMENT”	M/s Wonder Cement Ltd, 17, Old Fatehpura, Seva Mandir Road, Udaipur – 313 004. Rajasthan (India) Tele : +91-294-33991133	
21	BLANK		
22	M/s Sagar Cements Ltd Brand "SAGAR"	M/s Sagar Cements Ltd Plot No 111, Road No 10, Jubilee Hills, Hyderabad-500 033 Tele: +91-40-23351571, 2335672 Fax: +91-40-2335673 Email: info@sagarcements.in WebSite: www.sagarcements.in	OPC 43, OPC 53, PPC, PSC
23	M/S My Home Industries Ltd Brand: "MAHA CEMENT"	9th Floor, Block-3, My Home Hub, Madhapur, Hyderabad - 500081 Ph- 040-66929696 Fax- 040- 66929797/98 Email: corp@myhomegroup.in Website- www.myhomeindustries.com	OPC 43, PPC, PSC

Note:- Any manufacturer not included in above list but approved by E-in-C Branch shall be deemed to be included without any price adjustment.

PARTICULAR SPECIFICATIONS

- (b) The contractor shall furnish the particulars of the manufacturer/ main producers of cement along with the date of manufacture to the Garrison Engineer for every lot of cement separately. The cement so brought shall be fresh and in no case older than 60 days from the date of manufacture. The Garrison Engineer shall verify the documents in support of the purchases of cement. Before placing the order for supply of cement by the contractor, he shall obtain written approval from the GE regarding name of manufacturer, quantity of cement etc. Cement shall be procured for minimum requirement of one month and not exceeding the requirement for more than two months at a time. **The cement shall be consumed in the work within three months from the date of manufacture.** Cement shall conform to the requirement of Indian Standard specification and each bag of cement shall bear relevant ISI mark. The weight of each consignment shall be verified by the GE and recorded. The content of cement shall be checked at random to verify the actual weight of cement per bag. However, each bag of cement shall be of nominal average net mass of 50Kgs, subject to tolerance given in relevant clause and Annexure 'B' of IS: 8112 of 89 and in relevant clause of IS 1489-1991.

6.3 TESTING OF CEMENT

- 6.4 The contractor shall submit the manufacturer's test certificate in original along with test sheet giving the result of each physical test as applicable in accordance with the relevant IS provision and the chemical composition of cement or authenticated copy thereof, duly signed by the manufacturer with each consignment, as per the following IS provision: -

- (a) Method of sampling hydraulic cement as per IS - 3535 - 1986.
- (b) Methods of physical test for hydraulic cements as per IS - 4031.
- (c) Method of chemical analysis of hydraulic cement as per IS-4032-1985.
The test sheet should include results of the following mandatory tests:-
 - (i) Specific surface by Blains air Permeability method.
 - (ii) Soundness Test by Le' Chatelier method.
 - (iii) Initial setting time.
 - (iv) Final Setting time.
 - (v) Compressive strength test at 3, 7 & 28 days as specified in the relevant IS code.
 - (vi) The test report should also show the chemical properties of the cement as per relevant IS codes.

- 6.5 The test certificate and test sheet shall be furnished with each batch of manufacture. The Engineer-in-Charge shall record these details in the cement acceptance register to be maintained by him which will be signed by JE (Civil), Engineer-in-Charge, Garrison Engineer and the contractors as given in the format herein after for verification.

- 6.7 The contractor shall however organise, setting time and a compressive strength test of cement through designated approved laboratory on samples collected from the lot brought at site before incorporation in work. The contractor will be allowed to use the cement only after satisfactory compressive strength test results of three days & seven days. To meet this requirement contractor is required to keep minimum 10 days stock before any new lot brought at site which can be used in the work. The contractor shall be required to remove the cement not meeting the requirement from site within 24 hours. Seven days strength test will be relied upon to accept the lot of cement to commence the work. 28 days compressive strength test will be the final criteria to accept/reject the lot.

PARTICULAR SPECIFICATIONS

- 6.8 In addition to above, the GE will organise independent testing as per test mentioned in "Cement Supply/Acceptance Form" (Physical and Chemical requirement) of random sample of cement drawn from various lots from the **National Test House/SEMT wing/Any Govt Engineering Colleges** as per IS-3535-1986 (Method of sampling Hydraulic cement), IS-4031 (Method of physical test for Hydraulic cement) and IS-4032-1985 (Method of Chemical Analysis of Hydraulic cement). The cement shall be tested for physical properties as per relevant IS codes for the job/contract. In case the cement is not of requisite standard despite manufacturer's Test Certificate the Contractor shall remove the total consignment from the site within 24 hours at his own cost after written rejection order of the consignment by the GE. The cost of tests shall be borne by the contractor irrespective of the results of testing and no extra claim whatsoever shall be admissible. The payment shall be considered to be paid only after confirmation of satisfactory results from the specifies agencies as mentioned and the contractor shall have no say/claim whatsoever regarding payment for any delay hereinafter.

6.9 **SAMPLING OF INDEPENDENT AND ADDITIONAL TESTS**

- 6.9.1 Sample of cement from each lot shall be collected in accordance with Para 5.6 of IS-3535-1986, for independent or additional tests. At least 2% of the bags subject to a minimum of five bags shall be sampled as per procedure laid down in IS-3535. The cement should be tested within 1-3 weeks of supply but before incorporation in the work.
- 6.9.2 The random samples as per relevant IS shall be selected by GE before carrying out testing. The record of such samples selected by the GE for testing shall be properly maintained in the 'Cement Testing Register' giving cross reference to relevant consignment of cement and quantity received etc.
- 6.9.3 Cost of transportation of samples to the approved laboratory/test house and all testing charges including cost of sample shall be borne by the contractor.
- 6.9.4 The contractor shall be required to setup adequate testing facilities at site to the entire satisfaction of Garrison Engineer for conducting setting time tests and compressive strength test as per IS codes referred to herein before for the samples collected from the lot brought at site. These tests shall be carried out within 7days of receipt of cement at site. The tests can alternatively be carried out at the Zonal laboratory, or any other recognised laboratory so designated by GE

6.10 **DOCUMENTATION**

- 6.10.1 The following documents will be maintained by the Engineer-in-Charge/GE for cement supplied by the contractor in addition to the documents specified here-in-before:-
- (a) Original vouchers of cement shall be kept in the concerned file of the contract in GE's office, serially numbered on each page.
 - (b) Original Test Certificate and Test Sheet should also be kept in the concerned file of the contract in the GE's office duly numbered.
 - (c) In/Out Register for Cement as per **Appendix 'D'**.
 - (d) Cement Acceptance Register as per **Appendix 'E'**.
 - (e) Register containing results of independent and additional testing by GE.
 - (f) Register containing records of surprise checks and BOO.
 - (g) Inspection Register.
- 6.10.2 The contractor shall submit original purchase vouchers for the total quantity of cement supplied under each consignment to be incorporated in the work. All consignments received at the work site shall be inspected by the GE along with the relevant documents to ensure the requirements as mentioned hereinbefore, before acceptance. The original purchase vouchers and the test certificates shall be verified for subject contract & defaced by the Engineer-in-Charge and kept on record in the office of the Garrison Engineer duly authenticated and with cross reference to the consignment/control number recorded in the cement Acceptance Register. The cement Acceptance Register shall be signed by the Junior Engineer (Civil), Engineer-in-Charge, GE and the Contractor. The contractor shall maintain schedule of supply of cement for each consignment.

PARTICULAR SPECIFICATIONS

6.10.3 The Accepting Officer shall order a Board of Officers at following different stages of work for conducting random check of cement and verification of connected documents :-

- (a) Beginning of the project i.e. on receipt of first lot.
- (b) After receipt of 15 to 20% of the quantity of cement.
- (c) After receipt of 35 to 40% of the quantity of cement.
- (d) After receipt of 50 to 60% of the quantity of cement.
- (e) After receipt of 70 to 80% of the quantity of cement.
- (f) After receipt of 80 to 100% of the quantity of cement.

6.10.4 The GE will intimate to the Accepting Officer when the above quantity of the cement is received at site of work for ordering the requisite BOO. Due to administrative reasons if there is a delay in ordering BOO, the same will not affect the prog of wk at any stage.

6.11 **STORAGE/ACCOUNTING/PRESERVATION OF CEMENT**

6.11.1 Cement shall be stored in covered godown over dry platform at least 20cm high in such a manner as to prevent deterioration due to moisture or intrusion of foreign matter. In case of storeroom, the stack should be at least 20cm away from floors and walls. The stacking of cement shall be done as specified in relevant IS. The storage, accounting and preservation of cement supplied by the contractor shall be done as per standard engineering practice till the same is incorporated in the work and the cost of the same shall be deemed to be included in the unit rate/amount quoted by the tenderer. The Engineer-in-Charge shall inspect once a day to verify that cement lying at site is stored, accounted, preserved and maintained as per the norms. The cement shall be stored so as to differentiate each tested and untested consignment separately with distinct identification. If the GE is not satisfied with the storage/ preservation of cement, he may order for any test(s) of cement as applicable for that consignment to ensure its conformity to the quality mentioned in the manufacturer's test certificate. The contractor shall bear the cost of necessary testing(s) in this regard and no claim whatsoever shall be entertained.

6.11.2 Stacking of cement shall be done as per relevant IS and as under:-

- (a) Each cement consignment shall be stacked separately displaying the control No and date of receipt of cement and removal shall be made on the basis of 'First in First out'.
- (b) Adequate top cover will be provided.
- (c) Stacks in no case shall be higher than 10bags. The maximum width of each stack shall be 3.00m. If the stack is to be more than 7 or 8bags high, the bags shall be arranged in header and stretcher fashion, i.e. alternately lengthwise and cross wise so as to tie the piles together and avoid danger of topping over.
- (d) Adequate space shall be kept between two stacks.

6.11.3 Cement godown shall be provided with two locks on each door. The key of one lock at each door shall remain with the Engineer-in-charge or his representative and that of the other lock with the contractor's authorised agent at site of works so that cement is removed from the godown only according to daily requirement with the knowledge of both the parties. During the period of storage, if any cement bag(s) found to be in damaged condition due to whatsoever reason, the same shall be removed from the cement godown on written orders of the GE and suitable replacement for the cement bag(s) so removed shall be made and no claim whatsoever shall be admissible on this account.

6.11.4 Cement shall be removed from the store only according to daily requirement with the knowledge of both the parties and daily consumption of cement shall be recorded in **cement consumption register**, which shall be signed by the Engineer-in-charge and the contractor. Calculation of cement consumption shall be on quantity of cement approved in Design Mix for RCC/PQC works. Cement constants given in Appendix 'A' to E-in-C's Branch letter No. 19280/E8 dated 03 May 1976 shall form the basis of consumption of cement for various items of works unless specifically indicated otherwise.

PARTICULAR SPECIFICATIONS

- 6.11.5 In case the consumption of cement as per cement consumption register is found to be more than the estimated quantity of cement due to whatsoever reason, the contractor shall not have any claim whatsoever for such excess consumption of cement.
- 6.12 SCHEDULE OF SUPPLY
- 6.12.1 The procurement of cement should be such that it matches with the physical progress of the work. The schedule of procurement shall be worked out by the GE in consultation with the contractor. The schedule shall be got vetted by GE from time to time. The contractor shall ensure that the schedule is adhered to. The contractor shall forfeit his right to demand extension of time if the supply of cement is get delayed due to his failure in placing order in time to the manufacturer.
- 6.13 MEASUREMENTS AND PAYMENT OF CEMENT
- 6.13.1 The entire quantity of cement shall also be suitably recorded in the Measurement Book for record purposes as ‘Not to be abstracted’ before incorporation in the work and shall be signed by the Engineer-in-Charge and the contractor.
- 6.14 RELEASE OF PAYMENT
- 6.14.1 The payment shall only be allowed after production of original purchase vouchers, certified copies of test certificates from manufacturer for each consignment and results of testing carried out in laboratory on receipt of cement (7 days compressive test) are found satisfactory after testing as specified herein before. Cement shall be paid as material lying at site as per condition 64 of IAFW-2249. Rate of cement given in SSR or market rate whichever is less shall be applicable for cement irrespective of grade of cement specified for use in the work. The original purchase voucher shall be defaced by the Engr-in-Charge before allowing legible payment to the contractor.
- 6.15 ACCEPTANCE/REJECTION OF CEMENT
- 6.15.1 The contractor will keep a separate stack of cement brought at site for inspection, away from the accepted lot of cement. In case the new lot is rejected by the GE it will be removed from the site within 24 hours, at the cost of the contractor. The cement may be rejected if it does not comply with any of the requirement as per relevant IS codes. The cement should be weighed and each bag shall be of nominal average net mass of 50 kgs. The tolerance on weight of the cement shall be as per the relevant IS Codes.
- 6.16 Movement of cement shall be recorded in **In/Out** Cement Register as per the following proforma: -

Appendix ‘D’

IN/OUT CEMENT REGISTER

Sl No.	Date	Cement IN		Cement OUT			Qty Balance (In Bags)	Signature		Remarks
		Qty (In Bags)	Control No.	Qty (In Bags)	Reasons*	Age of Cement		Contractor	AGE/GE	
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(j)	(k)	(l)

* **NOTE:** The following reasons may be mentioned for taking out cement from store: -

(a) For testing purpose

(b) For use in work

(c) Rejected cement taken out of site

PARTICULAR SPECIFICATIONS (Contd.,)

- 6.17 In case, estimated requirement of cement is less than 5000 bags for entire work, the contractor can procure the cement from the authorised distributor/dealer of the approved firm, as approved by GE out of firms as mentioned hereinbefore. However, contractor will have to submit test certificates to the GE for the batch issued by the firm.
- 6.18 In the above case, If the factory test certificates are produced by the contractors, the independent testing will be at the option/discretion of the Garrison Engineer. In a particular case when the contractor does not produce the factory test certificate, the testing of cement by Garrison Engineer will be mandatory. However, the testing will be restricted to IS: 4031 (Methods of physical test for hydraulic cement) only.
- 6.19 The Garrison Engineer will ensure that cement accepted should not be more than two months old. The week/date of manufacture of cement is always printed at the bottom end of the cement bag. Mixing of different types/brands of cement is not permitted.
- 6.20 All other conditions/requirements i.e. Storage/Accounting/Preservation of cement, Measurements & Payment of cement etc. shall be complied with as brought out in earlier Paras hereinbefore.
- 6.21 **CEMENT CONSTANT Etc.,**
- (i) All the requirements applicable to cement concrete of Grade M-30/M-35 (Design mix) shall be deemed to be included in the quoted lumpsum.
 - (ii) Engineer-in-Charge shall maintain a record of actual consumption of cement in proper register (other than the cement register mentioned in Special Conditions) and initial the entry for every change in quantity of materials.
 - (iii) In case of dispute with regard to provisions mentioned above, the decision of Accepting Officer shall be conclusive, final and binding.
- 6.22 **EXPOSED SURFACE OF CONCRETE**
- 6.22.1 Any irregularities and protruding formwork marks in respect of exposed RCC/Plain cement concrete surfaces, which are ultimately required to be finished by application of white/colour wash, distemper, cement based or oil paint, etc, shall be removed and minor honey combing made good in cement mortar 1:3 and finished with a thin layer of cement and sand mortar 1:3 averaging 5mm thick finished fair and even as specified in Para 4.11.16.2 (b) of MES Schedule 2009 Part-I (Specifications). In case of deviation, formwork shall be considered as formwork for fair finished surfaces i.e. using wrought and smooth timber.
- 6.22.2 Exposed surfaces of lintels, beams, columns, bands, slabs etc., which are continuous with plastered surfaces of walls, shall be plastered, in the manner specified for the walls. In case of deviation the formwork shall be considered as formwork for rough finished surfaces i.e. using clean swan timber.
- 6.22.3 Use of mortar/plaster shall not be permissible for correcting levels, unevenness or elevation etc
- 7 **PRECAST CONCRETE ARTICLES**
- 7.1 Cement concrete lintels (except integrally cast chajjas) upto 1.5m clear span, cills, bed blocks/plates, and the like may be either be precast or cast in situ at the contractor's option. If pre-cast, these shall be set in cement mortar (1:3). In case of deviation involving these items however, pricing shall be done on the basis of cast-in-situ work.
- 8 **THROATING/WEATHERING**
- 8.1 Throating to projections of RCC/PCC beyond external faces of the walls where shown on drawings, and where RCC chajjas are not provided with downward facia, shall be formed in the concrete while casting, by planting fillets/bar of 12mm diameter in the form work and finished smooth.

PARTICULAR SPECIFICATIONS (Contd.,)

8.2 **CURING:** Curing of all concrete work shall be carried out all as specified in MES Schedule 2009 Part-I (Specifications).

8.3 **FORM WORK**

- 8.3.1 Formwork (both vertical props and surfaces) shall be of steel form work, beam bottom and sides may be of plastic coated plywood with adequate strength, properly designed, constructed to shapes, lines and dimensions of various structural members all as shown on drawings and conforming to relevant IS specifications for use of steel formwork and shall also comply with requirements of clause 4.11.6, 4.11.6.1 to 4.11.6.5 and 7.15.2 to 7.15.10 of MES Schedule 2009 Part-I (Specifications). However in these clauses if any reference is made to wooden formwork and wooden ballies, same shall be amended to cater for **steel formwork and steel section props**. Deformed steel sheet shall not be permitted for use as formwork. General requirements of material design and construction of formwork for buildings/ structures shall be as per the standards laid down in IS-14687 and in IS-8989. In case of deviations the formwork for exposed concrete surfaces as specified in clause 5.8.2 of particular specification and all unexposed surfaces shall be priced as timber formwork clean sawn and all other exposed surfaces of concrete as specified in clause 5.8.1 of particular specifications shall be considered as wrought irrespective type of formwork used subject to deviation percentage.
- 8.3.2 Where inverted RCC beams are provided for roof slabs, the shuttering shall be so designed that additional supports are provided under the beam and it should be possible to strike slabs shuttering earlier leaving beam supports undisturbed.

9.1 **MIX OF CONCRETE**

9.1.1 The mix, type and grade of reinforced cement concrete shall be as under:-

SI No	Situation	Type of Concrete
(a)	All RCC works for all items of buildings and structures of Schedule 'A' Part-I (except piles)	Design Mix M-30 grade using Semi-Automatic batching plant or weigh batching with print out facility at the option of contractor.
(b)	All RCC works for piles and pile caps	Design Mix M-35 grade as per 456-2000 using graded crushed aggregate
(c)	For items of Schedule 'A' Parts other than Part-I	As specified in Schedule 'A'

9.1.2 For other locations with PCC, unless otherwise specified elsewhere in this particular specifications or indicated in drawings, the mix, type and grade of plain cement concrete in various situations shall be as under : -

SI No	Situation	Type of Concrete
(a)	Foundation lean concrete and lean concrete below column footings/ plinth beams/toe beams.	PCC (1:4:8) (by volume) Type D-2
(b)	PCC in drain and channel and PCC block for holder-bats, and plugging for scaffolding holes.	PCC (1:3:6) (by volume) Type C-1
(c)	PCC in plinth protection, Cills, coping, bedplate, benching, splash stones, coping, and pre-cast articles and in any other situations/locations not mentioned above.	PCC (1:2:4) Type B-1
(d)	Sub base for flooring	1:4:8 Type D-2
(e)	PCC in surroundings of Nahani traps, sunken floor and in surroundings of WC	1:5:10 Type E-2

PARTICULAR SPECIFICATIONS (Contd.,)

9.2.0 PLAIN CEMENT CONCRETE

- 9.2.1 (i) All materials, workmanship, inspection, sampling and testing shall be as per the requirements given in IS-456-2000.
- (ii) The contractor shall provide all facilities and equipment for casting, curing and conveyance of test cubes of cement concrete to the laboratory approved by the GE. Test of concrete cubes during execution shall be carried out as laid down in IS-456 by the contractor in laboratory. Contractor shall supply free of cost concrete cubes for testing any number of times as demanded by GE. All incidental charges for taking out cubes, transporting to laboratory, testing charges etc; shall be borne by the contractor. The number of cubes made and tested shall be recorded to account the quantity of cement consumed.
- (iii) **Batching:** All ingredients shall be batched by volume. All measuring equipments shall be kept in a clean and serviceable condition and their accuracy checked periodically.
- (iv) **Mixing, Transportation, placing:** Refer corresponding clauses under Design Mix concrete.
- (v) **Compaction:** The concrete should be adequately compacted by suitable means as directed by Engineer-in-Charge.
- (vi) **Curing:** Refer corresponding clauses under Design Mix concrete.
- (vii) **Sampling, testing and acceptance criteria:** Refer IS-456-2000 where the strength is specified for volumetric mix.

9.3.0 DESIGN MIX CONCRETE RCC

- 9.3.1 (i) The grade of concrete shall be as mentioned hereinbefore. The specifications for Design Mix concrete shall be that given under:
- (ii) Design mix concrete shall be as specified in IS-456-2000 and IS-10262. Mix design shall be carried out by semi-automatic batching plant or weigh batching plant with print out facility at the option of contractor and its proportioning shall be approved by GE in writing. It shall be ensured that grading characteristics as adopted for mix design are followed through out as per IS 456. However, when there is a change in type of cement and aggregate a fresh mix design shall be carried out and approved by GE. Periodical check shall be carried out in relation to grade of mix. Necessary reference shall be made to Note given in Table 8 of IS 456-2000 and quality control shall be maintained as specified for assumed standard deviation for M-30.

9.3.2 The parameters for concrete mix design shall be as follows :

(a)	Grade of concrete	M-30 (Design mix) for all RCC works and M-35 (Design mix) for water retaining structure and Pile foundation.
(b)	Strength to be achieved	As per IS: 456-2000
(c)	Target mean strength	As per structural drawings / As per IS 10262 clause 2.2
(d)	Maximum size of coarse aggregate	20mm
(e)	Grade of cement	43 grade (OPC)
(f)	Aggregate / cement ratio by weight	As per mix design based on IS: 10262 and IS: 456-2000
(g)	Workability	As per clause 7.1 of IS: 456-2000 slump shall be 25mm to 75mm compaction factor 0.85 to 0.92
(h)	Cement content	As per IS: 456-2000 and not less than as detailed in notes hereinafter
(j)	Type of aggregates	Crushed stone aggregates and river sand
(k)	Slump	35 to 75mm (except pile foundation). 100 to 180mm (for pile foundation)
(l)	Max water cement ratio	0.45 and as per mix design based on IS: 10262 and IS: 456-2000
(m)	Exposure condition (for super-structure)	Severe
(n)	Exposure condition (for RCC below GL)	Severe
(o)	Degree of quality control	Good (refer appendix-'A' of IS: 10262)

PARTICULAR SPECIFICATIONS (Contd.,)**Notes:**

(i) The requirement of cement per cubic meter of Design Mix of grade M-30/35 shall be as per IS:456-2000. The actual requirement of cement for the design mix concrete shall be ascertained by the tests as specified hereinafter. The design mix shall be carried out as specified hereinbefore. The tenderer shall ascertain the quantity of cement required and quote his lump sum / rates accordingly. No claim whatsoever arising on account of quantity of actual cement incorporated in the work on account of design mix is admissible.

(ii) The rates given in MES schedule for design mix shall be applicable irrespective of the quantity of cement approved / used in the execution of design mix work. The Contractor is required to keep this aspect in mind while quoting his rates

(iii) Mix design shall be prepared based on SP-23, handbook on concrete mixes and IS-10262, recommended guide lines for concrete mix design. No element of wastage of cement shall be allowed while working out the cement consumption details for design mix concrete work.

9.3.3 Design mix shall be obtained from **IITs/IISC Bangalore/SERCs/SEMT Pune** as approved by the GE and kept on record. Contractor shall take immediate action for getting the mix design done to avoid hold up in the work. Trial mix shall be prepared at site based on proportions indicated in the design mix details obtained from approved laboratory as above. Cubes casted based on trial mix shall be tested and test results shall meet the design criteria. The GE shall accord his written approval for the design mix proportions after satisfactory test results and due verifications. A re-verification of mix proportions for design mix concrete shall be essential at every change in the brand of cement and source of aggregates. Tenderer to note that no design mix concrete work shall be commenced unless the approval of design mix is obtained from the GE.

9.3.4 All materials required for carrying out the Design mix, transportation of materials to the approved laboratory and fees for conducting the test shall be borne by the contractor and shall quote his rates/lumpsum considering the above provisions and no extra claim shall be admissible on the account.

9.3.5 The contractor may use the plasticizers / admixtures as approved by GE, to improve the workability of concrete, at no extra cost. The relative density of liquid admixtures shall be checked for each drum and the same shall be compared with the specified value before acceptance. Chloride content of Admixture shall be independently tested for each batch before acceptance. Two or more admixtures shall not be used in the work. The use of admixture shall in no way be permitted to affect quality of the concrete at site. Admixtures such as super plasticiser shall be from any one of the following firms.

- (i) Asian Laboratories (India), 88, DSIDC Shed Scheme-1, New Okhla Industrial Complex, Phase II, New Delhi-110020
- (ii) MC-Bauchemie (India) Pvt Ltd, 201, Vardhman Chambers, Sector-17, Vashi, New Bombay
- (iii) Fosroc Chemicals (India) Ltd, Hofeeza Chambers, 2nd floor, 111/7, KH Road, Bangalore-560027
- (iv) Roffe Construction Chemicals Pvt Ltd, 12-C, Vikas Centre, S V Road, Santa Cruz (W), Mumbai-400054.
- (v) STP Speciality Chemicals Ltd, 16, NGN Vaidya Marg, Mumbai-400023.
- (vi) Fairmate Chemicals Pvt Ltd, 8/1, Sai Sudha Armoday Society, Alkapuri, Vadodra-390007.
- (vii) CICO Technologies Ltd, A-9, Chitranjan Park (LGF), Outer Ring Road, New Delhi.

9.3.6 No water/admixtures shall be allowed after initial mixing of concrete at the plant.

10 READY MIXED CONCRETE (RMC)

PARTICULAR SPECIFICATIONS (Contd.,)

- 10.1 RMC shall conform to the requirements of the following Indian Standards:
(a) IS-4926 - Ready Mixed Concrete-Code of Practice
(b) IS-9103 - Concrete Admixtures-Specifications
(c) IS-269 - OPC Grade 43 or Portland-Specifications or
(d) IS-456 - Plain and Reinforced concrete-Code of Practice
- 10.2 The contractor shall engage any of the following manufacturers for manufacture and supply of RMC. It is the responsibility of the contractor to make payments to the RMC supplier independently and the department is not responsible for any disputes between contractor and RMC manufacturer for non-payment or delayed payment or on account of any other reasons. The contractor may alternatively establish Ready Mixed Concrete (RMC) plant of required capacity at site without any extra cost to Government.
- 10.3 **SELECTION OF RMC MANUFACTURER:** Immediately on commencement of the work, the contractor shall intimate the name of manufacturer of RMC whom he proposes to engage.
- 10.4 Even though the firm for manufacturing and supply of RMC is approved, the responsibility to maintain quality and grade of concrete fully rests with the contractor.
- 10.5. **MATERIALS:**
- (a) CEMENT: Cement shall conform to specifications as specified here-in- before.
- (b) FINE AGGREGATES: Fine aggregates shall be as specified here-in-before.
- (c) COARSE AGGREGATE: The coarse aggregates shall be as specified here-in-before.
- (d) WATER: Water shall comply with the requirements as per IS-456 and IS- 3025.
- (e) **ADMIXTURES (LIQUID TYPE ONLY):** Admixture shall be retarding super plasticizing type and shall conform to IS-9103 and of approved manufacturers as given here-in-after in list of makes
- Note:** Admixture shall not exceed 1.5% of cement contents by volume in any case.
- 10.6. Mix design shall be got carried out by the contractor from the approved RMC manufacturer incorporating materials complying with the requirements given hereinbefore. The mix design shall be properly bound in booklet form and submitted in triplicate for approval by the Garrison Engineer. The RMC incorporated in the work shall be in accordance with the approved mix design. The CWE/GE/Engineer-in- Charge/JE (Civil) who are connected with administration and execution and other operations connected with the execution of this work shall have access to inspect /check the quality of materials used for manufacturer of RMC in RMC manufacturer's yard as well as the quality/grade of RMC supplied by the manufacturer. The contractor shall make all arrangements for the aforesaid inspections and checks as required.
- 10.7. Contractor shall obtain a certificate from RMC manufacturer for the RMC supplied for each day to the effect that materials used for manufacturing of RMC complies strictly as per mix design requirements and the materials incorporated are conforming to the specifications given herein before. In addition, the contractor shall collect samples of materials for each days concreting in the presence of Engineer in-Charge which shall be tested in approved lab as specified herein before to ensure that materials used are as per requirement as specified. Such tests for each material shall be made as per relevant BIS requirements and shall be entered in register of test results. Register shall be signed by the contractor, GE, Engineer-in Charge & JE.
- 10.8. A register shall be maintained by the contractor duly signed by the Engineer-in Charge showing the following details of RMC in addition to the information given on delivery ticket for each delivery of concrete (Refer Clause 9.4 and ANNEX-G of IS 4926):
- (a) Time of mixing of each batch.
- (b) No. of batches in each delivery.
- (c) Location where used in the work and reference to cube test register.
- 10.9. For the RMC delivered at site and incorporated in work, sample for cube test shall be taken as per requirements of IS-4926 and as specified hereinafter.

PARTICULAR SPECIFICATIONS (Contd.,)

- 10.10 If the condition of RMC delivered at site is not acceptable to the Engineer-in Charge, it shall be removed from site by the contractor at his own cost. The decision of the GE with regard to non-acceptability of RMC shall be final and binding. No claim of contractor, what so ever, shall be admissible on this account. Some of the conditions under which RMC can be rejected are given below: (a) Initial setting due to delay in transit. (b) Segregation of aggregate due to excessive rotation of mixer during transit.
- 10.11. **ACCEPTANCE OF CONCRETE:** Acceptance criteria for the RMC shall be as per IS-456. In case the RMC supplied and incorporated fails to meet the strength requirements as per IS-456, work done shall be rejected by GE and contractor shall demolish the rejected work and re-do the same with-out extra payments so as to produce the work complying with the strength requirements as per IS-456. The contractor will have no claim whatsoever on this account.
- 10.12. **DESIGN, MANUFACTURE, TRANSPORTATION, PLACEMENT & TESTING:**
- (a) The design mix shall be carried out as per the durability condition stipulated in the contract. Concrete mix information shall be supplied by the Contractor to the RMC manufacturer on the format as per Annexure D of IS-4926, which shall form the basis of mix design.
- (b) RMC supplier will ensure that the concrete is transported in truck/transit mixers conforming to IS-5892 to the point of placing as rapidly as possible by methods that will maintain the required workability and will prevent segregation, loss of any constituents or ingress of foreign matter or water.
- (c) RMC shall be used in the work only after design mix has been approved by GE in writing.
- (d) Contractor should plan their work in such a way so as to full load of concrete is discharged within 30 minutes of arrival at site and placed immediately. Re-handling should be avoided as far as practicable.
- (e) The concrete shall be discharged from the truck mixer within 2 hours of the time of loading at the plant.
- (f) Conveying equipments for concrete shall be water tight, well maintained and thoroughly cleaned before commencement of concrete mixing.
- (g) Concrete shall not be dropped from a height, thrown or otherwise treated so that segregation, undesirable finish, or defective structural quality results.
- (h) No extra water shall be added to the concrete mix after it has left the batching plant. The contractor shall take adequate precautions to protect concrete in transit from the effects of the weather.
- (j) Pumping operation whenever commences shall proceed continuously so as to prevent "Cold" joints between placed sections. Concrete less than 6 cubic metres may be deposited manually. Concrete for columns may be deposited manually.
- (k) The delivery line of the pump shall be 100 mm dia or greater and pump shall be capable of pumping concrete containing 20 mm nominal size aggregate.
- (l) The pump shall have receiving hopper and pumping chamber shall be capable of pumping at least 15 Cum of concrete per hour against horizontal delivery head of at least 90 m and/or a vertical delivery head of 20m.
- (m) Pumping lines shall be of approved metallic type laid to avoid bends. The joints in pumping lines shall be sealed tight to prevent leakages.
- (n) All equipments, pump chamber, hoppers, lines etc. shall be kept clean at all times. Any build-ups in the lines of materials from previous operations shall be cleaned out prior to pumping.
- (o) In the event of breakdown in the equipment causing delay not exceeding 20 minutes, the time within which concrete cannot be replaced, the following procedure shall be adopted:

PARTICULAR SPECIFICATIONS (Contd.,)

“With the approval of Engineer-in-Charge, the concrete already placed shall have the “Wet Edge” and vibrated into mass. Where atmospheric temperature exceeds 30 degree centigrade, the receiving hopper and lines shall be cleaned out and concrete contained therein discarded and immediately removed from the site. The concrete shall be discarded if initial setting of the concrete has begun in the hopper or discharge lines. All lines shall be cleaned free of concrete prior to resumption of pumping after each breakdown. Concrete in the lines shall be pumped at approximately 8 minutes intervals to ensure the concrete in the line is live, whenever delivery of concrete in the pump is delayed. This pumping interval shall be reduced to 5 minutes during extra hot weather conditions. Delivery lines where exposed to hot sun, shall be protected by covering with gunny bags, wet hessian or other approved means.”

(p) Due to mechanical malfunctioning, if concreting is required to be stopped, necessary precautionary measures shall be taken by the contractor. Cost of any additional work caused due to these stoppages shall be contractor’s responsibility.

(q) No concreting shall be commenced until formwork and reinforcement and other preparatory work required are completed, inspected and approved by the Engineer-in-Charge/GE.

(r) The contractor shall take adequate precautions and strengthening measures to strengthen the shuttering as required to withstand the pressure that will be created due to pumping of concrete. (s) Slump of concrete shall be as per IS-456 and as specified. The workability shall be within the following limits on the specified value as appropriate:

Slump	:	+ 25 mm or + 1/3 of the specified value whichever is less.
Compaction Factor	:	+ 0.03, where the specified value is 0.90 or greater + 0.04, where the specified value is less than 0.90 but more than 0.80 and + 0.05, where the specified value is 0.80 or less

(t) Slump test shall be carried out at site by the contractor in the presence of Engineer-in-Charge/JE.

(u) The contractor shall obtain from RMC manufacturer computer printout of the data sheet of every batch of concrete and submit to GE. The same shall be signed by the Contractor, Engineer-in-Charge & JE.

(v) The minimum cement content shall be as per IS: 456-2000 (durability criteria).

10.13. **CONSOLIDATION OF CONCRETE:** Consolidation shall be done by mechanical vibrators, plate type for slab and needle type for other locations.

10.14. **SAMPLING AND TESTING OF READY MIX CONCRETE:**

(a) Allow at least the first 1/3 cum of concrete to be discharged from the truck mixer prior to taking any samples. Take required number of samples from the remainder of the load avoiding sampling the last cubic meter of concrete. Thoroughly re-mix this composite sample either on a mixing tray or in the sampling bucket and proceed with the required testing.

(b) In addition to the tests carried out by the RMC manufacturer at the plant site, sampling and testing of concrete shall be carried out at the site after delivery as per IS-456 by the department along with the representatives of the contractor at contractor’s expense.

(c) Samples from fresh concrete shall be taken as per IS-1199 and cubes shall be made, cured and tested in accordance with IS-516 for 7 & 28 days compressive strength. The samples shall be taken as follows:

Place of sample	Quantity of Concrete	No of Samples	Remarks
At RMC Plant	For every 6 Cu.m or part thereof	1	One sample will comprise of 4 test specimens. 3 specimens for testing and one for preservation.
At Site	For every 6 Cu.m or part thereof	1	(a) One sample will comprise of minimum 7 test specimens, 3 specimens each for

PARTICULAR SPECIFICATIONS (Contd.,)

			7 days and 28 days testing and 1 specimen for preservation. (b) One sample for slump/compaction factor for workability.
--	--	--	--

Notes :

1. At least one sample shall be taken from each delivery.
2. The test specimens will be marked showing clearly the C. A. No., date of sample, location and name of building/pile reference where it has been taken from.

11 ----- BLANK -----

12 SAMPLING AND STRENGTH OF DESIGNED CONCRETE MIX AND ACCEPTANCE CRITERIA (Refer Clause 15 & 16 of IS 456:2000)

- 12.1 Samples from fresh concrete shall be taken as per IS 1199 and cubes shall be made cured and tested in accordance with IS 516. The frequency of sampling of concrete for cube tests shall be in accordance with clause 15.2.2 of IS 456:2000. Each sample for testing shall consist of three test specimens tested at 28 days.
- 12.2 Minimum cement content required to achieve the designed strength of mix for M-30 grade of concrete shall be as stipulated in drawings. Tenderer to note that they will have to incorporate cement content as obtained from design mix carried out and as approved and no price adjustment shall be made for actual cement content of design mix if it is more than minimum cement content.

13 MIXING, DEPOSTING AND RAMMING

- 13.1 All cement concrete (plain or reinforced including nominal mix concrete) shall be machine mixed as specified in Para 4.11.5 and 4.11.5.1 of MES Schedule 2009 Part-I (Specifications), deposited and compacted all as specified in clause 4.11.10 and 4.11.11 of MES Schedule Part-I. For small works and in exceptional cases, hand mixing may be carried out by the contractor with prior written permission of GE without any price adjustment. Where hand mixing is permitted, it shall be carried out on a water tight platform and care shall be taken to ensure that mixing is continued until the concrete is uniform in colour and consistency.

14 BATCHING

- 14.1 Batching for concrete other than design mix concrete shall be as per clauses 4.11.3 and 4.11.3.2 to 4.11.3.5 of MES Schedule Part-I. Batching of design mix concrete shall be done by weigh batching.
- 14.2 The concrete which is not coming upto the desired strength will be rejected and will be made good by the contractor without any extra cost.
- 14.3 Tests of cement, aggregate and concrete cubes shall be carried out as laid down in IS 456. The testing of cubes shall be carried out in MES laboratory/approved laboratory. Contractor shall supply samples free of cost. Recovery of testing charges for tests conducted in MES laboratory shall be made from the contractor as per the list of testing charges
- 14.4 In case non availability of testing facilities in MES lab the tests shall be conducted in any outside approved laboratory. Testing charges of materials/cubes carried out in Govt. approved laboratory shall be as per actual and will directly borne by the contractor

15 TESTING CHARGES

- 15.1 The materials listed hereinafter shall be tested as per the frequency indicated therein
- 15.2 Level of testing shown in legend as A, B & C are defined as under:-

PARTICULAR SPECIFICATIONS (Contd.,)

15.3 LEVEL 'A' "Site Lab" means own site lab established by Contractor at the work site for such tests. This lab shall house all the facilities including T&P, machinery, equipment, and manpower etc., required for conducting tests. Competent technical representative as approved by the GE shall be employed by the contractor to man the laboratory. This lab shall be operative for the entire duration of the contract till its completion. Tests shall be carried out in the presence of Engineer-in-Charge to be nominated by GE or any other departmental official to be nominated by the GE. Random check of compliance of frequency of testing shall be done by GE. Setting up site laboratory is mandatory for all works costing Rs.1 Crore and above. The contractor may at his option set up site laboratory for works costing less than Rs. 1 Crore

(a) Record shall be maintained at work site. These test results shall be signed by contractor or his authorized representative and aforesaid departmental official.

(b) Within 15 days of placement of work order No 1, site lab shall be established and fact reported by the contractor to GE in writing who will verify the fact and satisfy himself of the facilities provided. Thereafter, GE shall issue a certificate to this effect in writing listing out equipment particulars etc., of each material test. Only after issue of this certificate by GE, the tests shall be carried out and materials so approved shall be incorporated in the work.

(c) Manpower, material and infrastructure like electricity, water etc., required for conducting these tests shall be provided by the contractor.

(d) Tenderer is deemed to cater for above provisions in his quoted lumpsum.

(e) Remedial measures, if any, required to achieve/obtain desired results for each test shall be taken promptly by contractor. Lumpsum is deemed to include for this eventuality and nothing extra shall be payable to the contractor. No extension of time shall be admissible on this account

(f) Rate per test given is applicable for recovery in case of unavoidable circumstances where some tests as laid down could not be done and in the opinion of the GE non-performance of tests does not affect quality control. However, in case, GE in his opinion considers that contractor is purposely not adhering to laid down frequencies of tests, he shall reserve the right to get it tested in Zonal Lab or any other lab as deemed fit and make penal recovery from RAR which shall be double the rate of testing charges indicated or testing charges actually paid to lab whichever is higher. GE's decision, in this regard, shall be final and binding.

15.4 LEVEL 'B'

(a) "Zonal Lab" means any lab of MES.

(b) The tests shall be conducted as per frequencies laid down for these tests in these labs for which contractor shall provide all requisite facilities like samples, cubes, material etc., transportation to these labs for testing purpose. It will be contractor's responsibility to adhere to the laid down frequency of testing. Test results shall be sent by lab to the GE whose copies can be made by contractor at his own expense. Testing charges for the tests so conducted shall be recovered at the rates indicated from the running payments. The contractor's quoted lumpsum is deemed to include for above provision.

(c) Provision of para (f) above of level 'A' shall be applicable to level B' also

15.5 LEVEL 'C'

(a) Level 'C' lab stands for National Test House, SEMT Wing, Pune located in CME Pune -31 / Govt approved Laboratories accredited by NABL/ Recognised Engineering Colleges or Polytechnics where such facilities exist.

(b) Test provision contained in Para (b) of level 'B' above shall be applicable here except that contractor shall make necessary arrangement for transportation etc., to hand over the samples to these labs. Test results shall be forwarded to GE by these labs directly. The testing charges payable to these labs for conducting these tests shall be borne by the contractor and his quoted lumpsum is deemed to include this provision.

PARTICULAR SPECIFICATIONS (Contd.,)

- 15.6 In case the contractor has not set up the site laboratory and the tests are carried out in Zonal or any other laboratory, the recovery shall be made at the applicable rates indicated hereinafter.
- 15.7 In case non-availability of testing facilities in MES Lab, the tests shall be conducted in any outside approved labs. Testing charges of materials/cubes carried out in approved laboratory shall be as per actual and shall be directly borne by the contractor.
- 15.8 The contractor is to provide the following tentative list of equipment at site lab with all the equipments, as per relevant IS all as mentioned in the list of material and their tests as per PS. However, the list of equipment is not exhaustive. The actual equipment to be provided shall be all as approved by GE. The cost of the same is deemed to be inclusive of the rates quoted against Schedule 'A'.

LIST OF SUGGESTED ESSENTIAL EQUIPMENTS

Sl. No.	Name of Equipment
1.	Cube Mould (150 +/- 0.2mm) – 12 Nos
2.	Tamping Bar (16mm dia, 600 mm long)
3.	Balance 12 Kg (LC lgm)
4.	Balance 220gm (LC.001 gm) digital
5.	Weights
6.	Compression Testing machines with three gauge (capacity 2000KN)
7.	Slump Test Apparatus
8.	Standard Test Sieve (80 to 4.75mm) Square hole, perforated plate
9.	Standard Test Sieve (3.35mm to 75 micron) fine mesh, wire cloth.
10.	Soft brush & Camel hair brush
11.	Lid & Pan
12.	Hot air oven (Thermostatically controlled)
13.	Thickness Gauge
14.	Measuring Cylinders (graduated)
15.	Steel Tape (Lc. 1 mm), Steel scale (Lc.5 mm)
16.	Plywood sheet (2 No.) 3mm thick
17.	Dish (180mm, 180mm, 40mm) of glass or porcelain of glazed stoneware
18.	Distilled water
19.	Moulds for casting concrete beams for testing flexural strength.
20.	Relevant IS Codes
21.	Concrete Hammer
22.	Hand Penetro Metre
23.	Vicat Apparatus

PARTICULAR SPECIFICATIONS (Contd..)

Appendix 'H'

MATERIAL TESTS AND THEIR RECOVERY RATES OF TESTING CHARGES

SI No	Materials	Test	Method of Testing	Frequency of Tests	Level of Test	Rate per Test in Rs	Remarks
1	2	3	4	5	6	7	8
1.	Coarse Aggregate	1) Sieve Analysis	IS: 2386(Part-I)	One test for every 15 cum of aggregates or part thereof brought to site.	A	120/-	
		2) Flakiness Index	IS: 2386(Part-I)	One test for every 15 cum of aggregates or part thereof brought to site.	A	90/-	
		3) Estimation of deleterious materials	IS: 2386(Part-I)	One test for every 100 cum of aggregate or part thereof.	A	120/-	
		4) Organic impurities	IS: 2386(Part-I)	One test per source of supply	C	120/-	
		5) Moisture content	IS: 2386 (Part-II)	Regularly as Required.	A	120/-	
		6) Specific gravity	IS: 2386 (Part-II)	One test for each source of supply.	B	120/-	
2.	Fine aggregate	1) Sieve Analysis	IS: 2386 (Part-I)	One test for every 15 cum of FA or part thereof when brought to site.	A	180/-	
		2) Test for clay, silt and impurities.	IS: 2386 (Part-I)	One test for every 15 cum of FA or part thereof when brought to site.	A	90/-	
		3) Specific gravity	IS: 2386 (Part-II)	One for each source of supply	B	180/-	
		4) Test for organic impurities	IS: 2386 (Part-II)	One test for each source of supply.	C	180/-	
		5) Moisture content	IS: 2386 (Part-II)	Regularly as required subject to 2 tests/ per day when being used.	A	180/-	

PARTICULAR SPECIFICATIONS (Contd.../-)

MATERIAL TESTS AND THEIR RECOVERY RATES OF TESTING CHARGES (Contd....)

SI No	Materials	Test	Method of Testing	Frequency of Tests	Level of Test	Rate per Test in Rs	Remarks
1	2	3	4	5	6	7	8
3.	Cement	1) Setting time	IS-4031-63 Reaffirmed 1980	Once for each consignment or as and when Required.	B	180/-	
		2) Soundness	IS-4031-63 Reaffirmed 1980	Once for each consignment or as and when Required.	B	120/-	
		3) Compressive strength	IS-4031-63 Reaffirmed 1980	Once for each consignment or as and when Required.	B	360/-	
		4) Fineness	IS-4031-63 Reaffirmed 1980	Once for each consignment or as and when Required.	B	120/-	
4.	Structural concrete (M-15 Grade and above)	1) Slump test or compacting factor test or VEE-BEE time	IS-1119	The Min frequency of sampling of concrete of each grade shall be as under :-	A	180/-	(1) Random sample shall be carried out to cover mixing units.
		2) Compressive strength	IS-516	Qty of Conc. in the work (M ³)	A	120/-	(2) As per IS-456-2000 Clause. 14 for frequency of sampling.
				1 - 5		1	
				6 - 15		2	
				16 - 30		3	
				31 - 50		4	
				51 and above	4+1 for each Addl 50 Cu M. or part thereof		

PARTICULAR SPECIFICATIONS (Contd.../-)

MATERIAL TESTS AND THEIR RECOVERY RATES OF TESTING CHARGES (Contd....)

SI No	Materials	Test	Method of Testing	Frequency of Tests	Level of Test	Rate per Test in Rs	Remarks
1	2	3	4	5	6	7	8
5.	Water for Construction purpose	1) Test for acidity 2) Test for alkalinity 3) Test for Solid content	IS: 456 & 3015 IS: 456 & 3015 IS-456 & 3015	Once at the stage of approval of source of water	B B C	240/- 240/- 300/-	Also refer clause 4.3 of IS-456 and its subsequent sub clauses regarding suitability of water.

LEGEND

A-Site Lab B-Zonal Lab C-National Test House / SEMT WING / NABL Approved Lab/Engg. College

NOTE: List of tests given above is not final. Other due tests required as per SSR/BIS to satisfy the quality requirement will also be got done by the GE and necessary expenditure for the same shall be borne by the contractor.

PARTICULAR SPECIFICATIONS (Contd...)**16.0 STEEL AND IRON WORK**

16.1 Steel and iron work in various situations shall be carried out as specified in MES Schedule Part-I 2009 Part-I (Specifications), Section 10 and as shown in drawings. CTD bars wherever shown on drawings shall be replaced with TMT bars of same dia.

16.2 STEEL

16.2.1 Steel supplied by the contractor shall conform to the following grades and quality: -

(a) STEEL FOR CONCRETE REINFORCEMENT

- (i) Irrespective of whatsoever specified elsewhere and shown on drawings, all steel for reinforcement for whole work shall be CRS bars conforming to relevant IS. The reinforcement steel shall be of grade SAIL 500D/ TATA TISCON (Fe500D)/ RINL Fe 500 or equivalents of other manufacturer as specified, conforming to IS-1786. If bars of above grades are not available due to manufacturing status, next higher grade may be used without revising the design and without any price adjustment. Where indicated as HIGH YIELD STRENGTH DEFORMED BARS, it shall be corrosion resistant steel as specified above CRS bars conforming to IS-1786-1985 (Reaffirmed 1990) & grades Fe 500D/ Fe 550D.

- (ii) Mild steel bars shall conform to IS-432 (Part-I) and Grade I.

(b) STRUCTURAL STEEL

- (i) Structural steel standard quality shall conform to IS-2062 and shall be provided in the locations indicated in the drawings.
- (ii) Structural steel ordinary quality shall conform to IS-1977 and shall be provided in the locations indicated in the drawings.

(c) Galvanised steel sheets (plain and corrugated) shall conform to IS-277.

(d) **HARDDRAWN STEEL WIRE FABRIC FOR CONCRETE REINFORCEMENT:**
Fabric reinforcement shall conform to IS-1566.

(e) Steel tubes for structural purposes shall conform to IS-1161 and shall be of Grade YST-240.

16.2.2 SOURCE OF PROCUREMENT

- (a) **STRUCTURAL STEEL:** The contractor shall procure structural steel sections directly from main producers like SAIL / RINL / TISCO / JINDAL STEELS AND POWER LTD, Haryana. Galvanised sheets and Fabric Reinforcement for concrete shall be procured directly from Main producers and shall be ISI marked.

PARTICULAR SPECIFICATIONS (Contd.../-)

(B) STEEL REINFORCEMENT BARS

SL NO	FIRM NAME, BRAND & ADDRESS	SIZE / DIA AND TYPE
(I)	STEEL AUTHORITY OF INDIA LIMITED, BRAND: SAIL, CENTRAL MARKETING ORGANIZATION, NORTHERN REGION, 17TH FLOOR, SCOPE MINAR, LAXMI NAGAR DISTT. CENTRE DELHI – 110 092	FOR ALL TYPES & DIA OF TMT CRS BARS
(II)	TATA IRON & STEEL COMPANY (TISCO, OR TATA STEEL), BRAND: —TATAII, BOMBAY HOUSE, 2, 4 HOMI MODI STREET, MUMBAI – 400 001, INDIA TEL : (91 22) 204 9131, FAX : (91 22) 204 9522, 287 840, EMAIL: CORPCOMM@JSR.TATASTEEL.COM (BR OFFICE FOR NORTH : JEEVAN TARA BLDG, PATEL CHOWK , NEW DELHI)	FOR ALL TYPES & DIA OF TMT CRS BARS
(III)	RASHTRIYA ISPAT NIGAM LIMITED, BRAND: RINL, VISAKHAPATNAM STEEL PLANT VISAKHAPATNAM – 530 031, INDIA TEL: (91 891) 518226, 518376, FAX: (91 891) 518316 E-MAIL: CMDVSP@ITPVIS.AP.NIC.IN	FOR ALL TYPES & DIA OF TMT CRS BARS
(IV)	M/S SHYAM STEEL INDUSTRIES LTD, BRAND: SHYAM SHYAM TOWERS EN-32, SECTOR-V SALT LAKE, KOLKATA – 700 091, TEL: 033 40074007 FAX: 033 40074010, EMAIL: MARKETING@SHYAMSTEEL.COM	TMT BARS OF GDE FE 500D & CRS
(V)	M/S JINDAL STEEL AND POWER LTD, HARYANA BRAND: JINDAL PANTHER OP JINDAL ROAD, HISSAR, HARYANA-125005 PHONE: +91-1662-222471/84 FAX: +91-1662-222476 WEBSITE:- WWW.JINDALSTEELPOWER.COM	TMT BARS OF GDE FE 500, FE 500D, FE 550D & FE 550D & CRS (SIZE 8-40MM)
(VI)	M/S SPS STEEL ROLLING MILLS LTD (WB) BRAND: "ELEGANT TMT" DIAMOND HERITAGE 16, STRAND ROAD, ROOM NO H523 A, 5 TH FLOOR KOLKATA 700001 TEL: +91-9831055568/9830281273 E-MAIL: INFO@SPSGROUP.CO.IN	TMT BARS OF GDE FE 500D
(VII)	M/S GALLANTT METAL LTD BRAND: —GALLANTT TMXII WARD 10BC, PLOT NO. 123, GROUND FLOOR, GANDHI DHAM KUTCH, GUJARAT-370201, TEL: +91-2836-228164, FAX: +91-2836-235787, E-MAIL:GML@GALLANTT.COM, WEBSITE: WWW.GALLANTT.COM	TMT BARS OF GDE FE 500, FE 500D & CRS (SIZE 8-32MM)
(VIII)	M/S SHRI BAJRANG POWER & ISPAT LTD., BRAND: "GOEL TMT" VILL — BORJHARA, URLA INDUSTRIAL AREA, RAIPUR — 493 221, CHHATTISGARH.	TMT BARS OF GDE FE 500, FE 500D & FE 550D (SIZE 8-32MM) FE-500D CRS (SIZE 10-25 MM)

PARTICULAR SPECIFICATIONS (Contd.../-)

	<u>TEL : 0771 4288019 / 29 / 39</u>	
<u>(IX)</u>	<u>M/S JAI BALAJI INDUSTRIES PVT LTD (WB)</u> <u>5 BENTINCK STREET, 1ST FLOOR KOLKATA</u> <u>700001</u> <u>BRAND: "BALAJI SHAKTI"</u> <u>TEL: 033-22489808/22488173</u> <u>FAX: +91-33-22430021/22</u> <u>EMAIL:</u> <u>WWW.INFO@JAIBALAJIGROUP.COM</u>	<u>TMT BARS OF GDE</u> <u>FE 500D & FE 500D CRS</u> <u>(SIZE 8-32MM)</u>
<u>(X)</u>	<u>M/S SHYAM METALICS & ENERGY LTD.</u> <u>BRAND: "SEL TIGER"</u> <u>VISWAKARMA BUILDING, 1ST, 2ND AND 3RD</u> <u>FLOOR, 86 C TOPSIA ROAD,</u> <u>KOLKATA-700 046 (WB)</u> <u>TEL- +9133 4011 3000</u> <u>FAX- +9133-2285 2212</u> <u>WEBSITE- WWW.SHYAMMETALICS.COM</u>	<u>TMT BARS OF GDE</u> <u>FE 550D</u> <u>(SIZE 8-32MM)</u>
<u>(XI)</u>	<u>M/S ELECTROTHERM (INDIA) LTD BRAND:</u> <u>— ET TMTII</u> <u>SURVEY NO 72, PALODIA (VIA THALTEJ,</u> <u>AHMEDABAD)</u> <u>GUJARAT 382115</u> <u>TEL- +91 2717 234553/ 660550</u> <u>FAX- +91 2717 234866</u> <u>WEBSITE- WWW.ELECTROTHERM.COM</u>	<u>TMT BARS OF GDE</u> <u>FE 500, FE 500D & CRS</u> <u>(SIZE 8MM-36MM)</u>
<u>(XII)</u>	<u>M/S REAL ISPAT & POWER LIMITED (CG)</u> <u>BRAND: — G K TMT</u> <u>VRINDAVAN, NEAR IDBI BANK, CIVIL INES,</u> <u>RAIPUR-492001, CHHATTISGARH</u> <u>TEL- +91 771-4224000</u> <u>FAX- +91 771-4224010</u> <u>WEBSITE- WWW.REALISPAT.COM</u>	<u>TMT BARS OF GDE</u> <u>FE 500D</u>
<u>(XIII)</u> <u>)</u>	<u>M/S RASHMI METALIKS LTD. WB</u> <u>PREMLATA BUILDING 39, SHAKESPEARE</u> <u>SARANI 6TH FLOOR, KOLKATA-700017</u> <u>BRAND: — RASHMI TMT</u> <u>TEL- +91 33-22894255/ 56</u> <u>FAX- +91 33-22894254</u> <u>WEBSITE- WWW.RASHMIGROUP.COM</u>	<u>TMT BARS OF GDE</u> <u>FE 500, FE 500D & FE</u> <u>550D & CRS (SIZE 8MM-</u> <u>32MM)</u>
<u>(XIV)</u>	<u>M/S STEEL EXCHANGE INDIA PVT LTD (AP)</u> <u>D. NO. 1-65/K/60, PLOT NO 60 ABHIS</u> <u>HIRANYA, 1ST FLOOR , KAVURI HILLS,</u> <u>HYDERABAD, TELANGANA</u> <u>BRAND: — SIMHADRI TMT</u> <u>TEL- +91 40-23403725/23413267</u> <u>FAX- +91 2717 234866</u> <u>EMAIL- INFO@SEIL.CO.IN</u>	<u>TMT BARS OF GDE</u> <u>FE 500, FE 500D HSCRM</u>
<u>(XV)</u> <u>)</u>	<u>M/S SUPER SMELTERS LIMITED, KOLKATA</u> <u>PREMLATA 39, SHAKESPEARE SARANI</u> <u>2ND FLOOR, KOLKATA-700017</u> <u>BRAND: — SUPER SHAKTI</u> <u>TEL- +91 33-2289-2734</u> <u>FAX- +91 33-2289-2736</u> <u>WEBSITE- WWW.SUPERSHAKTI.IN</u>	<u>TMT BARS OF GDE</u> <u>FE 500D & FE 550</u> <u>(SIZE 8MM-32MM)</u>
<u>(XV)</u> <u>)</u>	<u>M/S SUGNA METALS LTD</u> <u>BRAND:- SUGNA TMT</u> <u>PLOT NO 76, VEMIREDDY ENCLAVE, ROAD</u> <u>NO 12, BANJARA HILLS HYDERABAD</u> <u>500034 (TELANGANA)</u> <u>TEL- +91 40-27664502/27663527</u>	<u>TMT BARS OF GDE</u> <u>FE 550D WITH SIZES</u> <u>(SIZE 8MM-32MM)</u>

PARTICULAR SPECIFICATIONS (Contd.../-)

	<u>EMAIL- INFO@SUGNATMT.COM</u>	
<u>(XV II)</u>	<u>M/S JINDAL STEEL AND POWER LTD.</u> <u>BRAND: “JINDAL”</u> <u>JINDAL CENTRE, PLON NO 2, SECTOR-32</u> <u>GURGAON- 122001, HARYANA</u> <u>TELE:- 0124 661 2000</u> <u>FAX :- 0124 661 2125</u> <u>WEBSITE:-</u> <u>WWW.JINDALSTEELPOWER.COM</u>	<u>STRUCTURAL STEEL</u> <u>(ANGLE, BEAM, COLUMN,</u> <u>CHANNEL, PLATE ETC.)</u>
<u>(XV III)</u>	<u>M/S MSP STEEL & POWER LIMITED,</u> <u>CHHATTISGARH</u> <u>BRAND: MSP TMT 500D</u> <u>16/S, BLOCK-A NEW ALIPORE, KOLKATA-</u> <u>700 053</u> <u>TELE:- 033 4005 7777/2398 2239</u> <u>MOB:- 7381028976</u> <u>EMAIL:- CONTACTU@MSPSTEEL.COM</u> <u>WEBSITE:- WWW.MSPSTEEL.COM</u>	<u>TMT BARS OF GDE FE</u> <u>500D(SIZE 8-32MM)</u>
<u>(XI X)</u>	<u>M/S TULSYAN NEC LIMITED, CHENNAI</u> <u>BRAND: TULSYAN TMT</u> <u>APEX PLAZA, 1ST FLOOR, OLD NO 3, MEW</u> <u>NO77, NUNHAMBAKKAM HIGH ROAD,</u> <u>CHENNAI – 600 034 (TN)</u> <u>TELE:- 044=61991060/61991045</u> <u>WEBSITE:- WWW.TULSYANNEC.IN</u>	<u>TMT BARS OF GDE FE 500,</u> <u>FE 500D & FE 550 WITH</u> <u>(SIZE 8MM TO 35MM)</u>

PARTICULAR SPECIFICATIONS (Contd.../-)

- (i) Steel for reinforcement manufactured by above manufacturer may also be procured from M/s ANIIDCO, Port Blair without any price adjustment. However, in case of steel procured from M/s ANIIDCO, Port Blair mandatory physical and chemical testing shall be ensured by GE for each lot. The contractor shall immediately on receipt of work order shall work out requirement of different sizes of steel for reinforcement and submit size wise requirement to the branch sales officers of SAIL/RINL/ TISCO or approved primary producers with a copy of the same to GE. GE in turn will verify the requirement and immediately confirm to the respective branch sales officer.

(**NOTE:** In no case TMT steel bars/CRS of all sizes shall be allowed to be procured from other than the above mentioned producers).

NOTE. 1: In addition to the above makes, during currency of contract if any new make is approved by E-in-C's branch and valid for the contract period the same shall also be considered.

NOTE. 2: In no case TMT steel bars/CRS of all sizes shall be allowed to be procured from other than the above mentioned producers.

PARTICULAR SPECIFICATIONS (Contd.../-)

(ii) All finished steel shall be well and clearly rolled to the dimensions, section and weight specified. The finished material shall be reasonably free from cracks, surface flaws, lamination rough, jagged and imperfect edges and any other harmful defects and shall be finished in a proper manner. Tolerance on size and weight of the reinforcement bars shall not be more than those specified in clause 10.17.4 and 10.17.5 of SSR Part-I and as specified in IS-1786. The steel shall conform to the requirements as stated in clause 10.2.1 above. The contractor shall within 15 days of placing of work order indicate the source for procurement of steel to GE in writing. The documents in support of the purchase of steel shall be verified by the site staff and GE. The particulars of the manufacturer/supplier of steel shall be submitted by the contractor for every lot of steel separately. The Engineer in Charge shall record these details in STEEL SUPPLY ACCEPTANCE FORM as given here in after.

(iii) The contractors shall place their demand/requisition of steel with adequate lead-time. The steel shall be purchased from the storage depots of the main producers only.

(c) Steel sections for railings, gates, fencing, guard bars, grills, steel chowkhats, holdfasts etc., which do not constitute structural members, can be procured from main producers/secondary producers/BIS marked manufactures or their authorised dealers at the option of contractor without any minus price adjustment. Tests will not be insisted upon for such steel section.

16.3 TEST CERTIFICATE

16.3.1 The manufacturer shall carry out inspections and testing of steel in accordance with the relevant BIS provisions. The contractor shall submit the manufacturer's test certificate in original along with the test sheet giving the results of each mechanical test as applicable and the chemical composition of the steel or authenticated copy thereof, duly signed by the manufacturer with each consignment. The Engineer-in-Charge shall record these details in **STEEL ACCEPTANCE REGISTER** as per proforma given here in after due verification and send certified true copy of test sheets to GE for his record.

PARTICULAR SPECIFICATIONS (Contd.../-)

Appx 'F'

STEEL SUPPLY / ACCEPTANCE REGISTER

1. CA No. & Name of Work
2. Control No.*
3. Name of Manufacturer's T.C.No.
4. Manufacturer
5. Random Test Details

(a) Physical test Report from Vide their letter No. (Name of NABL approved Lab/Govt Engg College)

(b) Chemical test report from vide their letter No. (Name of NABL approved Lab/Govt Engg College)
6. Types of Steel, Dia & Qty (a) type : TMT/CRS (b) Dia __ mm (c) Actual Wt __ MT
- (d) Conversion Wt __ MT

	Chemical Test							Mechanical Test						
	Carbon %	Sulphur %	Phosphorous %	Sulphur + Phosphorous %	Manganese %	Silicon %	Corrosion Resistant element	Wt Per metre	Yield Stress (N/Sqmm)	Tensile Strength (N/Sqmm)	Percentage Elongation %	Bend Test	Rebend Test	Remarks
As per IS 1786														
As per manufacturer's test certificate														
As per independent test														

Remarks with Signature

Accepted / Rejected

Contractor Junior Engineer Engineer-in-charge Garrison Engineer

Remarks of BOO / Inspecting Officer / CWE

* To be allotted serially by GE consignment wise

PARTICULAR SPECIFICATIONS (Contd..)

17.4 TESTING OF STEEL

17.4.1 In addition to production of test certificate as mentioned above, the GE shall also organize independent testing of random samples of steel drawn from various lots from a **National Test House, SEMT CME, Regional Research Labs and Zonal Labs**, etc as per the recommended minimum frequency of various tests for steel as given here in after in PS Clause 10.8. Sample from each lot should be tested for quality and elongation. The elongation shall not be less than **18%**. In order to undertake Departmental testing, requisite facilities shall be organized by the contractor. Cost of samples, transportation, and cost of testing shall be borne by the contractor.

17.5 Nominal mass of any size of finished section of steel shall be checked as specified in relevant IS code. The nominal mass so determined shall be recorded in steel testing register giving cross reference to consignment number. Nominal mass of any size of finished section of steel if found to be beyond the tolerance limits on minus side as specified in relevant IS code, the same shall be rejected and the contractor shall remove the same at his own cost without any extra cost to the Government. However, if the weight of steel section is beyond the tolerance limit on higher side the same can be provided with approval of the Garrison Engineer but without any extra cost to the Government.

17.6 If any test result of any particular size of section of steel of any consignment is not found satisfactory as specified in relevant IS, retest shall be carried out for that particular section of steel. Even after carrying out retest, if that section of steel is not found satisfactory the contractor shall remove the same at his own cost and no claim of contractor shall be entertained on this account.

17.7 TESTING CHARGES

17.7.1 The unit rate/amount quoted by the contractor in the tender shall be inclusive of cost of all sorts of testing/retesting to the extent as specified here-in-before and in relevant Indian Standards.

17.8 FREQUENCY FOR NOMINAL MASS, TENSILE, BEND AND REBEND TESTS ON STEEL

17.8.1 REINFORCEMENT STEEL

Nominal mass test, Tensile test, Bend and Rebend test shall be carried out as per minimum frequency given below: -

Nominal Size of Bars		Frequency For Nominal Mass, Tensile, Bend And Rebend Test
(a)	Bar size less than 10mm	One sample (3 specimens) for each test for every 25 tonnes or part thereof.
(b)	Bar size 10mm to 16mm	One sample (3 specimens) for each test for every 35 tonnes or part thereof.
(c)	Bar size over 16mm	One sample (3 specimens) for each test for every 45 tonnes or part thereof.

17.8.2 **STRUCTURAL STEEL:** Tensile tests and Bend test shall be carried out as per the frequency mentioned below:-

Type of Test	Frequency
(a) Tensile Test	One test for every 25 tonnes of steel or part thereof.
(b) Bend Test	One test for every 25 tonnes of steel or part thereof.

NOTE (i) For various tests, Acceptance criteria, tolerance etc., refer to Steel supply/ Acceptance Form in and relevant BIS Codes.

PARTICULAR SPECIFICATIONS (Contd.../-)

- (ii) Testing by the GE as per above frequency is mandatory before payment is released to the contractor or steel is incorporated in the work. However, tests will not be insisted upon for the steel required for guard bars, holdfasts, grills and such other allied items. Any items of steel, not meeting the requirements, shall be rejected and the particular consignment removed from the site by the contractor at his own cost. The Contractor will have no claim on this account. Cost of tests and test samples as per above frequency shall be borne by the contractor irrespective of test results.
- (iii) The GE may also increase frequency and number of samples / tests for his satisfaction. The cost of these additional tests shall be governed as per Condition 10(A) of IAFW-2249. However cost of samples, transportation and other overheads shall be borne by the contractor irrespective of test results.

17.9 DOCUMENTATION

17.9.1 The contractor shall submit original vouchers from the manufacturer for the total quantity of steel supplied under each consignment to be incorporated in the work. All consignments received at the work site shall be inspected by the GE along with the relevant documents before acceptance. The original vouchers and the Test Certificates shall be defaced by the Engineer-in-Charge and kept on record in the office of the GE duly authenticated and with cross reference to the control number recorded in the steel Acceptance Register. The steel Acceptance Register will be signed by JE, Engineer-in-Charge, GE and contractor. The Accepting Officer may order a Board of Officers for random check of steel and verification of connection documents.

17.10 **STORAGE:** Steel supplied by the contractor shall be stored in accordance with the requirements of ISS. Each grade and quality of steel shall be stored separately and have identification tacks indicating the source, quality and grade.

17.11 **PRESERVATION AND MAINTENANCE OF STEEL:** The steel brought by the contractor shall be preserved to ensure that no rusting takes place till it is incorporated in the works. Steel sections which are not likely to be used before onset of or during monsoon shall be given cement slurry wash so as to ensure steel free from scale and rust.

17.12 **SCHEDULE OF SUPPLY:** The contractor shall procure all the steel sections in accordance with CPM chart.

17.13 **PAYMENT:** Running payment of steel shall be governed in accordance with condition 64 of IAFW-2249. Payment shall only be allowed after production of Test Certificate and purchase vouchers by the contractor for each consignment of steel and results of independent testing carried out by department are found satisfactory after testing.

17.14 **MEASUREMENT:** The entire quantity of steel items shall be suitably recorded in measurement book for record purposes showing length and weight as "Not to be abstracted" before incorporation in the work and shall be signed by the Engineer-in-Charge and the contractor.

17.15 **WEIGHT CONVERSION:** Weight of steel supplied by the contractor shall be calculated at unit weights given in Appendix 'A' of MES Schedule Part-II. For sections not listed in MES Schedule, the ISI conversion table shall be followed or manufacturers catalogue if the weights are not available in MES Schedule/ISI table.

17.16 Bending and fixing of bars for concrete reinforcement including mild steel wire for binding shall be carried out all as specified in MES Schedule.

17.17 Hooks shall be provided only for mild steel bars. Instead of hooks, ends of cold twisted/deformed steel/TMT bars shall be bent as shown on drawings.

17.18 Binding wire for reinforcement shall be mild steel wire (annealed) of size not less than 0.9mm.

PARTICULAR SPECIFICATIONS (Contd.../-)**18.0 RCC CHAJJAS**

- 18.1 RCC chajja shall be provided as per details shown on drawings.
- 18.2 RCC Chajja (whether cast integral with the lintel or precast embedded in the wall) shall be provided with a coved fillet of radius 50mm in PCC (1:2:4) type BO, preferably cast on green concrete.
- 18.3 The top surface of chajjas and the coved fillet shall be finished with 15mm thick cement plaster in cement mortar 1:3 mixed with approved water proofing compound as per manufacturers instructions while the concrete still green. The waterproofing cement plaster shall be taken over to the wall to a height of 30cms. In case of deviation, the percentage & addition of water proofing compound shall taken as 3% by weight of cement for omit purpose.

19.0 BEARINGS OF RCC STRUCTURAL MEMBERS

- 19.1 Bearing to all roof/floor slabs on masonry walls shall comprise of 15mm thick bearing plaster in CM (1:4) finished even and smooth and two layers of laminated water proofing building paper type-I conforming to IS-1308 weighing not less than 100gms/Sqm each layer, laid over it. However, in case floor/roof slab rests on RCC beams/bands, this provision does not apply.
- 19.2 All RCC beams/bressumers resting on masonry work shall be provided with PCC bed blocks cast in PCC (1:2:4) B-1. Bed blocks shall be twice the width of beams in length covering the entire thickness of wall and of depths 150mm, unless otherwise shown on drawings.
- 19.3 The bearing of lintels shall comprise of a full brick with vertical joints staggered.
- 19.4 No treatment shall be provided under bearing of RCC bands.

20 RCC LINTEL BAND

- 20.1 Provide RCC band at lintel level for the entire length of PCC solid block walls except at locations shown on structural plan including over opening with full bearing at the end of walls/columns and the same shall be constructed as per size and reinforcement details given in drawings or as specified. Unless otherwise shown on drawing the RCC band shall be 300mm depth reinforced with 4 Nos 12mm dia TMT steel bars as longitudinal bars and 8mm dia TMT steel bars links at 150mm centre to centre. Longitudinal bars shall be anchored in supporting walls/columns..

21 PLINTH PROTECTION

- 20.1 Unless otherwise shown on drawings Plinth protection shall be provided with 75mm thick PCC (1:3:6) type C-1 over 75mm thick consolidated bed of hard core (Stone aggregate) grouted with sand over well consolidated sub base. The width of the plinth protection shall be all as shown on drawings. Plinth protection shall be laid to a slope of 1:30. PCC shall be laid in alternate bays (bay area shall be not exceeding 2.0Sqm each) and finished fair on top without using extra cement. 6mm wide joints shall be provided throughout the thickness of plinth protection in concrete bays at corners and turning points and also in between walling and plinth protection. All joints in bays, as well as between walling and the concrete in plinth protection shall be filled-in with mastic filling comprising 1 part of heated bitumen 85/25 or 90/10 grade and 3 parts of sand (all by weight).

- 22 **CONCRETE PADDING:** Where the required height of walls, openings is not obtained with adequate size of PCC blocks the same shall be obtained by providing PCC 1:3:6 type C-1 using 20mm graded stone aggregate.

- 22A **CURING:** Curing of all concrete work shall be carried out all as specified in MES Schedule 2009 Part-I (Specifications).

- 22B **AAC BLOCK:** The specification for AAC Block size 600 x 200 x 200 mm, compressive strength 5N/mm² and density 651-750Kg/Cum as per Para 4.1 of IS 2185 (Part-3) 1984 and jointed using chemical mortar as per manufacturer's instructions. Curing of all concrete work shall be carried out all as specified in MES Schedule 2009 Part-I (Specifications).

23 PRECAST PCC SOLID BLOCK MASONARY

- 23.1 PCC solid blocks shall conform to IS-2185.

PARTICULAR SPECIFICATIONS (Contd.../-)

23.2 TYPE OF MIX

- 23.2.1 The precast PCC solid blocks shall be grade of C-5 as specified in the drawing. Aggregate shall be mixed thoroughly to achieve desired grading. PCC blocks with above mix shall be checked and verified for 28 days compressive strength as per IS 2185 at the commencement of work and whenever there is change in source of ingredients. The block shall have minimum compressive strength of 50Kg/Sqcm.
- 23.2.2 Trial mixes shall be carried out before casting the blocks to ensure that the required strength and block density is achieved as per IS. In case superior mix ratio is required to achieve the desired strength, nothing extra will be paid to contractor on this account.
- 23.3 **Size:** The block shall be one of the following sizes

SI No.	Nominal size in cm			Actual size in cm		
	Length	Breadth	Height	Length	Breadth	Height
(a)	40	20	20	39	20	19
(b)	40	10	20	39	10	19
(c)	20	20	20	19	20	19
(d)	20	10	20	19	10	19

Size other than those specified above may also be used with the approval of Engineer-in-Charge.

23.4 MATERIAL

- 23.4.1 **Cement** – All as specified here in before
- 23.4.2 **Coarse Aggregate** – This shall be crushed or natural aggregate 20mm and down size of approved quality and as specified here in before.
- 23.4.3 Fine aggregate (River sand) - This shall be river sand and free from dust and well graded and as specified here in before.
- 23.4.4 A block shall be deemed to be solid if the solid material is not less than 75% of the total volume of the block calculated from the overall dimension.

23.5 MANUFACTURE OF BLOCKS

- 23.5.1 The block shall be machine made. The mixing of concrete manufacture of block, curing and drying shall be in accordance with the para 6 to 10 of IS-2185. PCC solid blocks can be procured from manufacturers confirming to IS, if not manufactured at site and necessary test certificates from manufactures shall be submitted. All tests for blocks shall be carried out as stipulated here in after before incorporating in work.
- 23.5.2 Faces of the block shall be flat and rectangular
- 23.5.3 **MIXING** – Concrete shall be mixed in mechanical mixer. Mixing shall be continued until there is uniform distribution of material and the mix is uniform in colour and consistent.

23.5.4 PLACING AND COMPACTION

- (i) In case of mechanical compaction, the mould shall be filled up to over flow, vibrated or mechanically tamped and struck of level.
- (ii) After de moulding the block shall be protected until they are sufficiently hardened to permit handling without damage.
- 23.5.5 **CURING**- The block hardened as mentioned here in before shall be then be cured in the curing water tank or in curing yard and shall be kept continuously moist for at least 14 days. Where the blocks are cured in an emersion tank, the water of tank shall be changed at least every 4 days.

NOTE: - Curing yard is a paved yard sub divided by shallow drains 4 to 5 metres, Square platform, which are provided with water fountain in the centre. The blocks are stacked on the

PARTICULAR SPECIFICATIONS (Contd.../-)

platform around the fountain, which works continuously. The fountain is connected to an elevated water storage tank.

- 23.6 **DRYING:** After curing the block shall be dried for a period of 4 week before being used in the work. They shall be stacked with voids horizontal to facilitate thorough passage of air. The dimensioned stability of concrete block is greatly affected by variation in their moisture content. Since the shrinkage of the block is much greater at the time it dries for the first time than due to subsequently wetting and re drying, it is necessary to ensure that the blocks are dried so that initial shrinkage is completed before they are delivered to use. Further their moisture content should not exceed 25% of their maximum water absorption capacity, if the blocks are to be used in situation where the average relative humidity of air is more than 60%. In that case the blocks can be dried to a moisture content of 40 % of their maximum water absorption capacity.

23.7 **PHYSICAL REQUIREMENT**

- 23.7.1 **GENERAL:** All blocks shall be sound and free from cracks or other defects which interfere with proper placing of the block or impair the strength or performance of the construction. Minor chipping resulting from the customary methods handling during delivery shall not be deemed ground for rejection.

- 23.7.2 **TOLERANCE:** The maximum variation in the length of the units shall not be more than $\pm 5\text{mm}$ for length and maximum variation in heights and width of unit, not more than $\pm 3\text{mm}$.

- 23.7.3 **BLOCK DENSITY:** The block density shall be as per Para 4 of IS 2185 for solid PCC blocks. It shall not be less than 1800 Kg/Cum

- 23.7.4 **COMPRESSIVE STRENGTH:** The average compressive strength of eight blocks when determined in the manner described in IS-2185 shall not be less than 50 kg/sqcm of gross area. The strength of lowest individual block shall be not less than 80% of the average compressive strength of eight blocks.

- 23.7.5 **WATER ABSORPTION:** The water absorption shall be as per IS-2185.

- 23.7.6 Drying shrinkage and moisture movement shall be as per IS 2185

23.8 **TESTS**

- 23.8.1 Tests and sampling of blocks shall be as per requirements of IS-2185 (Part I)

- 23.8.2 All the following tests shall be carried out in accordance with IS-2185 (Part I):-

- (a) Compressive test
- (b) Block density
- (c) Water absorption
- (d) Dry shrinkage
- (e) Moisture movement

- 23.8.3 All the above tests shall be carried out as described in Appendices of IS-2185 part I. The tests shall be carried out of by the contractor through laboratories as mentioned in **Appendix 'H'** to the particular specifications. The cost of testing shall be borne by the contractor.

- 23.8.4 For tests mentioned in (d) and (e) in clause No 6.8.2 above, sufficient number of blocks are also required to be tested as per the provisions contained in relevant IS. The tests shall be carried out contractor's own arrangement from recognized laboratory and expenses towards the same shall be borne by the contractor.

- 23.8.5 A record of 'concrete pour' for blocks and numbers of blocks cast/incorporated in testing shall be jointly maintained to access the quality of cement utilized. The contractor shall bear cost of blocks, preparation of blocks and their curing transportation and handling complete.

- 23.8.6 Casting of $\frac{1}{2}$ blocks and $\frac{3}{4}$ blocks simultaneously at site and kept for the block masonry to avoided breakages during the time of casting.

PARTICULAR SPECIFICATIONS (Contd.../-)**23.9 PRECAST PCC SOLID BLOCK WALLING**

23.9.1 20cm thick PCC solid block walling shall be built in cement mortar (1:6). 10cm thick PCC solid block walling shall be built in cement mortar (1:4).

23.9.2 **LAYING:** The pre cast PCC solid block shall be slightly wetted before & during laying in the wall. The block shall be laid with mortar joints completely filled without any void left in the masonry. The thickness of the horizontal and vertical joints shall not exceed 1cm.

The 1/2, 1/3 and 2/3 blocks shall be used for breaking the joints. The face joints shall be raked to a depth of 1cm by raking tool during the progress of the work, when the mortar is still green so as to provide proper key for plaster or to facilitate pointing to be done later. Where plaster or pointing is not required the joints shall be struck flush and finished side by side as work proceeds without any cost to the department.

23.9.3 **CURING OF WALLING:** Masonry work shall be kept constantly moist on all the faces for a minimum period of 7 days.

23.9.4 **SCAFFOLDING FOR WALLING:** Only double scaffolding shall be used. The scaffolding shall be strong and sound. No holes in the masonry for supporting scaffolding will be allowed.

23.9.5 20/10 cm thick walls wherever shown on drawings shall be 20/10 cm thick precast solid block walling. Dowel bars (connecting bars) shall be provided in the adjoining RCC columns all as specified in respective drawings.

23.9.6 100mm thick partition walls shall rest on plinth beam as shown in structural drawings. In case plinth beam is not shown in structural drawing 100mm thick wall shall rest on sub base of the floor in ground floor. 10cm thick partition wall shall be properly bonded at ends into adjoining wall/column. RCC bands in 100mm thick walls shall be provided at the locations as per provisions given in drawings. In case details are not shown in drawing lintel shall be provided as under:-

(a) RCC band at lintel level for the entire length (including over opening) shall be provided. The RCC band shall be of 100mm depth and reinforced with 4 Nos 10 mm dia TMT steel bars as longitudinal bars and 8mm dia TMT steel bars links at 200mm centre to centre. Longitudinal bars shall be anchored in supporting walls/columns.

(b) If length of the wall is exceeding 3metre and not exceeding 6metre in plan which is unsupported in perpendicular direction, the vertical RCC band of size 100x100mm shall be provided at centre reinforced with 4Nos 10mm dia deformed twisted TMT steel bars as longitudinal bars and 8mm dia TMT steel bars stirrups at 150mm centre to centre. This band shall be anchored in slab/beam/sub base

(c) Whenever partition walls rest over slabs, additional reinforcement shall be provided in the RCC slab as shown in the structural drawing along the direction of wall.

23.10 DAMP PROOF COURSE

23.10.1 The damp proof course with 40mm thick PCC (1:2:4) type B-0 using 12.5mm graded stone aggregate mixed with water proofing compound as per manufacturers instructions shall be provided (except where the top of plinth beam/band is at the plinth level or 40 mm below the finished floor level) over full width of all external and internal walls except dwarf wall and 100mm thick partition walls. DPC shall be provided to all openings as specified in clause 5.42 of MES Schedule 2009 Part-I (Specifications). In case of deviation, waterproofing compound shall be taken as 3% by weight of cement adjusted by applicable contractor's percentage.

24.0 PVC SOLID DOORS

24.1 Irrespective of whatever shown on drawing all doors of toilet, bath and WC shall be PVC doors. Door frames and shutters shall be PVC. The members of door including frame shall be as shown on drawing and as specified in MES Schedule 2009 Part-I (Specifications). The entire door shutters shall be provided with stainless steel screws at appropriate places for rust free quality. Irrespective of whatever is shown on drawings, the door frame shall be fixed to the wall by 6 Nos expandable fastener bolts of 100mm long. Builder's hardware shall be anodised aluminium. Colour and finish of PVC door shall be as approved by Engineer-in-Charge.

PARTICULAR SPECIFICATIONS (Contd.../-)**25. BUILDER'S HARDWARE**

- 25.1 **ITEMS AND QUANTITIES**: Hardware fittings shall be provided according to the scales indicated on the schedule of iron mongery on the relevant drawing and in conformity with any note that may be appearing on a particular drawing.
- 25.1.1 **SIZES**: In case the size of particular fitting is not given in the drawing, it shall be of size as directed by the GE.
- 25.1.2 All articles of builder's hardware shall bear ISI marking. In case any item/fitting with ISI mark is not manufactured then it shall conform to the relevant IS specifications and the specifications given in the MES Schedule 2009 Part-I (Specifications) for the relevant item.
- 25.1.3 Screws used for fixing items of builder's hardware shall be as specified in Clause 9.2.6 of MES Schedule 2009 Part-I (Specifications).
- 25.1.4 Articles of builder's hardware, excluding butt hinges, mortice locks and ball catch shall be of anodised aluminium. Anodising shall not less than 15microns.
- 25.2. **BUTT HINGES**: Irrespective of whatever is indicated on drawings Butt hinges shall be of medium weight, stainless steel with galvanised mild steel pin and shall be bright finished with smooth surfaces conforming to IS 12817-1997.
- 25.3 **DOOR HANDLES**: All doors and shutters shall be provided with Aluminium anodised handles all as specified in clause 9.11 of MES Schedule 2009 Part-I (Specifications).
- 25.4 **MORTICE LOCK**: Mortice lock if shown on drawings shall be of steel (4 levers) with latch size 65mm all as specified in clause 9.9.2 of MES Schedule 2009 Part-I (Specifications).
- 25.5 **TOWER BOLTS**: Tower bolts shall be of Aluminium anodised (extruded section) conforming to specifications given in Clauses 9.3.1 & 9.3.3 of MES Schedule 2009 Part-I (Specifications). The dia of bolt shall be 10mm dia upto size 125mm and 12mm dia for sizes 150mm and above.
- 25.6 **SLIDING DOOR BOLTS**: Where shown on drawings these shall be of aluminium anodised all as per IS-2681 and 9.5.2 of MES Schedule 2009 Part-I (Specifications). The dia of bolt unless otherwise shown on drawings shall be 16mm.
- 25.7 **LOCKING BOLTS**: Locking bolts where shown on drawings shall be of mild steel chromium plated finish all as specified in Clause 9.6 of MES Schedule 2009 Part-I (Specifications).
- 25.8 **HASPS AND STAPLES**: Shutters of all cupboards/wardrobes shall be provided with hasps and staples safety type made of aluminium anodised, 100mm, all as specified in clause 9.10 of MES Schedule 2009 Part-I (Specifications).
- 25.9 **DOOR SPRING**: Wire gauge shutters shall be provided with 1 No door spring Rat Rail type made of MS all specified in clause 9.7.8 of MES Schedule 2009 Part-I (Specifications). Where helical spring hinges shown on drawings, the same shall be amended to read as door spring Rat Rail type
- 25.10 **DOUBLE ACTION SPRING HINGES**: All swing door shutters shall be provided with double action spring hinges of MS as specified in clause in 9.7.7 of MES Schedule and shall be of minimum of 125mm 2009 Part-I (Specifications).
- 25.11 **TOWEL RAIL**: Towel rail shall be aluminium anodised of 'D' shaped with flanged for fixing. It shall be of minimum diameter 19mm and 60cm, in case length is not mentioned in drawings.
- 25.12 **DECORATIVE TYPE CURTAIN ROD**: Decorative curtain rod shall be powder coated mild steel pipes 25mm dia 18SWG thick with decorative type fancy brass end caps as approved of suitable size with 12 Nos curtain rings with hooks. Curtain rod shall be fixed with suitable matching brackets all as directed. Sample and make of curtain rods shall be got approved by GE before incorporation in work.
- 25.12.1 **VENETIAN BLIND** : Venetian blinds shall be provided as shown on drawings of approved make. Venetian blinds shall be fixed with suitable matching brackets all as directed. Sample and make of curtain rods shall be got approved by GE before incorporation in work.

PARTICULAR SPECIFICATIONS (Contd.../-)**25.13 WIRE CLOTH**

a) The term wire gauge/fly proofing/mosquito proofing/wire mesh shall mean the 'woven wire cloth' and shall be conforming to relevant IS and sample as approved by the GE.

b) Wherever aluminium wire cloth is shown in the drawings for skeleton window shutters/ventilator shutters, provide Mosquito proof aluminium wire cloth with aluminium wire of 0.56mm nominal dia and 1.00mm average width of aperture. Aluminium wire cloth shall be fixed to the shutters with standard anodised aluminium angle beadings

25.14 DASH-THRU-FASTENERS Where the frames of doors, windows, cupboards are to be fixed to reinforced concrete jambs, these shall be fixed with 'Dash-thru-expansion fasteners' of adequate size manufactured by 'Dash Fasteners Pvt Ltd, C-10, South extension Part-II, New Delhi' and marketed by 'M/s Mon Traders, C-16, Tardeo AC market, Mumbai-34'. Wherever expansion fasteners are being used hold fasts/lugs need not used.

25.15 HOLD FASTS/LUGS: Flat iron hold fast/lugs shall be provided by welding as and where shown on drawings except those, to be provided to wooden chowkats, which shall be fixed with bolts/nuts as per details shown on drawings. Holes in wooden chowkats shall be plugged with hard wood plugs. Hold fasts/lugs shall be embedded in PCC (1:3:6) bed blocks of size 200x200x100mm in 200thick solid block masonry or equivalent walls and 200x 100x100mm in 100thick solid block masonry or equivalent walls.

25.16 WELDING: Welding of steel and ironwork shall be done in an approved manner and as specified in Para 10.15 of MES Schedule 2009 Part-I (Specifications). Welding electrodes shall be ISI marked and of quality suitable for welding of structural steel and shall comply with requirement of IS-814 for covered electrodes for metal arc welding of mild steel.

25.17 FAN HOOKS WITH BOXES: Wherever fan hooks/fan points have been shown, cast iron MS boxes with fan hooks as per details shown on drawings shall be provided. Exposed faces shall be given two coats of white synthetic enamel paint over a coat of red oxide primer.

26. ALUMINIUM DOORS/WINDOWS/ VENTILATORS:

26.1.1 All aluminium door/windows/ ventilators frames and shutters shall be factory made. The types and the overall size of aluminium doors shall be all as shown in Architectural /Sch of openings/TD drawings. Shop drawings shall be prepared by contractor & got approved from GE. Weight of aluminium sections used in manufacturing of frames including shutters of doors shall be as per relevant drawings.

26.1.2 The aluminium sections shall Conform to IS-737-1986 and specified in clause No 10.37 of SSR Part I. Frames/Shutter frames of aluminium door/windows/ ventilators shall be powder coated finish. Thickness of powder coating shall be 50 micron. Colour of powder coating shall be as directed by GE.

26.1.3 The shutters shall be made out of specially extruded tubular sections where provision for weather stripping made in the vertical jambs.

26.1.4 The cleats for mechanical horizontal (vertical joints) of the fixed frame and shutters shall be of specially extruded aluminium sections so as to avoid any ply between jointed members.

26.1.5 Single action door shall be fixed by plated brass pivots at top and bottom.

26.1.6 Single action doors shall be provided with over head door closers. Double action doors shall be provided with floor springs.

26.1.7 Inactive leaf shall be provided with concealed sheet bolt.

26.1.8 Shutters shall be provided with PVC/Neoprene weather stripping.

26.1.9 Neoprene/ PVC gasket shall be used in the glazing beads for shutters before fixing glazing, the glass shall be encased in PVC channel so as to avoid metal to glass contact.

26.1.10 The glazing beads both on shutters as well as fixed glazing shall be of screw less type.

26.1.11 The aluminium sections shall be coloured powder coated.

PARTICULAR SPECIFICATIONS (Contd.../-)

- 26.1.12** The fittings viz., hinges, bolts, handles, locking arrangement etc., shall be as per manufacturer's instructions and as shown on drawings. The thickness of glass shall be as shown in drawings.
- 26.2.1** The glass panel shall be all as specified in IS-1948. Glazing shall be with sheet/float glass ordinary quality of 5.5mm for aluminium doors and 4 mm thick for aluminium windows, ventilators medium weight quality (with mild steel wire pin) as per clause 9.7.2 of MES Schedule Part-I and shall be bright with smooth surface. Frosted glass shall be provided to windows/ vents of toilet, bath/WC.
- 26.2.2** All external windows/ ventilator shall be provided with aluminium grill except toilet as shown. Aluminium grills DG-104 shall be provided at the location where ever shown on the drawings.
- 26.3** Aluminium sections shall be obtained from any of the manufactured listed herein unless otherwise specified elsewhere in the tender documents.

26.4 FRP DOOR FRAMES/ SHUTTERS:

- 26.4.1** FRP door frames and shutters shall be provided wherever shown on drawings. Frame shall be medium frame of size 75 mm x 40 mm and shall be moulded with 2 mm the FRP laminate outer core and inner core filled with seasoned and treated rubber wood and PU foam with gel coat finish. FRP door shutters of 30 (+/-1)mm thick and shall be made up with gel coating and laminated with un saturated polyester resin moulded to average 2mm FRP laminate for forming hollow rails and stiles .Suitably treated and seasoned rubber wood are to be filled inside at required places for fixing of fittings FRP laminate 3 mm thick monolithically cast for panels .

- 26.5** **FIXING OF SHUTTERS:** Shutters shall be fixed to the frames all as specified in Clause 8.22 of MES Sch Part I.

- 26.6** **STEEL DOORS:** Steel doors with angle iron frame and MS sheet shall be provided all as shown on drawings.

- 26.7** **Other wooden surfaces exposed to view but not covered in schedule of finishes or their finishing is not specifically indicated in any other drawings or specified elsewhere shall be given two coats of synthetic enamel paint over a coat of primer as directed by the GE.**

26.8 BUILT IN CUPBOARD:

- 26.8.1** Provide cub board with all fittings all as shown on drg and specified here in below. Irrespective of what is shown on drg, 28 to 30mm thick factory made Solid PVC Moulded Door shutter with 2, 4, or 6 raised panel design with solid core of particle board of 24mm thick (12mm x 2). The particle board shall be lipped with 25mm thick baton made from PVC sheets on the stile where hinges are to be fitted. On the three other sides the lipping shall be of 15mm thick PVC baton. 2mm thick Moulded PVC sheet shall be stuck on the front face of the particle board suitable prepared to accept the moulded design and 2mm PVC sheet shall be stuck on the back face of the particle board with thermosetting adhesive. The 2mm thick PVC sheets shall be stuck with lipping by using solvent cement.

- 26.8.2** Solid PVC frame (Single Rebated) of size 60mm x 30mm made out of solid PVC foam with homogenous fine cellular structure having smooth outer integral skin with suitable metal stiffener and fixed with 100 x 8 sheet metal CSK screws complete all as specified.

(Note :- Door frame shall be waterproof, termite proof, elegant and should have excellent screws holding strength to fix hinges and hold doors properly for a long life)

- 26.8.3** The internal plastered and concrete surfaces of CB shall be painted with two coats of oil bound distemper over primer coat of alkali resistant primer after preparation of surface all as specified in MES Schedule (Part-I)

27 GUARD BARS/GRILLS

- 27.1** **Aluminium grills** of approved design shall be provided to all windows and ventilators at locations where shown in drawings. These shall be any one of the following makes 'DECOGRILL', 'DURAGRILL', 'AEROGRIILL' as approved by GE. The aluminium grills shall be provided with minimum thickness of 5.2mm and weight of 2.4 Kg/Sqm. In case of

Contd.../-

PARTICULAR SPECIFICATIONS (Contd.../-)

window/ventilators with mosquito proofing and glazing in the same opening, grills shall be provided to one of the frames only as directed by GE. The grills shall be riveted to panel of window frame all as directed by Engineer-in-Charge.

- 27.2 **MS Guard bars/grills** where indicated shall be provided as per details shown on drawings/schedule. Steel Guard bars/ steel grills shall be painted with 2 coats of epoxy paint over a coat of epoxy primer as specified. Steel Guard bars/ steel grills provided with Aluminium windows/ventilators shall be powder coated as specified here-in-before.

28. **ROOFING**

- 28.1 RCC Roof slabs shall be cast/laid to slopes as indicated in the drawings and the thickness shown on drawings shall be considered as minimum thickness. Top of roof/terrace slab shall be applied 15mm thick plaster with cement mortar 1:4 mixed with water proofing compound as per manufacturer's instructions when the concrete is green. In case of deviation, the same shall be considered as 3% by weight of cement (for omit purpose).

- 28.1.1 RCC roof slab/terrace slab after application of plaster shall be prepared as described in Paras 11.42.2 and 11.42.2.1 of MES Schedule 2009 Part-I (Specifications) before carrying out any treatment.

- 28.1.2 **PONDING TEST**: For ponding test, roof shall be filled with water and tested for 72 Hours after required period of curing to observe leakage/ seepage. Leakage/seepage if any shall be rectified and retested till leakage/seepage completely stopped.

- 28.1.3 Area below/around the location where water tank are to be placed shall be suitably raised with PCC 1:2:4 type B0 to drain off the over flow/ leakage water effectively.

28.2 **WATER PROOFING TREATMENT TO ROOFS (INACCESSIBLE ROOFS)**

- 28.2.1 Over the plastered roof slab, on which water proofing treatment is to be applied shall be cleaned off all foreign materials such as dust etc., by wire brushing, dusting, washed thoroughly dried up and the roof surfaces made completely dry and dust free as far as possible. On the dried roof surface apply a uniform coat of hot bitumen 85/25 grade @ 1.2Kg/Sqm over a coat of bituminous primer @ 0.30 litre per Sqm.

- 28.2.2 Water proofing treatment shall be carried out using Atactic Polypropylene (APP) membrane 3mm thick, weight not less than 3.5 Kg/Sqm reinforced with polyester non woven fabric laid over entire roof surface and on vertical surface up to grooves as applicable (or as per manufacturer's instructions) with side laps of 100mm and end laps of minimum 150mm. The over laps shall be bonded with bitumen primer and sealed by flames as per manufacturer's instructions. Water proofing treatment shall be tucked in wall to a depth of 50mm (minimum) where applicable. For parapets membranes shall be taken to a height of minimum 60cms and tucked in the groove. Groove made in the wall and shall be filled with bitumen mastic filling without any extra cost to government and finally water proofing membrane shall be finished with two coats of bituminous aluminium paint. The membrane should satisfy following specifications.

- (i) Single central non woven polyester reinforcement of $\geq 160\text{gms/Sqm}$
- (ii) Softening point of minimum 150°C
- (iii) Cold flexibility of minimum $(-) 5^{\circ}\text{C}$
- (iv) Tensile strength of 650N/Sqcms and 350N/Sqcms in longitudinal and transverse direction respectively
- (v) A minimum elongation of $> 20\%$ in both directions
- (vi) A dimensional stability with % change of maximum 1%
- (vii) Water tightness/impermeable at 2 Kg/Sqcm
- (viii) Water absorption of not more than 1% on mass within 24 hours

- 28.2.3 APP modified water proofing membrane to be incorporated in the work shall be obtained from any of the following manufacturers as given in Appx 'C'

- 28.2.4 The water proofing membrane treatment shall be carried out by the approved applicator of the manufacturer as approved by the GE and certificate to this effect shall be taken by the contractor from manufacturer and shall be submitted to GE before completion of work.

PARTICULAR SPECIFICATIONS (Contd.../-)

- 28.2.5 Contractor is required to procure APP from manufacturer as approved by GE supported by a test certificate of the manufacturer's company confirming and co-relating the date of manufacture and/or the batch number of the supplied quality, its brand name, along with the test properties. This certificate shall be required to be submitted along with memo/bill/invoice in original before incorporation of the material in the work/any claiming of payment as material lying at site.
- 28.2.6 The following tests shall be carried out in approved government laboratories or laboratories having NABL accreditation and necessary test report shall be submitted to GE for the material before incorporation in the work.
- (a) Thickness of membrane
 - (b) Weight of membrane
 - (c) Tensile strength (Longitudinal/Transverse)
 - (d) Tear resistance
 - (e) Softening point
 - (f) Weight of carrier (Polyester)

28.4 GUARANTEE FOR WATER PROOFING TREATMENT

- 28.4.1 After completion of work contractor shall submit a written guarantee for a period of **10 (Ten) years** for the water tightness of the water proofing treatment carried out from the certified date of completion of the entire work under the contract as certified by the GE.
- 28.4.2 This guarantee shall be given in the form as approved by the GE on non-judicial stamp paper of appropriate value. During the aforesaid guarantee period of **10 years** the contractor shall be solely responsible for the water tightness of the roof slab. Any leakages/defects noticed by the GE during this period shall be promptly rectified by the contractor without any extra cost to the Government.
- 28.4.3 GE at any time during construction or reconstruction or prior to expiration of **10 years** guarantee period finds that the works executed is not conformity with the specifications agreed upon or if leakages of any kind are noticed to, the contractor shall on demand in writing from the GE, in spite of the fact that the work may have been inadvertently passed, certified and paid for shall forth with get the work rectified at his own expenses, and render complaint free from any type of leakages. In the event of his failing to do so within the period specified by the GE in his aforesaid demand, the GE may get the defect/repairs rectification done, through other agency at the risk and expenses of contractor in all respects. Liability of the contractor for water tightness shall however not extend beyond the guarantee period of **10 years** unless the GE and previously given the notice to the contractor to carry rectifications/repairs.
- 28.4.4 The contractor shall furnish a guarantee for a period of 10 years for the effectiveness of all water proofing treatment carried out as specified here in before for the buildings catered under Sch 'A' Part I before completion of work and the same shall be reflected in the completion certificate. The contractor shall furnish a guarantee in favour of GE for the efficacy of the water proofing treatment during the guarantee period. Security deposit towards the guarantee for all water proofing treatment work executed under this contract shall be retained from the payment due to contractor. Amount of Security deposit towards the guarantee, shall be calculated **5% (Five Percentage)** on the amount of water proofing treatment at contract rates for the buildings described under Sch 'A' Part I and IA. This amount shall be released after successful expiry of the guarantee period. The contractor may, however, furnish a fixed deposit receipt in lieu, from a Scheduled Bank pledged in favour of GE. (Specimen of this guarantee certificate is att as Appendix 'I')
- 28.4.5 Condition 46 of the General Conditions of Contracts (IAFW 2249) shall be deemed to be amended to the extent mentioned."

29 GALVALUME SHEETS

- 29.1 Wherever galvalume sheet roof is indicated or shown on drawing, provide deep depth trapezoidal profiled pre-painted galvalume sheet as:-
- a) The roof sheets shall be of pre-painted Zinc alloy metallic coated trapezoidal sheet profile (Standard) with base metal sheet conforming to IS 15965 : 2012.

PARTICULAR SPECIFICATIONS (Contd.../-)

b) The base metal sheet shall be of high tensile steel with designation of IS 15965:2012/YS 550/AZ 200 / Class 4 of 0.50mm thickness (TCT). The top coat (finish coat) shall be provided with super durable polyester (SDP) containing inorganic lead free pigment having thickness not less than 20 micron in addition to all other coats as specified in the IS.

c) The sheets are to be fastened with self-drilling screws of class 3 category as per AS 3566:2002 class 3 with EPDM washer as per the requirement considering the profile shape and design load.

d) The profile shall have a minimum crest of 28 to 35 mm and maximum pitch of 250 mm with minimum side and end lap as per manufacturer's instructions.

e) Ridge cap and eaves cap shall be provided as per manufacturer's instructions.

f) The standard ridge shall extend 300mm on either side. The colour pattern of Galvalume sheet shall be decided by GE. The grade of Galvalume coating shall be conforming to ASTM A-792-AZ 150.

g) Contractor shall procure the Galvalume sheet from the profile manufacturer as given herein after and submit purchase vouchers and test certificate of the Galvalume sheet from manufacturer confirming to relevant standard to the GE before incorporating in the work. The rate quoted shall be deemed to include for all the provisions mentioned herein before.

29.2 The make of the Galvalume sheet shall be any of the following or as per attached list of makes under Appendix 'C' :-

(a) M/s Japan Metal Building Systems Pvt Ltd., No 6, Royal Arcade, Koramangala, Bangalore-560 095.

(b) M/s Lloyd Insulations (I) Ltd., 5, Haddows lane, Nungambakkam, Chennai-600 006.

(c) M/s New Life steel Structures, PO: 8226, 1 Shiv Darshan, Radhabai Mhatre Road, Dahisar(W), Mumbai-400 068.

(d) M/s Multicolor Steels (I) (P) Ltd., White House, 1/18-20, Rani Jhansi Road, New Delhi-110 055.

(e) M/s Everest Industries Ltd., Genesis A 32 Mohan Cooperative State, Mathura Road, New Delhi-110 044.

(f) M/s Tata Blue scope.

(g) M/s Roofit of M/s Shiv Shakti Fiber Udyog, Plot No 1-G, Northern Indian Complex, 20/3, Mathura Road, Faridabad-121 006, Haryana.

(h) M/s Prestar Infrastructure Projects Ltd, 10 Clive Row, 4th floor, Kolkata-700 001.

(j) M/s Kirby Building Systems India Ltd, Andhra Pradesh

(k) M/s Colour Roof India Ltd.

30. **FLOORING**

31.1 Provisions contained in clause 13.13, 13.25, 13.27, 13.28, 13.32, 13.39, 13.40 & 13.47 of MES Schedule 2009 Part-I (Specifications) are to be adopted for laying floors and pavements.

31.1.1 Floors shall be laid to levels or to falls as shown on drawings and as directed by the Engineer-in-Charge. Floor finish shall be extended over dwarf walls, doors and other openings.

31.1.2 In case of openings without door shutters, the finish of main room shall be extended for the full width of the opening.

31.1.3 The dividing line between the floors of different types wherever they so meet between adjoining rooms, shall be determined on the basis of the finish visible when the doors are closed and the applicable finish shall accordingly be provided.

PARTICULAR SPECIFICATIONS (Contd.../-)

- 31.1.4 Floor finish over PCC sub base shall be laid all as specified in MES Schedule 2009 Part-I (Specifications). Floor topping of Cast-in-situ, PCC shall be finished even and smooth without using extra cement.
- 31.1.5 Sub floor may not be laid in panels. Under-layer and topping layers of cast-in-situ cement floors shall be laid in square or rectangular panels as directed by Engineer-in-Charge, Length of panel not exc. 2.0 metre, length to width ratio not exc. 1.5 times in rectangular panels.
- 31.1.6 Dividing strips for PCC floor shall be of glass and width 2mm less than the thickness of floor. Thickness of glass strips shall be 3mm. The top of glass dividing strips shall be grounded smooth.
- 31.1.7 Joints in, PCC footpaths, steps and ramps shall be raked and filled with a mixture of hot blown grade bitumen conforming to IS-702 and sand in the ratio of 1:3.
- 31.2 **TYPE AND COMPOSITION OF FLOORS:** Floor finish shall be, as shown on drawings, and shall be laid as specified in MES schedule 2009 Part-I (Specifications) and as hereinafter.

31.2.1 PCC FLOOR

- (i) 40/50mm thick PCC (1:2:4) Type B-1 finished even and smooth using extra cement over 75/100mm thick PCC (1:4:8) Type D-2/PCC (1:5:10) sub base over 100mm thick hardcore over rammed earth in ground floor all as shown in Schedule of finishes.
- (ii) 40mm thick PCC (1:2:4) Type B-1 finished even and smooth using extra cement over RCC slab. The top surface of RCC slab shall be cleaned with hard wire brush and cement slurry @ 1.2kg/Sqm shall be applied before laying the floor all as shown in Schedule of finishes.
- (iii) 75mm /100 mm thick PCC 1:2:4 type B-1 finished fair and even over 75mm/100mm thick PCC 1:4:8 type D-2 over 100 mm thick hardcore over rammed earth in ground floor all as shown in Schedule of Finishes.

31.3 NON SKID CERAMIC TILE FLOORING

- 31.3.1 Non-skid ceramic tiles shall be flat true to shape, sound and free from flaws and other manufacturing defects. Ceramic tiles shall conform to IS-13755 grade B-II(a) for toilets and B-II(b) for other locations for floor tiles and grade B-III for wall tiles. Ceramic tiles shall be coloured as approved by GE.
- (a) Provide 7 to 9mm thick Non Skid Ceramic tiles (edge cut), coloured of size 40cmx40cm/30cmx30cm set, jointed in neat cement slurry and pointed in coloured cement to match, laid over 15mm thick screed in CM (1:4) over 30mm thick PCC (1:2:4) type B-0 over 75mm thick PCC (1:4:8) type D-2 sub base over rammed earth in Ground Floor.
- (b) Provide 7 to 9mm thick Non Skid Ceramic tiles (edge cut), coloured of size 40cmx40cm/30cmx30cm set, jointed in neat cement slurry and pointed in coloured cement to match, laid over 10mm thick screed in CM (1:4) over 30mm thick PCC (1:2:4) type B-0 over RCC slab. The top surface of RCC slab shall be cleaned with hard wire brush and cement slurry @ 1.2kg/Sqm shall be applied before laying the floor.

31.4 KOTA STONE SLAB FLOORING

- 31.4.1 Kota stone slab shall be of 20 to 25mm thick. Kota stone shall be mirror polished by machine.
- (a) 20 to 25mm thick machine cut mirror Polished Kota stone slab of size not less than 575mm x 575mm shall be laid and jointed with grey cement slurry mixed with pigments to match the shade of the slab including rubbing and polishing by machine, over 20mm thick screed bed in CM 1:4 laid over 75mm thick PCC (1:5:10) type E-2 sub base over 100mm thick hard core over rammed earth in Ground Floor all as specified in Schedule of Finishes.
- (b) 20 to 25mm thick machine cut mirror Polished Kota stone slab of size not less than 575mm x 575mm which shall be laid and jointed with grey cement slurry mixed with pigments to match the shade of the slab including rubbing and polishing by machine, over 20 mm thick screed bed in CM 1:4 over RCC slab. The top surface of concrete shall be roughed with steel

PARTICULAR SPECIFICATIONS (Contd.../-)

wire brushes and neat cement slurry @ 1.2 Kg/Sqm shall be applied before commencement of laying of floor finishes.

(c) In case of steps & riser of staircase kota stone shall be in one piece of full width of steps. It shall be laid over 20mm thick screed in CM 1:4. Steps one edge shall be bull nosed edge.

31.5 VITRIFIED TILE FLOORING / SKIRTING

31.5.1 Vitrified tiles shall be plain colour regular series and shall be provided in locations as specified and as directed. The size of the tile shall be 600mm x 600mm / 605mm x 605mm in floors if not otherwise specified in Schedule 'A'. Tiles shall be laid over screed bed and other sub layers all as specified in schedule 'A', set and jointed in neat cement paste and shall be pointed in coloured cement to match with colour of tile. 2 to 3mm joint shall be maintained uniformly to achieve better finish. The tiles are classified under group B Ia of the international standard for ceramic tiles ISO-13006. The thickness of tiles shall be not less than 10 mm. Make of the tile shall be as approved by the GE. The shade of the tiles will be as decided by the GE.

31.5.2 Laying, jointing and finishing shall be done all as specified in clause 13.47 of MES Schedule Part-I or as per manufacturers instructions

31.6 WEAR PROOF TOPPING

31.6.1 Metallic floor hardener and cement shall be thoroughly mixed to an even colour in dry state in the proportion recommended by the manufacturer. This mixture shall be mixed with crushed granite/ basalt/trap as indicated (6mm and down) in the proportion 1:2 by volume. Requisite amount of water shall then be added to form a workable mixture.

31.6.2 The topping of the thickness as indicated, shall be laid while the underlying surface is green. When the initial set has taken place, the surface shall be trowelled even and smooth with a steel trowel. Dry cement or mixture of dry cement and sand, shall not be sprinkled directly on to the surface with the object of absorbing moisture or for stiffening the mix. The final trowelling shall not be commenced until such time as the surface has so hardened that pressure with a finger ceases to make any indentation. The topping shall be kept damp with wet sacks or sand, for 7 days before putting to use.

32. PLASTERING**32.1 GENERAL**

32.1.1 Plaster and/or skirting/dado shall be returned in jambs, soffits of lintels and window cills etc.

32.1.2 Where plaster on concrete surfaces is shown to match the adjacent wall surfaces, the mix of plaster shall be as for the PCC block surfaces.

32.1.3 All internal plastered surfaces shall be trowelled to an even and smooth finish without using extra cement. External plastered surfaces shall be finished even and fair.

32.1.4 All external finishes shall be carried out up to 15cm below ground level where plinth protection is not provided.

32.1.5 Thickness of cement plaster mentioned hereinafter shall be finished thickness exclusive of dubbing. Dubbing may however be done in one operation with plaster. Nothing extra shall be paid for dubbing.

32.1.6 All corners, angle, junctions, and edges shall be truly vertical or horizontal as the case may be and shall be carefully finished. Corners around jambs of openings and junction of walls shall be rounded to a minimum radius of 5mm. At the internal junctions of wall and RCC beams/ lintels/ columns, 12mm wide groove shall be provided to the entire thickness of wall plaster. At the external junctions of wall and RCC slab/ beams/ lintels/ columns where both masonry and RCC have to be plastered flush, galvanised mild steel chicken wire mesh of 150mm wide (75mm on either side) shall be provided before application of plaster. The chicken wire mesh shall be of

PARTICULAR SPECIFICATIONS (Contd.../-)

size 12mm x 24 gauge and shall be rigidly fixed to RCC/ masonry surface with nails. Also trowel groove shall be provided at junction of walls and RCC columns of any other dissimilar material e.g. Wooden/ steel chowkats etc.

- 32.1.7 Particular attention of the contractor is invited to take note of local practices and local availability of materials like bricks/PCC solid blocks/stones, form work etc., for any extra quantity of mortar required for rendering smooth, extra dubbing required, touching up properly and achieving smooth and even surfaces. This shall be deemed to have been included in the lumpsum or the item rate quoted for plasterwork, as applicable.

32.2 MATERIALS

- 32.2.1 **CEMENT**: Refer clause 5.1 herein before.

- 32.2.2 **SAND**: Sand for mortar shall be Natural River sand confirming to IS-1542 (latest edition) specification for sand for plaster shall be as specified in Clause 14.5 of MES Schedule 2009 Part-I (Specifications) and as specified here in before.

- 32.3 **CEMENT PLASTERING TO SURFACES**: Unless otherwise shown on drawings, rendering shall be as follows: -

- 32.3.1 Internal surfaces of masonry work indicated in Schedule of Finishes of buildings under Schedule 'A' Part-I shall be plastered with cement mortar with thickness as indicated in drawings. In case the thickness of plaster and mix of cement mortar not shown on drawings, the same shall be taken as 15mm in CM (1:6) finished even and smooth without using extra cement. The plastering shall be done to walls above skirting/dado.

- 32.3.2 All external masonry surfaces, specified shall be plastered 5mm thick finishing coat in cement mortar (1:4) mixed with approved water proofing compound as per manufacturer instructions over a backing coat. The backing coat shall be of 10mm thick cement mortar (1:4) irrespective of what is indicated in schedule of finishes. In case of deviation, the quantity of water proofing compound shall be taken as 3% by weight of cement (for omit purpose).

- 32.3.3 **CEILING (exposed surfaces)**: 5mm thick cement plaster in CM 1:3 shall be provided to soffit of RCC slabs/beams at exposed surfaces all as specified here in before.

32.4 SKIRTING AND DADO

- 32.4.1 **CEMENT SKIRTING**: Cement skirting shall be provided adjoining PCC floors in locations as per specifications indicated in drawings. In case details not indicated in drawings, the same shall be 5mm thick setting coat in CM 1:2 over 15mm thick backing coat in CM 1:3 on masonry wall, finished even and smooth with steel trowel using extra cement. Height of cement skirting where not shown on drawings shall be considered as 100mm high. Groove wherever necessary between plaster and skirting shall be made. Junction of floor skirting shall be rounded to minimum radius of 5mm.

32.5 KOTA STONE SLAB SKIRTING

- 32.5.1 18 to 20mm thick machine cut mirror Polished Kota stone slab shall be laid and jointed with grey cement slurry mixed with pigments to match the shade of the slab including rubbing and polishing by machine, over 20 mm thick CM 1:4 backing coat. In case the height of skirting is not shown in the drawing, the same shall be considered as 100mm. The size of slab shall be as approved by GE.

32.6 CERAMIC TILES DADO

- 32.6.1 Where shown on drawings it shall be laid in the manner as specified in relevant clause of MES Schedule 2009 Part-I (Specifications). Height of dado shall be as indicated in drawings. In case no height is indicated in any location, it shall be 1.05m or cill of window in WC and 2m or door height in bath/toilet whichever is more. Tiles shall conform to IS-13753 and grade of tiles shall be BIII Grade

- 32.6.2 Where ever glazed ceramic tile dado is shown in drawings provide coloured glazed ceramic tiles of size 300x450x6 to 7mm thick. These shall be laid over backing coat of 10mm thick backing coat in cement mortar (1:3), set and jointed in neat cement slurry and pointed in white/coloured cement to match the shade of tile.

PARTICULAR SPECIFICATIONS (Contd.../-)**33. WHITE WASHING/OBD/ACRYLIC EMULSION PAINT**

33.1 **WHITE WASH / COLOUR WASH:** Three coats of white wash (lime) shall be provided as indicated in drawings, all as specified in MES Schedule 2009 Part-I (Specifications). For white washing on ceiling adequate quantity of zinc oxide shall be added to lime wash for achieving egg white shade. Skirting and dado are not to be white/colour washed. Where colour washing is indicated in drawings, apply two coats of colourwash over a coat of white wash. Tint of colour wash shall be approved by GE.

33.1.1 White washing and colour washing shall be applied with proper brushes as specified in clause 15.12 of MES SSR Part-I, contractor may, at his discretion, do the same by means of spray pump without any extra cost to the Government.

33.2 OIL BOUND DISTEMPER/DRY DISTEMPER OVER ALKALI RESISTANT PRIMER

33.2.1 Where oil emulsion distemper and/or dry distemper is indicated in drawing, apply two coats of oil emulsion distemper and/or dry distemper (as the case may be) of the tint approved by the GE. Prepare surfaces and apply primer as per clause 15.13 and 15.14 of MES SSR Part-I and provision of 0.5mm thick wall care putty to achieve smooth and plane surface before applying two coats of distemper.

33.3 EXTERNAL WEATHER PROOF ANTI FUNGAL EXTERIOR ACRYLIC EMULSION PAINT**33.3.1 GENERAL**

33.3.1.1 Unless samples of all materials are approved, the contractor will not be allowed to commence the work. Brushing for painting etc., shall be got approved by Engineer-in-Charge based on manufacturer's recommendations. No improvised brushes or substandard brushes shall be brought to site and used.

33.3.2 MATERIALS

33.3.2.1 Paint shall be weather proof Acrylic emulsion, exterior grade (100% Acrylic) Premium quality. Paint shall be procured from any of the makes listed in **Appendix 'C'** hereinafter.

33.3.2.2 Shade of the paint shall be as approved by GE.

33.3.2.3 Primer shall be water based acrylic suitable for exteriors as per manufacturer's instructions. Primer shall be of same make as of paint.

33.3.2.4 The paint and primer shall be brought in manufacturer's sealed containers only by the contractor duly marked with batch number from the manufacturer.

33.3.2.5 The contractor shall produce manufacturers test certificate along with purchase voucher in original for the paint and primer brought to site before claiming payment for the same. Purchase voucher of paint and primer shall contain the complete description of material, batch No., net weight, test certification No., quantity in each package, No. of packages etc., The quantity of material brought at site indicating No. of packages, quantity in each package, batch No., purchase voucher number, test certification number, date of manufacturing, date of expiry etc., shall be entered in MB as "Not to be Abstracted " and shall be signed by the JE, Engineer-in-Charge, GE and contractor.

33.3.2.6 Each container of paint and primer shall bear the following particulars:-

- (a) Manufacturer's trade mark.
- (b) Reference to Indian Standard to which they comply.
- (c) Name of product.
- (d) Net weight.
- (e) Date of manufacturing
- (f) Batch No.
- (g) Storage requirement
- (h) Storage life.

PARTICULAR SPECIFICATIONS (Contd.../-)

(j) Date of expiry

33.3.2.7 Each lot of paint and primer shall be checked by Engineer-in-Charge and approved by him after verifying from invoices, package, batch No. and test certificate. Materials shall be incorporated in the work only after written approval from Engineer-in-Charge.

33.3.2.8 Total quantity of paint required for the work as per specification shall be worked out, and the same quantity shall be brought by the contractor and be kept in custody of Engineer in charge. Record of issue shall be mentioned in daily bases.

33.3.3. WORKMANSHIP

33.3.3.1 All brushes, tools, pots, kettles etc., used in carrying out the work shall be free from foreign matter and shall be thoroughly cleaned with hot water and solutions at the end of a day's work or before use for a different type of material. No finish shall be executed until a sample of the finish to the required colour and shade has been approved by the GE. Where more than one finish is indicated, each coat shall be approved by the GE before the subsequent coat is applied.

33.3.3.2 The colour shall be even shade over the whole surface, if it is patchy or otherwise bad, the work shall be redone by the contractor at his own expense.

33.3.4 PREPARATION OF SURFACES

33.3.4.1 The surface shall be thoroughly cleaned of loose particles, dust, dirt, efflorescence, chalking, grease, mortar drops and other foreign matter. The surface shall be sand papered with grade I abrasive paper and dusted off to achieve an even and smooth surface free from all dust particles. The contractor will use electric blowers for this purpose. If surface so obtained is uneven, it shall be brought to a perfectly even surface by applying putty and allowing it to dry completely and then it shall be rubbed with the abrasive paper and dusted off and finally area cleaned by use of electric blower.

33.3.5. PRIMING COAT

33.3.5.1 After preparing the surface as approved by GE, one coat of exterior water based acrylic primer as approved by manufacturer, thinned with water in 1:1 ratio shall be applied with brush as per manufacturer's instructions and as directed by Engineer – in – Charge.

33.3.6 APPLICATION OF WEATHER PROOF ANTI FUNGAL ACRYLIC EMULSION PAINT

33.3.6.1 The weather proof anti-fungal acrylic emulsion paint shall be applied by brush or roller. No stainer or colorants shall be used. The paint shall be stirred well before use. The primer coat shall not be left without application of top coats for a long period time.

33.3.6.2 Two coats of 100% weather proof anti-fungal acrylic emulsion paint thinned with 400ml water per litre of paint shall be applied. The drying period between two coats shall be of minimum of 4 hours or as per Manufacturer's instructions. The shade shall be as approved by GE. The finish of Acrylic emulsion weather paint shall be smooth matt finish.

33.3.6.3 The paint shall be as per Manufacturer's original colour as available or shade card. No mix of tint shall be made into original shade.

33.3.7 GUARANTEE

33.3.7.1 The work of applying primer and paint shall be got carried out under the supervision and guidance of accredited representative of the manufacturer. A certificate from their representative shall be obtained by the contractor to the effect that work of painting and primer has been carried out under their strict supervision and as per manufacturer's instructions. The same shall be submitted by the contractor to GE. The contractor shall also obtain a written guarantee for effectiveness of paint against fading out, peeling off, cracking, dust / algae accumulation etc., for a period of **03 (Three)** years from the certified date of completion of entire work from the manufacturer and submit the same to GE before completion of work.

33.3.7.2 Should the GE at any time during construction or reconstruction or prior to the expiry of the Guarantee period, finds defective performance of the paint, the contractor shall, on demand in

PARTICULAR SPECIFICATIONS (Contd.../-)

writing from the GE specifying the locations complained of, notwithstanding that the same may have been inadvertently passed / certified and paid for, under take to carry out such treatment as may be necessary forthwith to rectify the defects to the full satisfaction of GE. In the event of his failure to do so, within the specified period to be specified by the GE in his demand aforesaid, the GE may undertake such defective work at the risk and expense of the contractor. The liability of the contractor under this condition shall not extend beyond the period of five years from the certified date of completion, unless the GE had previously given notice to the contractor to rectify the defects.

33.3.7.3 **2%** of the cost of the weather proof acrylic emulsion painting enhanced by **25% subject to minimum of Rs 5000.00** shall be retained from the final bill amount towards Guarantee which will be released after satisfactory expiry of **03 (Three) years** Guarantee period. If contractor fails to rectify the defects noticed in the treatment or found in the material the aforesaid amount so retained shall be utilized for rectification of defects and contractor shall have no claim whatsoever on this account. Alternatively, the contractor may give a separate interest bearing security deposit pledged in favour of GE valid for **3 years** for this amount in which event no further amount will be recovered from the final bill on this account. Defect liability period under condition 46 under General Conditions of Contracts IAFW-2249 shall be deemed to be amended to the extent mentioned above for Acrylic emulsion paint. **(Specimen of this guarantee certificate is att as Appendix 'J')**

33.3.8 SCAFFOLDING

33.3.8.1 The exterior painting work shall be carried out by using double scaffolding only. No Joola is permitted for the work under any circumstances. Suitable double scaffolding shall be provided for workmen.

33.3.8.2 Scaffolding or staging more than 3.5 metres above the ground or floor, swung or suspended from any overhead support or erected with stationary support shall have a guard rail properly attached, braced and otherwise secured at least 1 Metre high above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such openings 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.

33.3.8.3 Every opening in the floor of a building or in a working platform be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 1 Metre.

33.3.8.4 Safe means of access shall be provided to all working platforms and other working places.

33.3.8.5 The rates quoted are deemed to include the above provision of scaffolding and no extra will be payable to contractor on this account. The scaffoldings shall be removed only after obtaining clearance of Engineer-in-Charge / Garrison Engineer after considering the quality of the work undertaken on completion of the painting.

33.3.9 SAFETY PRECAUTIONS

33.3.9.1 Contractor shall provide all safety precautions for the labour engaged for this work. All the labours shall be provided with safety belts, helmets, nose screens etc., and the contractor shall adhere to all safety precautions as per Labour Welfare Act.

33.3.9.2 It is also advised, contractor to have insurance cover for his workmen working at heights against any eventuality from any reputed insurance agencies. Department will not be responsible for any untoward incident happening due to lack of safety precautions taken by contractor.

33.3.10 STAGE PASSING

33.3.10.1 The work shall be executed in a workmanship like manner and to the entire satisfaction of the GE. Contractor shall obtain the approval of GE stage wise as indicated below. The contractor shall give due notice in writing with sufficient time in advance to the Engineer-in-Charge and the GE, when each stage is about to be completed. The contractor shall start the work of subsequent stage only after obtaining written approval of the GE for previous stage. In default of such notice being received from the contractor, if he commences the work of subsequent stage without approval of the GE, then the GE shall have all the rights reserved to reject the work and ask the contractor to demolish the said portion executed. The contractor

Contd.../-

PARTICULAR SPECIFICATIONS (Contd.../-)

shall have no claim on this account or otherwise. The decision of the GE in this regard shall be final and binding.

STAGES:-

- (i) Extent of area to be painted.
- (ii) Sample of painting work (Area to be decided by GE)
- (iii) After preparation of surface and before applying priming coat.
- (iv) After applying priming coat.
- (v) After applying first coat of Acrylic emulsion paint.
- (vi) After applying second coat of Acrylic emulsion paint.

34. PAINING**34.1 GENERAL**

- 34.1.1 Materials and workmanship shall be all as specified in section 17 of MES Schedule 2009 Part-I (Specifications).
- 34.1.2 The contractor shall inform the GE, within four weeks of the acceptance of the tender, the brand names of the manufacturers of paint proposed to be used in the works and submit sample thereof well in time and obtain prior written approval of the GE before their use in work.
- 34.1.3 The contractor shall, when so required by the GE, produce certificate from the manufacturer or their representative to establish that the brands of paints purchased by the contractor from them satisfy the requirements of the relevant Indian Standard.
- 34.1.4 Paints for priming coat, under coat and finishing coat shall be of same manufacturer. The priming coat shall be re-done if more than 6 months elapsed at the time of application of under coat without any extra cost to the Govt.
- 34.1.5 Tint of paint, if not mentioned in drawings/Schedule of Finishes will be approved by the GE.
- 34.1.6 Unless otherwise specified here-in-after or shown on drawings all timber works shall be painted with two coats of synthetic enamel paint over a coat of pink primer, except the surfaces in contact with or buried in brick work/concrete/plaster which shall be treated as specified here – in- after.
- 34.1.7 Unless otherwise specified hereinafter or shown on drawings all surface of steel and iron works except surfaces in contact with or buried in brick work/concrete/plaster shall be treated with two coats of synthetic enamel paint over a coat of red oxide/zinc chrome primer.
- (Note: M.S. reinforcement and galvanised iron surfaces shall not be painted)
- 34.1.8 Bottom of door shutters shall be given one coat of primer only.
- 34.1.9 Synthetic enamel paint shall be first quality and of brands as mentioned in Approved list of Makes.
- 34.1.10 All bolts shall be hot dip galvanised (threads are spraying coated).

34.2 **TARRING**: The backs of wooden chowkats in contact with brick work/ plaster etc. and also wooden/steel surfaces embedded in walls shall be given two coats of tar including preparing surfaces. Hold fast shall be given two coats of tar and sanded.

34.2.1 The surfaces of steel frames in contact with masonry, metal or wood shall be protected with two coats of alkali resistant bituminous paint.

34.3 **CEMENT SLURRY**: Portions of MS bolts, lugs, anchor bolts etc., embedded in concrete shall be treated with neat cement slurry.

34.4 PAINING TO IRON AND STEEL WORK

34.4.1 Unless otherwise shown on drawings all exposed steel work (except ESHs sheds) and E/M exposed steel items shall be painted with two coats of synthetic enamel paint over a coat of

Contd.../-

PARTICULAR SPECIFICATIONS (Contd.../-)

zinc chrome primer after preparation of surface. Wherever the false ceiling are to be provided below trusses, softer, purlins and similar item, these shall be painted with one coat of paint over primer. All galvanised iron articles (except CGI sheet in fire point) and reinforcement bars shall not be painted. . All exposed steel work and E/M steel items of ESHs (Type 'A' & Maz Cat 1.1) shall be painted with two coats of fire resistant paint over a coat of primer as recommended by the manufacturer's recommendation after preparation of surfaces.

35. GLAZING

- 35.1 Glazing to windows/ventilators/doors shall be as shown on the relevant drawings.
- 35.2 Unless otherwise specified or shown on drawings glazing to aluminium windows/ventilators shall be 5mm thick. Glass used shall be plain float glass except in baths/WC/Toilets, where it shall be figured glass of thickness specified.
- 35.3 **FIXED GLAZING:** Fixed glazing, wherever indicated shall be to the dimensions as shown on drawings. These shall be fabricated all as shown in drawing. Thickness of glass shall be 5.0mm thick plain float glass unless otherwise shown in drawings.

36. SANITARY AND TOILET FITTINGS**36.1 GENERAL**

- 36.1.1 The lump sum tendered by the tenderer for the buildings shall include for the cost of supplying, fixing and testing as specified of the following sanitary fittings/fixtures for the respective buildings as shown in drawings including all accessories and plumbing to the extent mentioned herein after. All sanitary fittings shall be white glazed vitreous china, first quality, ISI marked.
- 36.1.2 (a) Water closet, (pedestal pattern) with plastic seat and cover, low level flushing cistern & toilet paper holder.
(b) Wash hand basin with mixer valve
(c) Peg sets
(d) Mirrors
(e) Soil, waste, vent and rain water pipes
(f) Gully traps, nahani traps and floor traps
(g) Water tanks
(h) Soap niche
(j) Towel rail
(k) Toilet paper holder
(l) Switch / meter box
(m) All other fixtures/fittings as shown on drawings.
- 36.1.3 All sanitary appliances shall be of vitreous china first quality white shall conform to IS-2556 for General requirements and the specific requirements as mentioned in relevant clause of MES Schedule 2009 Part-I (Specifications) and shall bear ISI mark. These shall be of an approved make from the list given in the list of Approved Makes.
- 36.1.4 All waste pipes and fittings up to floor/Nahani trap from wash hand basin shall be of galvanised steel tubing medium grade conforming to IS-1239 (Part II) 1969.
- 36.1.5 Flush pipe and socket of flushing rim of WC shall be jointed with white and red lead cement (white and red lead in equal portion by weight) and linseed oil added to form paste.
- 36.1.6 'P' and or 'S' trap shall be jointed to WC pan with cement joints as specified in clause 18.48.5 of MES Schedule 2009 Part-I (Specifications).
- 36.1.7 Brackets for low level flushing cistern shall be given two coats of aluminium paint over a coat of primer.
- 36.1.8 The sizes, given hereinafter are approximate sizes. The size of sanitary fittings to be provided shall be the nearest size as per manufacturers catalogue as approved by GE.
- 36.2 **WATER CLOSET ORISSA PATTERN:** Water closet, white, shall be of size 580mmx440mm with integral foot rests and 'P' or 'S' trap along with 10 litres discharge capacity, Low level PVC

PARTICULAR SPECIFICATIONS (Contd.../-)

valve less syphonic action flushing cistern conforming to relevant IS with all fittings including 32mm dia chromium plated brass tube flush pipe with brass unions at ends. The pan shall be set in cement concrete 1:5:10 at least 15cm around and finished just below the rim to receive adjoining floor finish.

36.3 EUROPEAN WATER CLOSET

36.3.1 Water closet European type (pedestal pattern/wall mounting pattern) where shown on drawings shall comprise as under: -

- (a) Vitreous china white water closet apparatus (pedestal pattern) of height 400 to 410mm rear outlet, conforming to IS with integral 'P' trap having minimum 75mm water seal. The closet shall be screwed to wooden plugs embedded into floor.
- (b) Seat and cover shall be of thermo plastic material conforming to IS-2548 (Part-I) white plastic closed pattern flat bottom, hinged with chromium plated brass hinges, rubber buffers of suitable size and ISI marked.
- (c) PVC low level cistern 10 litres capacity with internal fittings of approved make.
- (d) Flush pipe of adequate length shall be chromium plated brass tube, 32mm dia.
- (e) 15mm dia PVC supply pipe 450mm long with brass check nuts.
- (f) Toilet paper holder shall be 150mmx50mm recessed roll type as per catalogue No 40008 of Hindustan Sanitary Ware and fixed all as directed.

36.4 **WASH HAND BASIN:** Where shown on drawings, Wash hand basin shall be provided with the following: -

- (i) Wash hand basin of size 55x40cm vitreous glazed ware, flat back pattern with waste union and perforated grating (both fittings of brass chromium plated) ISI marked as per Hindustan Sanitary ware catalogue No 10009 (without pedestal) or Parryware Catalogue No 20602 or Neycer Catalogue No PWD 09555 with single tap hole.
- (ii) A pair of cast iron brackets. The cast iron brackets shall be fixed on to wall with screws fixed to wooden plug embedded in wall set in concrete 1:2:4 type B1 blocks of size 20 x10x 20cms.
- (iii) 32mm dia galvanised steel medium grade down take pipe fitted with brass chromium plated waste coupling outlet complete. Length of waste pipe shall be as indicated in drawing.
- (iv) Vitreous china shelf or niche as specified here-in-before.
- (v) 15mm dia chromium plated brass pillar tap conforming to IS 1795
- vi) 15mm dia PVC flexible pipe with brass unions and check nut for connecting WHB to supply pipe.

36.5 **OVAL SHAPED/COUNTER TYPE WASH HAND BASIN:** Where shown on drawings, Oval shaped/Counter type wash hand basin shall be provided with the following: -

- (i) Wash hand basin (white) of vitreous glazed ware, Oval shaped with waste union and perforated grating (both fittings of brass chromium plated) in case size of wash hand basin not shown it shall be of size 600mmx450mm.
- (ii) A pair of cast iron brackets.
- (iii) 32mm dia galvanised steel medium grade down take pipe fitted with brass chromium plated waste coupling outlet complete. Length of waste pipe shall be as indicated in drawing.
- (iv) Vitreous china shelf or niche as specified here-in-before.
- (v) Granite top shall be 20mm thick polished granite stone on RCC slab. In case Thickness of RCC slab and reinforcement details not shown on drawings, these shall be 100mm thick RCC slab and reinforcement details as directed by GE. Granite slab shall be rounded on all exposed edges.

PARTICULAR SPECIFICATIONS (Contd.../-)

vi) 15mm dia Chromium plated Pillar cock including 15mm PVC connection 450mm long with checknuts.

37. PLUMBING WORK

37.1 GENERAL

37.2 **PLUMBING WORK** shall be carried out as specified in clauses 18.13 to 18.27A of MES Schedule 2009(Part I) Specifications.

37.2.1 PVC(SWR) PIPES AND FITTINGS

PVC(SWR) pipes and fittings shall be UPVC(SWR) and shall conform to IS 13592 as under:

For use in ventilation pipe work and rain water specification :Type ‘A’

For use in soil and waste discharge systems :Type ‘B’

37.3 **SOIL/WASTE/VENT PIPE/FITTINGS/ACCESSORIES:** These shall be UPVC conforming to IS. All the pipes and fittings shall have ISI certification mark.

Irrespective of what is shown on drawing size of soil pipe/waste pipe at different locations shall be as under:-

(a)	WC to vertical stack	110mm dia
(b)	Nahani trap to floor trap/nahani trap to gully trap	75mm dia
(c)	Soil pipe in vertical stack and upto first manhole	110mm dia (separate pipe for each toilet).
(d)	Waste pipe in vertical stack and upto gully tarp	75mm dia
(e)	Vent pipe with PVC (SWR) slotted cowl	110mm dia.
(f)	Waste pipe gully trap to first manhole	75mm dia

37.4 **JOINTING:** All pipes and fittings shall be jointed as specified in clause 18.52 of MES Schedule 2009 Part-I Specifications.

37.5 **FIXING OF PIPES TO WALLS:** Pipes and fittings shall be fixed to wall all as specified in Clause No 18.67.7A.1 of MES Schedule 2009 Part-I Specifications.

37.5.1 Soil pipes in vertical stacks shall be extended above roof as vent pipe. Vent pipe shall be provided with slotted vent cowl on top with mosquito net. Vent pipe shall be extended above, such that top of vent cowl extended is 1200mm above RCC roof/sheet roof. Vent pipe shall be provided as specified above whether indicated on drawing or not.

37.6 **NAHANI/FLOOR TRAPS:** Nahani /floor traps shall be provided in situations as shown on drawings. These shall conform to IS. Floor traps shall be provided with CP steel grating. Nahani trap/floor traps shall be of UPVC.

Note: Where Nahani/floor traps of 22.5cms depth cannot be accommodated in sunken floor, a 300mmx300mm portion of the RCC slab or portion of size as indicated in drawings shall be sunken to the extent it accommodates the Nahani trap without any additional cost.

37.7 **SHORTER LENGTHS:** Except for WC connections, the contractor may use pipe pieces without sockets in shorter lengths (less than one pipe length) if approved by the GE and connect these to pipes fitting with double sockets/collars, including additional joints as specified above without extra cost to the Government.

37.8 GULLY TRAPS

(a) Where shown gully traps shall be of UPVC complying with the requirements of IS.

(b) Gully traps shall be square mouthed, 110mm size, type ‘P’ set in PCC (1:3:6) type C-2, block measuring 45cms square, thickness of bed concrete shall be 10cm. Jointing to drain pipe shall be done in cement solvent.

PARTICULAR SPECIFICATIONS (Contd.../-)

(c) Cast iron perforated grating shall be 110mmx110mm bituminous coated and fixed as directed by the Engineer-in-Charge.

(d) PCC (1:2:4) type B-1 Kerb and RCC cover slabs shall be provided all as directed by the Engineer-in-Charge.

- 37.9 **TESTING:** All soil waste and vent pipes shall be tested as specified in clauses 18.79.1 and 18.79.5 of MES Schedule 2009 Part-I Specifications. Record of testing shall be maintained separately for each building.

Note: The work of plumbing as specified herein before and as shown on drawings shall be for the complete plumbing stacks of all the buildings under this contract in all respects. Nothing extra shall be payable if any additional items, other than those shown on drawings are required to complete the stack. The lump sum quoted for Schedule 'A' Part-I is deemed to include provision of waste pipe upto and including gully trap and soil pipe up to a distance of 2 metres from external face of wall but excluding first manhole. In case first manhole is located at distance other than 2 Metres, the length of pipe provided shall be adjusted through DO.

37.10 **RAIN WATER PIPES**

- 37.10.1 Rain water pipes and fittings shall be of UPVC pipe, type 'A' conforming to IS-13592 of size as shown in drawing. Size of pipe where not indicated in drawings shall be 150mm dia. Pipes and fittings shall be secured to wall and gutter all as specified in clause 18.52 of MES Schedule 2009 Part-I Specifications. For connecting gutter to down take pipe a funnel shaped connecting piece shall be made of aluminium sheet and riveted to gutter and the other end shall be tailed into the socket of rain water pipes.

- 37.10.2 The grating shall be of PVC, round type, provided and fixed at the inlet of rain water pipes.

38. **MISCELLANEOUS ITEMS**

- 38.1 **GENERAL:** Specifications for miscellaneous item are for guidance. Drawings of respective items must be studied to avoid any likely ambiguity. All fittings and fixtures shown on drawings unless omitted specifically shall be provided as per details given in the drawings and their cost is deemed to be included in the lump sum cost of buildings in Schedule 'A' Part-I.

- 38.2 **HDPE STORAGE WATER TANKS:** Water tanks shall be HDPE rotational moulded polyethylene, double layer and cylindrical vertical, ISI Marked of capacities as shown on drawings. The installation of the same shall be done on PCC 1:2:4 type B1 raised platform as indicated in the drawing. Lump sum quoted also includes **cost of tank**, making necessary holes for inlet/outlet/washout connections with suitable unions, and ball valves. However inlet/outlet/over flow and washout pipe, shall be paid under provisional items.

- 38.4 **PCC BLOCK MASONRY STEPS:** Provide PCC solid block masonry steps and finishes as indicated in the drawing. If not given in drawing the same shall be as follows. PCC solid block shall be all as specified here in before and shall be in cement mortar 1:4. Treads of steps shall be provided with 22 to 25mm thick pre polished chequered cement concrete tiles and shall be laid and jointed with grey cement slurry, over 15mm thick screed bed in cement mortar 1:4 over treads of steps. Risers and sides of steps shall be plastered with 10mm thick cement mortar 1:4 and finished with finishes matching with the adjoining vertical surfaces. Foundation shall be in PCC 1:4:8 type D-2 using 40mm graded stone aggregate.

- 38.5 **MIRROR:** Mirror shall be polished sheet glass mirror 5mm thick, first quality of size shown in drawing with bevelled edges and square corners, polished edges including 6mm thick plywood backing and 12.7mmx 1.25mm aluminium frame, rubber gasket and fixed to wall with 4 Nos. chromium plated brass screws and cup washers and wooden plugs embedded in wall.

- 38.6 **PCC CILLS:** Irrespective of whatever is shown on drawings provide precast PCC cills all as specified. Cills shall have a bearing of 50mm on either side of window/ventilator openings. However bearing of cills shall not be provided at ends where cills are abutting columns or other RCC structures. Cills shall project 50mm beyond finished outer face of wall. The projected portion of cill shall be given throating at bottom all as directed.

- 38.7 **STAIR CASE:** This shall be constructed all as shown on drawing. The flooring on the treads of steps shall be as specified in Schedule of finishes. Sides of steps shall be plastered with 10mm thick cement mortar 1:4 and finished with finishes matching with the adjoining vertical surfaces.

Contd.../-

PARTICULAR SPECIFICATIONS (Contd.../-)

RCC parapets as shown in drawings if shown shall be provided. Railing at location shown on drawing shall be all as specified here in after.

- 38.8 **PEG SET**: Peg set where shown on drawings; these shall be of stainless steel fixed with steel chromium plated screws to 12mm thick teak wood planks. The supporting planks shall either be fixed to door shutter or walls as shown on drawings. The exposed surfaces of planks shall be enamel painted as specified herein before. If number of pegs is not shown on drawing, Peg set of three shall be provided.
- 38.9 **TOWEL RAIL**: Towel rail shall be aluminium anodised of 'D' shaped with flanged for fixing. It shall be of minimum diameter 19mm and 60cm, in case length is not mentioned in drawings.
- 38.10 **SOAP NICHE**: Internal surfaces of niche shall be finished as that of dado to the adjoining wall.
- 38.11 **MILD STEEL RUNGS**: Provide mild steel rungs at places and as per the details shown in the drawing. Rung shall be painted all over as specified hereinbefore.
- 38.12 **BALL VALVES**: Ball valves shall be of brass or bronze, high pressure type, suitable size and specification requirements as mentioned in Clause No. 18.19 of SSR Part I.
- 38.13 **SPOUT**: Spouts shall be of PVC/galvanised steel water tubes of light grade as shown in drawings. Where length/diameter of spout is not indicated it shall be taken as passing throughout the width of parapet or facia and projecting 15cm from outer face of the wall and of 50mm bore.
- 38.14 **EAVES BOARD**: Eaves/ barge boards where indicated in drawings shall be provided with 20mm thick second class hard wood boards, 250mm wide all as per the details given in drawing. Wood work shall be all as specified herein before. Wooden planks shall be in one piece upto a length of 2 metres and shall be planed on both the sides and exposed edge. Exposed surfaces shall be painted with two coats of synthetic enamel paint over a coat of primer as specified here in before.
- 38.15 **DWARF WALL**: Wherever dwarf wall is shown on drawing the same shall be constructed to the dimensions as shown on drawings. The specifications for sub structure shall be as follows:-
- (a) Foundation concrete shall be with PCC 1:4:8 type D2.
 - (b) Footing and basement shall be pre cast solid block masonry in 1:3:6 type C1 set in CM 1:4.
 - (c) Solid block masonry shall be all as specified hereinbefore.
 - (d) External surfaces of the dwarf wall shall be plastered all as specified here-in-before for external wall plastering.
- 38.16 **GUTTER FOR RAIN WATER PIPES**: Wherever gutter has been shown in drawings, provide galvalume sheet factory made gutter made out of 1mm thick pre painted sheet. Galvalume sheet shall be all as specified in MES Schedule 2009 Part - I (Specification) and shall be provided to the fall all as shown on drawing including all accessories. At junctions, joints and supports, the ends of the sheets shall be suitably over lapped into each other and made flush by riveting to obtain a leak proof joint.
- 38.17 **RAMP**: Wherever shown on drawings, the ramp shall be constructed with PCC solid block masonry in CM 1:6 with foundation PCC 1:4:8 type D-2 using 40 mm graded stone aggregate including all necessary earth work excavations all as shown on drawing. Exposed surfaces of sides shall be plastered with 15mm thick cement mortar 1:4. Internal portion of ramp shall be filled with approved soil. Flooring of ramp shall be as given in Sch of finishes. If not specified in Schedule of Finishes the same shall be as follows. Flooring shall be 100 mm thick PCC 1:2:4 type B-1 using 20mm graded stone aggregate finished even and smooth without using extra cement duly making impressions of expanded metal while the concrete is green over PCC 1:4:8 type D-2 of 100 mm thick over 100mm thick hardcore over rammed earth. Top surface of flooring shall be given chequered finish as directed by Engineer-in-charge Other specification if found necessary shall be as per building specified herein before.

PARTICULAR SPECIFICATIONS (Contd.../-)**38.18 RCC FIN/FACIA/DROP/PARAPET**

(a) RCC fin/facia/drop/parapet etc., shall be provided as shown on drawings and shall be cast monolithically with slabs/beam.

(b) Exposed surfaces of RCC fins/facia/drop/parapet shall be plastered not less than 5mm thick in CM (1:3) finished even and smooth using steel trowel without using extra cement.

38.19 **DRIP MOULDING:** Irrespective of whether shown on drawing or not, drip moulding in cement mortar 1:4 of size 50mm wide x 15mm thick shall be provided where water is likely to travel inside the building on all projections of chajja, RCC roof slab drops ,facia etc .as required.

38.20 **RCC SHELVES:** The thickness of RCC shelves and platforms where shown in drawings, shall be finished thickness. In case the thickness of shelves not indicated on drawings; it shall be 50mm thick excluding finishes. The edges of RCC shelves shall be rounded to a radius of 5mm except where it is to receive some topping. Top surfaces of shelves shall be finished with 5 mm thick plaster in CM 1:3 even and smooth all without using extra cement unless otherwise specified. Internal surfaces of shelves shall be finished with finishes same as adjoining surfaces. Ceiling of RCC shelves shall be finished with three coats of white wash as specified.

38.20.1 Where only Granite stone slab is provided as shelf as shown in drawings the same shall be one piece, 20 to 25mm thick polished Granite stone with ends rounded to a radius o 5mm and set in cement mortar 1:3.

38.23 **GROUND SINK:** This shall be provided at location all as shown to the size on the drawings. Where PCC curb is not shown on drawings it shall be of 75x75mm in 1:3:6 type C-1. The finishes shall be as per the specification of flooring, water proofing as specified for sunken slabs shall be carried out for first & subsequent floors sinks before finishes.

38.24 NUMBER PLAQUE

38.24.1 For the purpose of building No, all building / structures shall be provided with a diamond square 30 cm x 30 cm x 20 mm thick plaster plaque in cement mortar (1:2) finished smooth using extra cement duly painted in black (three coats) of synthetic enamel paint including priming coat and number letter (each of 12 cm height) as directed by Engineer-in-Charge.

38.25 Location of plaque shall be as decided by the GE.

38.26 STEEL ROLLING SHUTTERS

(a) Steel rolling shutter shall be approved by the GE and shall confirm to the requirement of IS 6248. The size of rolling shutter shall be as indicated on drawing and as specified in clause 10.23 MES SSR Part I.

(b) Rolling shutters shall be self-coiling type with ball bearing gear operated with bevel gear box & crank handle.

(c) Safety lever lock:- Whether indicated on drawing or not shutter shall be provided with one pair of safety lever lock of approved quality fitted on either ends of bottom lock plate.

(d) The curtain shall be built up of interlocking lath sections formed from cold rolled steel strips 1.2mm thick & hood cover shall be made of mild steel 1.00mm thick.

(e) All structural steel (standard quality) shall confirm to Fe-410WA conforming to IS-2062.

(f) All steel surfaces shall be finished with two coats of synthetic enamel paint over a coat of red oxide zinc chrome primer as specified here in after.

39 RCC JALLI

39.1 In case RCC Jalli is indicated in drawings, the same shall be type 'A' with Nominal mix M-25 using aggregate of size 6mm and below and shall be precast with wire reinforcement as per drawings, and jointed in cement mortar (1:4). Type of RCC Jalli it not shown in drawing shall be of type as approved by GE. Thickness where not shown on drawings shall be 50mm. Faces of RCC Jalli shall have fair and even surface. In the event of deviation RCC Jalli shall be priced as per SSR rate for pre-cast using aggregate of size 12.5mm enhanced by percentage for

PARTICULAR SPECIFICATIONS (Contd.../-)

valuation of DO as in Schedule 'A' Notes for Schedule 'A' Part-I and Contractor's quoted percentage against other Parts of Schedule 'A'.

40. **CRUMPLE SECTION:** Crumple section shall be provided all as per drawing at the location shown on drawing and as directed by GE. Irrespective of whatever is shown on drawing joints shall be filled with pre moulded bituminous filler and sealed with sealing compound of grade 'A'. Crumple joint shall cover outer face of column-to-column, beams bottom and roof as shown in drawing. All details shall be as per drawing.
41. **EARTHWORK AND SITE CLEARANCE**
- 41.1 The earthwork and clearance shall be carried out all as described in Schedule 'A' and all as specified. The specifications for materials and all other details shall be as described herein before.
42. **ROADS /PATHS/CULVERTS**
- 42.1 All roads, etc, and appurtenant works shall be constructed to the widths, alignments, cambers, super elevations and gradients, etc., as specified or as directed. Where a road is required to the opened for traffic urgently, work shall be carried out in convenient sections as directed by EIC.
43. **SEWAGE DISPOSAL**
- 43.1 **Excavation and Earth Work:** Irrespective of the width of trenches for the pipes excavated, the width for the purpose of payment shall be the authorised width as defined in clause 3.2 of MES Schedule (Part-II). Other requirements specified herein before and in the MES Schedule 2009 Part-I Specifications as applicable shall be complied with.
- 43.2 **SEWAGE PIPE AND FITTINGS**
- (i) These shall be CI pipes conforming to IS. All the pipes and fitting shall have ISI certification mark.
- (ii) Laying and jointing of pipes shall be done all as specified in clause 18.69 and 18.77 of MES Schedule 2009 Part-I Specifications.
- (iii) PCC in concrete bedding and haunching shall be of the type and mix given in relevant section of Schedule 'A'.
- (iv) In Schedule 'A' bedding and haunching has been catered for. However reference shall be made to IS 4127 (Clause 4.1, 4.2 and 4.3) and if the site conditions regarding sub soil water level and other related factors so require, adjustment for providing bedding only or completely encasing the pipe shall be made through a deviation order.
- (v) Filling of spoil in trenches and ramming shall be carried out in layers not exceeding 25cm thick and surfaces left slightly proud of the adjacent ground. Surplus spoil shall be disposed off to a distance indicated in respective items of Schedule 'A'.
- 43.3 **TESTING:** Drains and sewers shall be tested as per clause 18.79 and 18.79.2 to 18.79.5 of MES Schedule 2009 Part-I Specifications and its record shall be maintained.
- 43.4 **MANHOLE:** Manholes shall be built as per the relevant items given in the respective section of Schedule 'A' and as shown on drawings.
44. **AREA DRAINAGE**
- 44.1 The work under this Schedule 'shall be carried out all as described in respective items. The specifications for materials shall be as described herein before.
45. **INTERNAL WATER SUPPLY**
- 45.1 **SCOPE OF WORK:** The extent of work under this Contract is as indicated in relevant part/section of Schedule 'A', particular specification and drawings. All reference to clauses in succeeding paragraphs pertains to MES Schedule 2009 Part-I Specifications.

PARTICULAR SPECIFICATIONS (Contd.../-)**45.2 GENERAL REQUIREMENT**

- 45.2.1 The requirement pertaining to materials, conformity with National Building Code, workmanship, testing, record of installations shall be all as specified in MES Schedule 2009 Part-I Specifications Clause 18.40 and 18.41. Laying and jointing of UPVC pipe shall be in accordance with relevant clauses of MES Schedule 2009 Part-I Specifications.
- 45.2.2 All pipe work shall be laid concealed or fixed to walls to be completely airtight and watertight as specified. Work shall be executed by a licensed plumber.
- 45.2.3 Testing of pipe shall be carried out as specified in clause 18.48.7 and 18.50.4 of MES Schedule 2009 Part-I Specifications. Record of testing shall be maintained separately for each building.

45.3 WATER TUBING

- 45.3.1 All water tubing shall be galvanized medium grade conforming to IS-1239 or as specified in Schedule 'A' and fittings shall comply with requirement of relevant IS. Laying of GI pipes shall be in accordance with clause 18.51 of MES Schedule. The pipes for supply of water with all fittings shall run on the walls except where otherwise specified. Where GI pipes crosses the wall, GI sleeve piece of suitable dia & length shall be provided to accommodate the pipe and cost of the same shall be deemed to be included in the lump sum cost of building. The contractor shall use proper bends, elbows, tees etc at turning corners. Contractor shall provide screwed plugs to all open ends of pipe on completion of day's work.
- 45.3.2 Anti corrosive bituminous paint shall be applied to the all underground MS/ERW pipe line before laying.

45.4 BIB TAPS AND STOP VALVES

- 45.4.1 Bib taps and stop valves shall be of size and specification as given in respective item of Schedule 'A', ISI marked and of approved make. Minimum finished mass of bib tap and stop valves shall be all as specified in relevant clause of MES Schedule 2009 Part-I (Specifications).
- 45.5 **GATE VALVE:** Gate Valve shall be of size and specification as given in respective item of Schedule 'A', ISI marked and of approved make.

45.6 PILLAR TAPS

- 45.6.1 Pillar taps shall be of size and specification as given in respective item of Schedule 'A', ISI marked and of approved make. Minimum finished mass of pillar tap shall be all as specified in relevant of MES Schedule 2009 Part-I (Specifications).
- 45.7 **RECORD DRAWINGS:** Three copies of line plan of complete work indicating the line of pipes, size, positions of fittings etc., shall be submitted by the contractor to the Engineer-in-Charge on completion of work.

46 EXTERNAL ELECTRIFICATION

- 46.1 **SCOPE OF WORK:** The extent of work under this schedule is as indicated in relevant Para/section of Schedule 'A', Particular Specification and drawings. All reference to clauses in succeeding paragraphs pertains to MES Schedule. The layout of conductors/cable, route shall be as directed by the Engineer-in-charge.

46.2 GENERAL REQUIREMENT

- 46.2.1 The requirement pertaining to materials, conformity with Indian Electricity Act and rules, workmanship, testing, record of installations, safety procedures and practices and fire safety, shall be all as specified in MES Schedule 2009 Part-I (Specifications) Clause 19.2.
- 46.2.2 The contractor is deemed to have included in rates, cost of making holes/ chases where required through roads/masonry or concrete work for taking in cables/conduits and conductors, etc., and making good the same to match with existing work.
- 46.2.3 All materials, fittings appliances etc, used in electrical installations shall conform to relevant IS specifications and shall be well finished. If any material conforming to IS specification is not manufactured the same shall be got approved by GE.

PARTICULAR SPECIFICATIONS (Contd.../-)

- 46.2.4 Approval of sample of materials shall be in writing. Approved samples shall be labelled as such and signed by the contractor and Engineer-in-Charge. They shall be in the custody of GE/ Engineer-in-Charge till completion of the work.
- 46.2.5 The materials shall be brought to site by the contractor in maker's original packing with seal intact or with maker's wrapper on and shall not be installed unless approved by the Engineer-in-Charge. Necessary test certificate for the materials shall be produced by the contractor on demand by the Engineer-in-Charge.
- 46.2.6 **EXECUTION OF WORKS:** All works shall be carried out by skilled technicians of relevant trade as specified herein before. Local regulations particularly relating to the safety of men and equipment during installation and subsequent operation shall be complied with.
- 46.3 **STANDARDS:** All materials supplied and incorporated in the work shall comply with requirement of relevant Indian Standards. The contractor shall ensure that samples of all materials to be incorporated in the work shall be got approved by the GE before commencement of work
- 46.3.1 All screws used in the work shall be alloy aluminium or cadmium plated iron as approved by GE. Cover for pressed steel terminal boxes shall be fixed with cadmium plated iron screws.
- 46.4 **EXCAVATION AND EARTH WORK FOR CABLE**
- 46.4.1 The trenches for cable shall be upto a depth of 75cms for LT cable and 90 Cm for HT cables and width as per IS-1255 of 1983 with allowances for horizontal inter axial more than required excess spacing as specified in succeeding clauses and bottom of trenches shall be formed to level and gradients all as specified in MES Schedule. In case excavation is done more than those required, the excess shall be made good by cement concrete (1:7:12) with 20mm graded aggregate.
- 46.4.2 All surplus spoil shall be disposed off to a distance not exceeding 50 metres as directed by the Engineer-in-Charge.
- 46.5 **HT/LT CABLES:** HT/LT underground cables shall conform to relevant IS-specifications suitable for 11000/1100 volt grade electric supply with aluminium conductors. The cable shall be laid and jointed as specified in clauses 19.74 to 19.91 & 19.93 to 19.96 of MES Schedule 2009 Part-I (Specifications). While laying underground cables under paths, roads etc, exact depth at which the cable are to be laid shall be directed by Engineer-in-Charge. Cables shall not be bent to small radius while laying in trenches/ducts. The minimum safe bending radius shall be taken as 12 times the diameter of the cable. Cable gland shall be made of brass of size indicted in schedule 'A' and conforming to relevant IS specifications.
- 46.5.1 **TESTING OF CABLES:** Testing of cables shall be carried out as detailed in clauses No 19.93 and 19.94 of SSR 2009 Part-I (Specifications). The cable record shall be maintained all as per clause 19.95 of SSR 2009 Part-I (Specifications).
- 46.6 **MCCB:** for both Internal and External Electrification shall be suitable for operation on triple pole AC 415 Volts 50 cycles of different interrupting capacity as specified in Schedule 'A'.
- 46.6.1 **TESTS:** The manufacturer's test certificate duly signed by the authorised testing authority of the manufacturer's or the test certificate obtained from any recognised Govt test house shall be accepted as an evidence of the equipment/materials conforming to their relevant IS.
- 46.7 **TESTING EQUIPMENT:** All tests shall be carried out by the contractor using his own instruments without any extra payment. All tests shall be recorded and signed by the contractor and Engineer-in-charge.
- 46.8 **EARTHING AND TESTING:** The earthing shall be in accordance with section 19 clause 19.137 MES Schedule 2009 Part-I (Specifications) and as per electrical plate No. 3 of MES Schedule 2009 Part-I (Specifications) and the work shall be executed with presence MES representative. Excavation for earth pit in any type of strata. Surplus soil if any shall be removed to a distance of not exceeding 50 metre and site left clean and tidy. The Charcoal dust and return fillings shall be done in layers not exceeding 150mm thick and shall be properly watered and rammed. The desirable earth resistance of the earth electrode shall be

PARTICULAR SPECIFICATIONS (Contd.../-)

as per BIS. In case the desired resistance is not achieved, the matter will be referred to Accepting Officer.

46.8.1 **TEST CERTIFICATE**: Manufacturer's test certificates shall be furnished by the tenderer in respect of equipment as demanded by the department. If deemed necessary, initial test may be conducted at the manufacturers work site in presence of the GE's representative. All tests shall be carried out in accordance with relevant Indian Standards (or British Standards where Indian Standards do not exist.)

46.9 **LIGHT FITTINGS**: Light fittings shall be of the makes as mentioned in Schedule 'A'. Unit rates for various fittings shall be deemed to include for fixing the fittings and connecting up complete with necessary connections, cable etc., all as directed by EIC and as shown on drawings. In case the fittings from the firms other than those mentioned in the respective items of Sch 'A' are acceptable to department, contractor may procure similar fittings of other makes only with prior approval of Accepting Officer. The change shall be subjected to price adjustment with NO plus effect but with minus effect if the alternate is cheaper.

46.10 The unit quoted rate for E/M items is deemed to be included for testing and commissioning of entire completion of E/M items and testing shall be carried out by the authorised / approved dealers of Airfield Lightening system

46.9 **PANEL BOARD/FEEDER PILLAR BOX**: This shall be type (Indoor/Outdoor) and shall be provided as specified in Schedule 'A'.

46.9.1 **FABRICATIOIN AND GENERAL DETAILS**

(a) The panel board shall be fabricated out of CRCA sheet steel of thickness as indicated in respective items of Schedule 'A'. The panel board shall consist of free standing panels arranged to form a continuous line up of uniform height.

(b) The panel board shall be totally enclosed, dust and vermin proof. The panel board shall be fully compartmentalized with totally segregated compartments having full side portion between the panels. Bus bar chambers, cable, alloys, modules etc., shall be such that vermin cannot go from one compartment to the other gaskets of durable switch boards specified for outdoor installation shall be housed in/out door type kiosks to make it water proof. The panel boards shall be with suitable hooks and shall be provided for lifting the boards. These hooks when removed shall not have any openings in the board.

(c) Panel board shall be suitable for top and/or bottom cable entry as specified in the Material requisition. Each panel shall have been separate cable alloy. The width of this cable alloy shall be sufficient to accommodate all the cable and shall have free access for cable termination and in any case shall not be less than 150mm.

(d) All hardware shall be corrosion resistant. All joints and connecting shall be made by galvanized zinc or cadmium plated high tensile strength steel bolts, nuts and washers secured against loosening.

(e) The Panel board shall be designed to endure maximum safety during operation, inspection, and connection of cables, relocating of outgoing circuits and maintenance with the bus bar system energized and without taking any special precaution. Means shall be provided to prevent sorting of power and or control terminals, tools etc., inside the panel board.

(f) Checking and removal of components shall be possible without disturbing adjacent equipments. All auxiliary equipment should be easily accessible.

(g) The switches/Moulded cases circuit breakers shall be inter locked with the compartment door to prevent opening of the door when the switch/moulded case circuit breaker is in 'ON' position and prevent switching on when the door is open.

(h) The maximum height of the operating handle/switches shall not exceed 1800 mm and the minimum height not below 300mm.

PARTICULAR SPECIFICATIONS (Contd.../-)**46.9.2 CONNECTION**

- a) All electrical equipments shall be doubly connected to earth strip conductor from the frame of the equipment to main earthing. The cable armour shall be earthed through the cable glands.
- b) All electrical connections shall face before the earthing connections are made. Earth connections at the equipment terminal shall be made in a mutually agreed manner. Anchor bolts or fixing bolts shall not be used for earthing.
- c) All hardware used shall for earthing installation shall be hot dip galvanized or zinc. Spring washers shall be used for all earthing connections of equipment having moving parts of vibration.
- d) Internal wiring to current transformer and surfaces shall be carried out using suitable copper wires/strips duly provided with thimbles/jugs.

46.9.3 **TESTING OF PANEL BOARD:** Test for high voltage as specified in IS-8623 shall be carried out to panel board by the manufacturer and certificate this effect shall be obtained by the contractor and shall be furnished to GE before erection.

46.10 **SWITCH FUSE UNITS:** Switches and fuses shall be of type and capacity as indicated in Schedule 'A'. Damaged fuses shall not be acceptable. Fuses shall be non-deteriorating type and shall have operation indicator, which will be visible without removal of fuses from services. Fuses shall be pressure fitted type and shall have ribs on the contact blades to ensure good line contact.

46.11 **INDICATING LAMPS:** Panel board type low power consumption indicating lamps shall be used. Indicating lamps shall be suitable for the voltage indicated on the M/R. Lamps shall be supplied complete with the necessary current lighting register. Lamps shall be provided with translucent lamp cover to diffuse light.

46.12 MEASURING INSTRUMENTS

a) All AC ammeters, voltmeters, KWH meters shall be moving iron type. Accuracy class shall be 1.10 as per IS-1248. The range shall be all as indicated in respective items of Schedule 'A'. Ammeters for motor feeders shall have a nonlinear compressed scale at the end to indicate motor starting current. Voltmeter shall be suitable for direct line connection.

b) All measuring instruments shall be of 96 x 96mm, square pattern, flush mounted type. Instrument shall be provided wherever indicated in the single line diagram. All auxiliary equipment such as CTs, VTs that are required shall be deemed to be included in the unit rate of the panel board.

41.13 **GUARNTTEE:** The panel board shall be guaranteed for trouble free operation for a period of 12 months from the date of commissioning. Any defects notified during this period shall be rectified free of charge by contractor

47. BLANK**48. SYNTHETIC FIBRES REINFORCEMENT IN PQC**

48.1 The fibres selected for the purpose must be able to reduce concrete cracking due to plastic shrinkage, reduce permeability, enhance impact and abrasion resistance and resist impact of alkalis, chemicals, chlorides on concrete.

48.2 IS16481:2016 gives out standard requirements for the synthetic fibres for use in concrete as secondary reinforcement for varied construction works such as roads, pavements, industrial floorings, residential and commercial buildings etc. However, use of synthetic microfibers in pavement quality concrete, used for construction of defence airfield pavement wherein fighter aircrafts (which generate very high temperatures while landing and take-off) use these pavements, needs special attention to ascertain specific requirements. Hence, the purpose of the particular specifications is to give out specific requirements to be followed by executives for use of synthetic microfibers in pavement quality concrete (PQC) for construction of defence pavement facilities.

48.3 Requirements

PARTICULAR SPECIFICATIONS (Contd.../-)

48.3.1 Following are the main requirements for synthetic fibres to be used as secondary reinforcement in PQC:-

- (a) **Physical Fibre Forms.** Only virgin, synthetic, monofilament polyester fibres of cut length 12 mm to 18 mm, inert to concrete environment shall be used as secondary reinforcement in cement based matrix and no recycled material shall be permitted.
- (b) **Dispersal.** Fibres shall be well dispersed in the cement based matrix so as to have uniform functional properties. Fibres shall be identified as per the confirmatory tests specified in IS 667.
- (c) **Type and Doses.** Most synthetic fibre applications are at the low doses 0.06 percent to 0.3 percent by volume depending upon the type of fibre and as specified by the manufacturer.
- (d) **Certification by Manufacturer.** The executives shall obtain a certificate from the fibre manufacturer along with a test report including that the fibre used is virgin fibre for every lot of fibre purchased. The iso-phthalic acid (IPA) content for polyester virgin fibre shall be zero when tested as per method prescribed in Annexure C of IS 16481:2016.
- (e) **Polymer Content.** Polymer content of the virgin polymer shall be minimum 97percent and other additives such as oxidation and UV stabilizers shall not be more than 3 %. This shall be validated by a certificate from the polymer supplier for each lot.
- (f) **Resistance to Alkalis.** Synthetic fibres shall retain at least 90% of their original breaking strength when tested by the method prescribed in Annexure D of IS16481:2016.
- (g) **Resistance to Acids.** Synthetic fibres shall retain at least 90 percent of their original breaking strength when tested by the method prescribed in Annexure ‘E’ of IS16481:2016.
- (h) **Resistance to Ageing.** The test specimen of synthetic fibres in the form of a sheet (refer G-3 of Annex ‘G’ in IS1648:2016) when subject to ageing at 70 + 2 C for 168 hours by the procedure described in IS:7016 (Part 8) shall retain at least 90 percent of their original tensile strength.
- (j) **Resistance to Ultra- Violet Light.** The synthetic fibres when tested for resistance to ultra- violet light as specified in Annexure ‘F’ of IS16481:2016, shall not have tensile strength less than 90 percent of the original value.
- (k) **Water Absorptive Capacity.** The water absorptive capacity of the synthetic fibres when tested by the method prescribed in Annexure ‘G’ of IS16481:2016 shall be less than 1 percent.
- (l) **Physical and Application Requirements.** The synthetic fibre used as secondary reinforcement in the PQC shall comply with the requirement as given in Tables 1 and 2 below:-

Table 1: Physical Requirements

Sl No	Characteristic	Desired Parameters	Method of Test (Reference)
(i)	Fibre Type	Polyester	
(ii)	Cut length	12-18 mm	IS: 10014 (Part 1)
(iii)	Physical Fibre Forms	Only virgin synthetic monofilament fibres	IS: 667
(iv)	Cross section	Noncircular	IS:667
(v)	Minimum Tensile strength (Mpa)	300	IS: 235
(vi)	Specific gravity	1.34 to 1.39	Annexure ‘H’ of IS16481: 2016
(vii)	Minimum Secant modulus (10 ³ Mpa)	6	IS: 235

PARTICULAR SPECIFICATIONS (Contd.../-)

(viii)	Minimum Ultimate elongation, percent	15	IS: 235
(ix)	Minimum Melting temperature, (°C)	250 °C	Annexure 'J' of IS 16481: 2016
(x)	Minimum Glass transition temperature (°C)	80	Annexure 'J' of IS16481: 2016
(xi)	Minimum Intrinsic viscosity, (dl/gm)	0.60	Annexure 'K' of IS16481:2016

Table 2: Application Requirements

	Characteristic	Application for Concrete	Method of Test (Reference)
(i)	Equivalent fibre diameter, (Micron)	15-40	Annexure 'L' of IS16481: 2016
(ii)	Length, (mm)	12 to 18	IS: 10014 (Part 1)
(iii)	Aspect ratio	450 to 800	Annexure 'M' of IS16481: 2016

(m) **Functional Requirements.** To be as specified in Table 3 at Para 4 of IS 16481:2016.

48.4 Packing and Marking. To be as per guidelines specified at Para 5 of IS16481: 2016.

48.5 Sampling. To be as per guidelines specified at Para 6 of IS16481: 2016. However the fibres from the bags or pouches selected from the lot shall be tested for various requirements as specified in Para 4 above.

48.6 No of Test Specimen and Criteria for Conformity. To be as per guidelines specified at Para 7 of IS16481: 2016.

48.7 For any clarification on matters not explained in this policy, IS 16481: 2016 be referred.

48.8. Executive and supervisory staff will be fully responsible for ensuring use of correct synthetic polyester fibre meeting the laid down specifications. Proper check and record on the quality of the product supplied shall be maintained by the executives. Apart from manufacture's certificate/test results, the Engineer-in-Charge must get the material tested through an NABL approved laboratory as per the existing policies.

49.1 to 49.39 **BLANK**

49.40 **CCIS/CT20 STOWAGE FLOORING**

49.40.1 Flooring shall be same as cross section of pavement and shall be finished with 5mm thick epoxy flooring on top. The epoxy flooring shall be 5mm thick (Epoxy Quartz screed 4mm thick plus top 1mm self-levelling epoxy floor) including lines, dashes, arrows, numbering etc complete all as specified and directed.

49.40.2 **EPOXY POLYURETHANE FLOORING (EPU FLOORING)**

(a) **PREPARATION OF SURFACE** : Before applying primer the existing floor surfaces shall be cleaned off all dust, dirt, moisture and all foreign materials by mechanical equipment such as scarifiers, scrubbers, blowers, vacuum cleaners etc and the entire floor area shall be grinded using mechanical grinder to achieve proper adhesion with the priming coat and to achieve the floor level all as directed and as required at site to the entire satisfaction of GE. Acid itching shall be carried out to the floor surfaces followed by alkaline wash and subsequently washed by potable water. Then the floor is to be cleaned by using solvent, de-greaser, cleaner etc, to remove all residues by mechanical equipments as specified hereinbefore.

(b) After preparation of floor surfaces as mentioned above, repairs to pot holes, cracks and making good the existing joints to perfect right angle shall be carried out using epoxy resin mortar. Old sealing compound shall be racked out from all existing expansion/ construction joints as directed by the Engineer-in-charge. The sides and bottom of all joints to be cleaned off loose dirt, dust and grease by means of air blower or vacuum cleaner to the entire satisfaction of Engineer-in- Charge and spoiled edges to be repaired with epoxy resin mortar. The joints shall then be refilled with following specifications:-

PARTICULAR SPECIFICATIONS (Contd.../-)

(i) Expansion joints top 15 mm primed and sealed using polyurethane based sealing compound with suitable primer as per manufacturer's recommendations including provision of closed cell polyethylene backup rod of suitable dia.

(ii) Construction joints top 13 mm primed and sealed with using polyurethane based sealing compound with suitable primer as per manufacturers recommendations including provision of closed cell polyethylene backup rod of suitable dia.

(c) PRIMING COAT

(i) The prepared floor surfaces shall be tested for moisture content with a Thermo Hygrometer and moisture content shall be below 5%. For every 500 sqm a minimum of 5 readings shall be taken to assess the average moisture content of the surface. After conducting of moisture test and ascertaining the moisture content less than 5%, low viscosity epoxy primer (Cipoxy 11 or equivalent approved make) @ 5 sqmt /litre shall be applied to a thickness of not less than 200 microns with resin and hardener in 1:1 ratio by volume using stiff brush or roller. The primer shall be tack free before application of screed coat.

PARTICULAR SPECIFICATIONS (Contd.../-)

(ii) After preparation of the floor surfaces wherever the floor surfaces are found more porous primer shall be applied again as directed by the GE to achieve the desired bonding efficiency and the tenderer shall quote the rate accordingly and no extra claim shall be entertained by the Department. Therefore the tenderer shall visit the site before quoting the tender and ascertain the actual requirements to achieve the desired

(d) SCREED BED

(i) Screed coat shall be 3700 microns minimum thickness. Mixing of screed shall be done correctly with an electric variable speed mixer thoroughly till obtaining homogeneous mixture.

(ii) The work shall be got executed by one of the authorized applicator of the following manufacturers and the manufacturer shall be got approved by GE:-

- (a) M/S Pidilite Industries Ltd
- (ab) M/S Cipy Polyurethanes Pvt Ltd,
- (ac) M/s Fosroc
- (ad) M/s Sika India Pvt Ltd
- (ae) M/s Bostik India Pvt Ltd.

(e) **Work will be done by company's own trained application team with supervisor on spot.** Floor will be seamless without break at joints. Using appropriate technology and materials it is to ensure that there will be no visible marks on joints. Necessary certificate from the manufacturer duly indicated with the list of works carried out and completed by the applicators during last 2 years shall be submitted to the Garrison Engineer while seeking approval for applicators. The Contractor shall note that the Department has full rights to reject any applicator during execution of work in case of any poor workmanship found at site of work even if he is having requisite experience and the Contractor shall immediately replace the applicator and no extension of time shall be admissible due to the time taken on account of replacement of applicator.

(f) The base concrete (epoxy screed) floor shall have a maximum allowable surface tolerance of + 2mm. If the actual average tolerance exceeds the value (to be verified by the applicator by taking level measurements with the equipments) then Epoxy screed as catered vide relevant item of Schedule 'A' shall be laid for the required thickness to bring the level within the tolerance limits.

(g) The materials shall be procured only from manufacturer with BIS license or their authorized agents/ dealers. Test certificate from CQA ME Pune or DMRDE Kanpur or CPRI Bangalore along-with purchase voucher for each batch of material brought at site as applicable to be submitted by the contractor.

(h) Material brought to site in sealed container bearing ISI certification marks shall only be permitted to be used.

(j) Materials shall be stored carefully at site. The containers shall be broken only in the presence of the Engineer-in-charge. Empty containers shall be got removed off the site promptly. If on any particular day the contents of full containers could not be used in the work, the containers shall got sealed at the end of the day in the presence of the Engineer-in-charge and opened, when required, also in the presence of the Engineer-in-charge.

(k) The Engineer-in-charge shall ensure that paid vouchers are produced by the agency executing the work for the full quantity of materials required and brought to site and record of such vouchers should be kept by the Engineer-in-charge duly verified.

(l) **TESTING** The GE shall be at liberty to conduct field/ site test and /or refer the materials for testing to any recognized laboratory and the cost of which shall be borne by the contractor. The frequency of such tests shall be as specified in IS codes/ Literatures and in the absence of same it shall be as reasonably decided by GE.

PARTICULAR SPECIFICATIONS (Contd.../-)**(m) DEFECT LIABILITY PERIOD & GUARANTEE.**

(i) The defect liability period for EPU flooring shall be **05 (Five) years** from the certified date of completion of work and the contractor shall be responsible to keep the entire floor free from any defects for a period of 5 (Five) years after the date of taking over completed work from the contractor.

(ii) Should the GE at any time during the currency or prior to the expiry of said guarantee period of Five years, finds any defects, the contractor on demand in writing from the GE, shall forthwith undertake to carry-out such treatment which may be necessary to render the floor free from defect at his own expense till expiry of the guarantee period of Five years. In the event of contractor's failure to comply with the GE's direction within the stipulated period, the work shall be carried out at the risk & cost of the contractor. The liability of the contractor under this condition shall not however extend beyond the period of five years from the certified date of completion unless the notice was served on the contractor previously to rectify such defects. Security Deposit referred in condition 22 of IAFW-2249 shall be governed in terms of given here-in-after.

(iii) However the guarantee shall be furnished by the contractor and not by the specialist firm in favour of GE for a period of Five years on non-judicial stamp paper of appropriate value.

(iv) **A sum of 0.5% of the cost of flooring at contract price shall be retained out of the Final Bill amount as Security Deposit and the same shall be released after satisfactory completion of the guarantee period as stated above. The contractor may alternatively submit fixed deposit receipt of the said sum from a Scheduled Bank in favour of GE in lieu of the sum to be retained out of the Final Bill.**

(n) PAINTING WITH PU PAINT

(i) Polyurethane paint shall be all as specified in schedule 'A' and of first quality and shall be procured from any of the manufacturer as approved by GE or from their authorized dealers.

(ii) The paint shall be applied strictly as per manufacturer's instructions.

(iii) The contractor shall submit samples of the paints proposed for the project along with results of tests conducted in approved laboratory, as directed by the Engineer-in-Charge, for approval. The manufacturer's recommendations shall also be submitted for the consideration and approval of the GE well in advance.

(v) The paint shall be brought to the site of work by the contractor in original sealed containers. The material shall be brought in one lot in adequate quantity to suffice for the entire work. The material shall be kept in the joint custody of the contractor and the Engineer-in-Charge. The empties shall not be removed from the site of work, till the work has been completed and permission obtained from the GE.

(o) **PREPARATION OF SURFACE** The surface shall be thoroughly cleaned and dusted. All dirt, scales, oil and grease shall be thoroughly removed before painting is started. The prepared surface shall be inspected and approved by the GE before painting is commenced. The weather shall not be foggy/rainy, dusty or windy. The suitability of the weather will be determined by the Engineer-in-Charge.

(p) APPLICATION

(i) Before pouring into smaller containers for use, the paint shall be stirred thoroughly in its original container. The paint shall be continuously stirred in the smaller container while applying to surface so that its consistency is kept uniform. A time interval as recommended by the manufacturer or as directed by the Engineer-in-Charge shall elapse, between laying and finishing of the bituminous and cement concrete surfaces and the time of marking the pavement.

PARTICULAR SPECIFICATIONS (Contd.../-)

(ii) The painting shall be applied evenly and smoothly by means of crossing and laying off. The crossing and laying off consists of covering the area over with paint, brushing the surface hard for the first time over and then brushing alternatively in opposite direction, two or three times and then finally brushing lightly in a direction at right angle to the same. In this process, no brush marks shall be left after the laying off is finished. The full process of crossing and laying off will constitute one coat. Final coat of painting may be provided with road marking paint machine at the description of the contractor without any extra cost to the department.

(iii) Each coat shall be allowed to dry out thoroughly before the next coat is applied.

(iv) Earlier applied coat shall be cleaned off dust before the next coat is applied.

(v) No left over paint shall be put back into the stock tins. When not in use, the containers shall be kept properly closed.

(vi) No hair marks from the brush or clogging of paint puddles shall be left on the work.

(vii) The surface shall ordinarily not be painted until it has dried up completely. Trial patches of paint shall be laid at intervals to check if drying is satisfactory.

(q) The security deposit referred to in clause 49.40.2 m(iv) hereinbefore may be refunded to the contractor after expiry of the period of 5 (five) years from the certified date of completion by the GE, provided always that the contractor shall first have been paid the final bill and have rendered 'No Demand Certificate' IAFW-451 Condition 10, 48 & 68 of General Conditions of Contracts (IAFW-2249) shall be deemed to be amended to the extent mentioned above.

49.41 STRUCTURAL MEMBERS

49.41.1 **Primary Members** (Built-up sections) as specified here-in-before shall be fabricated from High Tensile Steel Plates conforming to relevant ASTM / IS Code as applicable. A Section is mill produced as per relevant ASTM / IS Code as applicable. Flanges of primary members shall be welded to the web by a continuous fillet weld deposited by an automatic submerged arc welding process. Painting of structural steel work shall be carried out all as specified hereinafter:

49.42 PAINTING OF STRUCTURAL STEEL WORK**49.42.1 PAINT**

49.42.1.1 All paint delivered to the fabrication shop shall be ready mixed, in original sealed containers, as packed by the paint manufacturers. Addition of thinners shall not be permitted.

49.42.1.2 Opened containers of paint shall be stirred frequently to keep the pigment in suspension.

49.42.2 STORAGE OF PAINTS

49.42.2.1 All paints shall be stored strictly in accordance with the requirements laid down by the paint manufacturers. The storage area shall be well ventilated and protected from sparks, flame, direct exposure to sun or excessive heat, preferably located in an isolated room or in a separate building

49.42.2.2 All paint containers shall be clearly labelled to show paint identification, date of manufacture batch number, order number and special instructions in legible form. The containers shall be opened only at the time of use. Paints that have liveried, gelled or otherwise deteriorated during storage, shall not be used. Paints, for which the shelf life specified by the supplier has expired, shall not be used without inspection and approval by the Engineer.

49.42.3 EXECUTION**PAINT SYSTEM**

49.42.3.1 In general, except where specified otherwise in approval shop drawings Sand blasting of steel surfaces shall be carried out in accordance with IS-1477. All painting work shall be done at fabrication shop in the factory.

PARTICULAR SPECIFICATIONS (Contd.../-)

Painting work shall be carried out as follows :-

DESCRIPTION	GENERAL SURFACE	
Fabrication shop	External surfaces	Internal surfaces
Surface Treatment	Abrasive blast cleaning to minimum SA-2.5 SIS-055900 near- white blast cleaning	Abrasive blast cleaning to minimum SA-2.5 SIS-055900 near- white blast cleaning
1 st Under-coat	Inorganic zinc silicate primer with 80% Zinc on dry film by weight (self-curing solvent type) DFT-75 µm. The primer should be applied by spray only.	Epoxy zinc phosphate primer polyamide cured DFT-70 µm. The primer should be applied by spray only.
2 nd Under-coat	Epoxy zinc phosphate primer polyamide cured DFT-35 µm. The primer should be applied by spray or brush only.	Epoxy zinc phosphate primer polyamide cured DFT-35 µm. The primer should be applied by spray or brush only.
3 rd Under-coat	Epoxy zinc phosphate primer polyamide cured DFT-35 µm. The primer should be applied by spray only.	Polyamide cured coal tar epoxy coating DFT-100 µm.
4 th Under-coat	Epoxy high build micaceous iron oxide coating polyamide cured DFT-90 µm. The M10 Pigment shall be of lamellar type. The primer should be applied by spray only. Stripe coat of Epoxy M10 30-40 µm applied by brush at weld, edges and corners.	Polyamide cured coal tar epoxy coating DFT-100 µm.
Intermediate coat	Acrylic polyurethane finish aliphatic isocyanate cured DFT-30 µm shall be Berger thane or approved equivalent applied by spray or brush in approved colour.	NA
Finish Coat	Acrylic polyurethane finish aliphatic isocyanate cured DFT-30 µm applied by spray or brush in approved colour.	NA
Erection site	External surfaces	Internal surfaces
Touch up coat	There are some minor damages during the course of erection the surface shall be redone with same coating as specified in “Finish Coat” or with sealant epoxy as per instruction of DMRC Engineers.	NA

- 49.42.3.2 **INTERNAL SURFACE:** Internal surface are those which will become inaccessible after fabrication and are not prone to humidity and moisture from the atmosphere.
- 49.42.3.3 **EXTERNAL SURFACE:** All other surfaces which are prone to humidity and moisture from the atmosphere.

PARTICULAR SPECIFICATIONS (Contd.../-)

The following precaution must be taken:-

- (a) After abrasive blast cleaning, the first undercoat (primer coat) should be applied well before surface deterioration.
- (b) At least EPOXY MIO coating application should be completed before giving any long over coating interval for external surface.
- (c) At least up to one coat of coal tar epoxy shall be completed before giving any long over coating interval for internal surface.
- (d) Over coating intervals, application parameters shall conform to manufacturer's instruction manual.
- (e) The DFT (Dry film thickness) shall be measured after completion of each coat

49.42.4 SURFACE PREPARATION

- (a) All surfaces shall be cleaned of loose substances and foreign materials e.g. dirt, rust, scale, oil, grease, welding flux etc so that the prime coat adheres to the original metal surface. The work shall be carried out in accordance with IS: 1477 (1971) (Part I). Any oil, grease, dust or foreign matter deposited on the surface after preparation shall be removed and care shall be taken to ensure that the surface is not contaminated with acids, alkalis or other corrosive chemicals. The primer coat shall be applied immediately after the surface preparation is completed.
- (b) Before the application of any paint the surfaces to be treated shall be thoroughly cleaned freed from all scale, loose paint, rust and other deleterious matters. Oil and grease shall be removed from the surface by washing with solvents or with a different solution before blast cleaning operation of metal polish with metal pellets. If any traces of oil or grease remain after blasting they shall be removed by solvent cleaning and the area will be re-blasted thereafter.
- (c) All welding areas shall be given special attention for removal of weld flux slag, weld metal splatter, weld head oxides, weld flux fumes, silvers and other foreign objects before blasting. If deemed necessary by the Engineer, acid washing and subsequent washing with clean water shall be used.
- (d) Any rough seams will have to be ground and must be inspected and approved by the Engineer before application of the coatings.
- (e) All structural steel to be painted shall be cleaned. Blast cleaning in accordance with SA 2 ½ Near- White Blast cleaning (equivalent Swedish Standard SIS 055900). For SA 2 ½ the profile should be in the range of 40-70 microns and shall be measured with comparator. Mill scale, rust and foreign matter shall be removed to the extent that the only traces remaining are light stains in the form of spots or stripes. Finally the surface shall be cleaned with a vacuum cleaner or clean dry compressed air.
- (f) The blast cleaning shall produce a surface roughness complying with the one specified by the paint manufacturer for the primer concerned. If, cleaned surfaces are rusted or are contaminated with foreign material before painting is accomplished they shall be re-cleaned by the contractor at his own expenses.
- (g) The surface shall be cleaned by impingement of abrasive materials, such as grit of cast iron, malleable iron, steel or synthetic material, at high velocity created by clean and dry compressed air blast. Prior to application of the blast, heavy deposits of oil and grease shall be removed by solvent cleaning and excessive surface scale removed by hand tool or power tool cleaning.

49.42.5 MIXING AND THINNING

- (a) All ingredients in a paint container shall be thoroughly mixed to break-up lumps and disperse pigments, before use and during application, to maintain homogeneity. All pigmented paints shall be strained after mixing to remove skins and other undesirable matters.
- (b) Dry pigments, pastes, tinting pastes and colours shall be mixed and / or made into paint so that all dry powders get wetted by vehicles and lumps and particles are uniformly dispersed.

PARTICULAR SPECIFICATIONS (Contd.../-)

- (c) Additives that are received separate such as curing agents, catalysts, hardeners etc., shall be added to the paints as per the manufacturers instructions. These shall be promptly used within the pot life specified by the manufactures and unused paint thereafter shall be discarded.
- (d) Thinners shall not be used unless essentials for proper application of the paint. Where thinners are used, they shall be added during the mixing process and the type and quantity of thinner shall be in accordance with the instructions of paint manufacturer.

49.42.6 PAINT APPLICATION

- (a) Paint shall be applied in accordance with the manufacturer recommendations, as supplemented by these Specifications. The work shall generally follow IS: 1477 (Part II). Prior approval of the Engineer shall be taken in respect of all primers and / or paints before their use in the works.
- (b) Paint shall generally be applied by brushing except that spraying may be use for finish coats only when brushing may damage the prime coats. Roller coat or other method of paint application shall not be used unless specifically authorized.
- (c) Spraying paint shall be adopted on red lead or zinc rich paints. Daubers may be used only when no other method is practicable for proper application in difficult accessible areas.
- (d) Paint shall not be applied when the ambient temperature is 10°C and below. For paints which dry by chemical reaction the temperature requirements specified by the manufacturer shall be met with. Also, paint shall not be applied in rain, wind, fog or at relative humidity of 80% and above or when the surface temperature is below dew point, resulting in condensation of moisture. Any wet paint exposed to damaging weather conditions shall be inspected after drying and the damaged area repainted after removal of the paint.
- (e) Each coat of paint shall be continuous, free of pores and of even film thickness without thin spots. The film thickness shall not be so great as to detrimentally affect either the appearance or the service life of the paint.
- (f) Each coat of paint shall be allowed to dry sufficiently before application of the next coat, to avoid damages such as lifting or loss of adhesion. Undercoats having glossy surface shall be roughened by mild sand papering to improve adhesion of subsequent coats. Successive coats of same colour shall be tinted. Whenever practical, to produce contrasts and help in identifying the progress of the work.

49.42.7 BRUSH APPLICATION

- (a) Proper brushes shall be selected for a specific work piece. Round or oval brushes which conform to IS:487 are better suited for irregular surfaces, whereas flat brushes which conform to IS:384 are convenient for large flat areas. The width of flat brushes shall not generally exceed 125mm.
- (b) Paint shall be applied in short strokes depositing a uniform amount of paint in each stroke followed by brushing the paint into all surface irregularities, crevices and corners and finally smoothening or levelling the paint film with long and light strokes at about right angles to the first short strokes. All runs and sags shall be brushed out. The brush marks left in the applied paint shall be as few as practicable.

49.42.8 SPRAY APPLICATION

- (a) The spraying equipment shall be compatible with the paint material and provided with necessary gauges and controls. The equipment shall be cleaned of dirt, dried paint, foreign matter and solvent before use.
- (b) The paint shall be applied by holding the gun perpendicular to the surface at a suitable distance and moved in a pattern so as to ensure deposition of a uniform wet layer of paint. All runs and sags shall be brushed out immediately. Areas not accessible to spray shall be painted by brush or dauber.
- (c) Water trap acceptable to Engineer / Authorised inspecting agency shall be furnished and installed on all equipment used in spray painting.

PARTICULAR SPECIFICATIONS (Contd.../-)

49.42.9 SHOP PAINTING

- (a) The painting system specified in Table shall be followed. Surfaces, which will be inaccessible after field assembly, shall receive the full-specified protective treatment before assembly.
- (b) Surfaces in contact during shop assembly shall not be painted. Surfaces which cannot be painted but require protection shall be given a rust inhibitive grease conforming to IS:958-1975 or solvent deposited compound conforming to IS: 1153 (1975) or IS: 1674 (1960) or treated as specified in the drawing.
- (c) Surface to be in contact with concrete shall not be painted.
- (d) The shop coats shall be continuous over all edges, including ends meant for jointing at site by bolting, except where the paint could be detrimental to bolting. In such cases, no paint shall be applied within 50mm, and the unprotected surface shall be given a coat of corrosion inhibitive compound.
- (e) The unpainted area shall be cleaned prior to welding. The welded joint shall be cleaned and de-slugged, and immediately after covered by the same paint as has been used for the remaining surface.

49.42.10 PROTECTION OF PAINT WORK

- (a) The contractor shall provide measures as necessary to prevent damage to the work and to other property or persons from all cleaning and painting operations. Paint or paint stains which result in other unsightly appearance on surface not designated to be painted shall be removed or obliterated by the contractor at his cost.
- (b) All painted surfaces that in the opinion of the Engineer/Authorized inspecting agency are damaged in anyway, shall be repaired by the contractor at his cost with materials and to a condition equal to that of the requirements specified in these specifications.
- (c) Upon painted surfaces that in the opinion of any other work that would cause dust, grease or foreign materials to be deposited upon the painted surfaces, the painted surfaces shall be thoroughly cleaned.
- (d) The areas for high-strength bolts shall be protected by masking tape against undercoat application at the fabrication shop. Immediately prior to erection any rust in the paint area shall be removed by power wire brushing to a standard equivalent to SA3.
- (e) Contractor shall make provision for requisite site painting to all fabricated steelwork, as per requirements of related specifications of the painting.
- (f) Secondary members as specified here-in-before are galvanized and cold-formed with pre-punched system from steel coils conforming to relevant ASTM / IS Codes as applicable.

49.43.1 BLANK

49.43.2 TEST CERTIFICATES AND PURCHASE VOUCHERS

- 49.43.2.1 Tenderer shall submit manufacturer's pack/samples of supply of all the materials, support letter and test certificates to GE before placing of bulk order for fabrication/fixing/erection.
- 49.43.2.2 The purchase vouchers from manufacturers/authorised dealers along with the test certificate in original shall be submitted by the contractor before claiming the payment for the material.

50 BLANK

51 GRANULAR SUB BASE (GSB)
MATERIAL

PARTICULAR SPECIFICATIONS (Contd.../-)

51.1 The material to be used for the work shall be natural sand, crushed gravel, crushed stone, crushed slag or combination thereof depending upon the grading required and conform to the quality standards as prescribed in the BOQ. The material shall be free from organic or other deleterious constituents and coarse aggregate shall be obtained from main land (India). Before execution of this item the approved material obtained from outside MD land shall be tested / checked for suitability to use. The lead/royalty involved is to be ascertained by the contractor before quoting his tender and no extra payment/adjustment for increase in lead or rate of royalty due to whatsoever reason shall be admissible on this account.

51.2 **PHYSICAL REQUIREMENTS :-** The material shall have a 10 percent fines of value 50 KN or more (for sample in soaked condition) when tested in compliance with IS : 2386 (Part 4) 1963. No aggregate which has water absorption more than 1 percent shall be used. For Grading II and III materials, the CBR shall be determined at the density and moisture content likely to be developed in equilibrium conditions which shall be taken as being the density relating to a uniform air voids content of 5 per cent.

51.3 **TABLE : GRADING FOR CLOSE GRADED GRANULAR SUB BASE MATERIALS**

IS Sieve Designation	Grade I	Grade II	Grade III	Grade IV	Grade V	Grade VI
75.0 mm	100	-	-	-	100	-
53.0 mm	80 -100	100	100	100	80 -100	100
26.5 mm	55 - 90	70 – 100	55 - 75	55 – 80	55 - 90	75 - 100
9.50 mm	35 - 65	50 – 80	-	-	35 - 65	55 - 75
4.75 mm	25 - 55	40 – 65	10 - 30	15 – 35	25 - 50	30 - 55
2.36 mm	20 - 40	30 – 50	-	-	10 - 20	10 - 25
0.85 mm	-	-	-	-	2 - 10	-
0.425 mm	10 - 15	10 – 15	-	-	0 - 5	0 - 8
0.075 mm	< 5	< 5	< 5	< 5	-	0 - 3

Note:- The material passing 425 micron (0.425 mm) sieve for above grading when tested according to IS : 2720 (Part 5) shall have liquid limit and plasticity index not more than 25 and 6 per cent respectively. **The grading of Granular Sub base shall be tested as per frequency laid down in Table 900-3 of MoRTH's** Specifications for Roads and Bridges (5th Revision 2013).

51.4 **PHYSICAL REQUIREMENTS OF MATERIALS FOR GSB**

51.4.1 Physical requirement for materials of GSB

Aggregate Impact Value (AIV)	IS: 2386 (Part 4) or IS: 5640	40 Maximum
Liquid Limit	IS:2720 (Part 5)	Maximum 25
Plasticity Index	IS:2720 (Part 5)	Maximum 6
CBR @ 98% dry density (at IS:2720-Part 8)	IS:2720 (Part 5)	Minimum 30 unless otherwise specified in the contract.

51.5 **CONSTRUCTION OPERATIONS**

51.5.1 **PREPARATION OF SUBGRADE:-** It shall be ensured prior to actual execution that the material to be used in the sub-base that the material used in the sub-grade satisfies the requirement of minimum CBR of 98% along with other physical requirements like density (98% of the modified Proctor lab MDD) when compacted and finished. The subgrade shall

PARTICULAR SPECIFICATIONS (Contd.../-)

be prepared by removing all vegetation and other extraneous matter, lightly sprinkled with water, if necessary and rolled with two passes of 80-100 KN smooth wheeled roller.

51.6 SPREADING AND COMPACTING

51.6.1 When the sub-base material consists of combination of materials mixing shall be done mechanically by the mix-in-place method. The equipments used for mix-in-place construction shall be a rotavator or similar approved equipment capable of mixing the material to the desired degree shall be carried out to establish its suitability for the work.

51.6.2 Moisture content of the loose material shall be checked in accordance with IS : 2720 (Part 2) and suitably adjusted by sprinkling additional water from a truck mounted or trailer mounted water tank and suitable for applying water uniformly and at controlled quantities to variable widths of surface or other means approved by the Engineer-in-Charge, so that, at the time of compaction, it is from 1 per cent above to 2 percent below the optimum moisture content corresponding to IS:2720 (Part 8). While adding water, due allowance shall be made for evaporation losses. After water has been added, the material shall be processed by mechanical or other approved means like disc harrows, rotavators until the layer is uniformly wet.

51.6.3 Immediately thereafter, rolling shall start, if the thickness of the compacted layer does not exceed 100 mm, a smooth wheeled roller of 80 to 120 KN weight may be used. For a compacted single layer upto 200 mm the compaction shall be done with the help of a vibratory roller of minimum 80 to 120 KN static weight with plain drum or pad foot drum or heavy pneumatic tyred roller of minimum 200 to 300 KN weight having a minimum tyre pressure of 0.7 MN/m2 or equivalent capacity roller capable of achieving the required compaction. Rolling shall commence at the lower edge and proceed towards the upper edge longitudinally for portions having unidirectional cross-fall and super elevation and shall commence at, the edges and progress towards the centre for portions having cross fall on both sides.

51.6.4 Each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass. During rolling, the grade and cross-fall (chamber) shall be checked and any high spots or depressions, which become apparent, corrected by removing or adding fresh material.The speed of the roller shall not exceed 5 km per hour.

51.6.5 Rolling shall be continued till the density achieved is at latest 98 per cent of the maximum dry density for the material determined as per IS:2720 (Part 8). The surface of any layer of material on completion of compaction shall be well closed, free from movement under compaction equipment and from compaction planes, ridges, cracks or loose material. All loose, segregated or otherwise defective areas shall be made good to the full thickness of layer and re-compacted.

51.7 SURFACE FINISH AND QUALITY CONTROL OF WORK

51.7.1 The finished surface shall be checked for lines, levels and regularity. The surface evenness of completed surface in longitudinal and transverse direction shall be with the tolerances specified in clause 20.A.19.3 of MES Standard Schedule of Rates Part-I.

51.8 RECTIFICATION

51.8.1 When the surface regularity shall fall outside the specification as above the surface shall be made up by trimming and compaction in case the surface is high or by scarifying, adding fresh material and compaction in case the surface is low to the required density. The degree of compaction shall confirm to as above.

51.9 QUALITY CONTROL

51.9.1 The frequency of the quality control tests shall be as under :-

SI	Test	Test method	Frequency (Minimum)
(a)	Grading	IS 2720 P VI	One test per 200 Cum
(b)	Atterberg limits of portion of aggregates passing 425 micron sieve plasticity.	IS 2720 P V	One test per 200 Cum
(c)	Natural moisture content	IS 2720 P II	One test per 250 Cum
(d)	Moisture content prior to compaction	IS 2720 P II	One test per 250 Cum

PARTICULAR SPECIFICATIONS (Contd.../-)

(e)	Density of compacted layer	IS 2720 P XXVIII	One test per 500 Sqm
(f)	Deleterious constituents		As required
(g)	Control of grade, camber thickness and surface finish.		Regularly
(h)	CBR.		As required

51.10 **TRIAL LENGTH:** Trial length shall be constructed as specified in Schedule ‘A’ Notes.

52.0 **WET MIX MACADAM**

52.1 This work shall consist of supplying, laying and compacted clean crushed graded aggregates and granular material like graded coarse sand are mixed with water in mixing plant and rolled, to a dense mass on a prepared sub base in accordance with the requirements & these specifications. The material shall be laid in one or more layers to the lines grade and cross section as specified in drawing and in BOQ and as directed by the Engineer-in-Charge. The thickness of a single compacted wet mix macadam layer shall be as specified in BOQ and as directed by the Engineer-in-Charge.

52.2 **MATERIAL**

52.2.1 **COARSE AGGREGATE**

52.2.1.1 Coarse aggregate shall be crushed stone obtained from approved quarries of main land India. It shall be hard, strong, dense and durable, clean and free from soft, friable, thin, flat, elongated or laminated, flaky pieces and shall be roughly cubical in shape. It shall be clean and free from dirt and other foreign matter. No aggregate which has water absorption more than 1 percent shall be used in the concrete mix. The aggregate shall conform to the physical requirements as specified as under: -

Sl No.	Test	Test Method	Requirements
1.	Los Angeles Abrasion value Or	IS: 2386 (Part IV)	40 % (Max.)
2.	Aggregate Impact value	IS: 2386 (Part IV) or IS: 5640.	30 % (Max.)
3.	Flakiness Index and Elongation indices (Total)	IS: 2386 (Part I)	35 % (Max.)

52.2.1.2 **GRADING OF AGGREGATES** : The combined grading of coarse / fine aggregates shall conform to the following:-

IS Sieve Designation	Percent by weight passing the IS Sieve
53.0 mm	100
45.0 mm	95 – 100
26.50 mm	–
22.40 mm	60 – 80
11.20 mm	40 – 60
4.75 mm	25 – 40
2.36 mm	15 – 30
600 Micron	8 – 22
75 Micron	0 - 5

Note: Material finer than 425 micron shall have plasticity index not exceeding 6.

52.2.2 **BINDING MATERIAL**

52.2.2.1 The binding material shall consist of fine grained material passing 100% through 425 mm micron sieve. The binding material shall confirm to Plasticity Index upto 6 when adopted for base / sub base course.

52.2.3 **FINE AGGREGATE**

52.2.3.1 The fine aggregate shall consist of crushed or naturally occurring material and be fraction passing 2.36 mm sieve and retained on 75 micron sieve consisting of crushed screening, natural sand or mixture of both,. It shall be clean, hard, durable uncoated and dry, free from injurious, soft or flaky pieces and organic or deleterious substances.

PARTICULAR SPECIFICATIONS (Contd.../-)

52.4 **PREPARATION OF BASE AND LAYING OF WMM**

52.4.1 Wet mix macadam shall be carried out all as specified in BOQ and as Clause No 20.B.5 of MES Standard Schedule of Rates Part-I (2009).

52.5 **QUALITY CONTROL**

52.5.1 The frequency of the quality control tests shall be as under:-

SI	Test	Frequency (Minimum)
(a)	Grading	One test per 100 Cum
(b)	Atterberg limits of portion of aggregates passing 425 micron sieve.	One test per 100 Cum
(c)	Moisture content prior to compaction	One test per 250 Cum
(d)	Density of compacted layer	One test per 500 Sqm
(e)	Aggregate impact value or Los Angeles Abrasion Value	One test per 200 Cum
(f)	Flakiness and Elongation Index	One test per 200 Cum

52.5.2 Before sample of material for aggregates is approved, these shall be tested for stripping. Where aggregates have poor affinity for bitumen, these shall be treated with approved anti-stripping agents.

52.5.3 Where crushed gravel is proposed for use as aggregate, not less than 90% by weight of the crushed material retained on 4.75mm sieve shall have at least two fractured faces.

52.6 **TRIAL LENGTH:** Trial length shall be constructed as specified in Schedule 'A' Notes.

52.7 For Wet Mix Macadam (WMM) the various provisions given in clause No.20.B.5 to 20.B.5.9.4 of SSR Part – I (2009) as applicable shall be adhere to.

53.0 **DRY LEAN CONCRETE (DLC)**

53.1 The DLC Sub-base shall extend beyond the pavement by 500 mm to facilitate further construction operations and provide as adequate support for the concrete slab. The extra width facilitates the movement of paver tracks on the extended DLC. The offset will be 200 mm in case of semi mechanized or manual construction.

53.2 **CEMENT** : Cement used in the work should confirm to one of the following standards:-

- (a) Ordinary Portland Cement 43 Grade IS 8112
- (b) High strength Ordinary Portland Cement 53 Grade IS 12269
- (c) Portland Slag Cement IS 455

53.3 **COARSE AGGREGATE**

53.3.1 Coarse aggregate shall consist of clean, hard, strong, dense, non-porous and durable pieces of crushed stone or crushed gravel and shall be devoid of pieces of disintegrated stone, soft, flaky, elongated, very angular or splintery pieces obtained from approved source of main land (India). The maximum size of coarse aggregate shall not exceed 26.5 mm in case of DLC unless otherwise indicated. No aggregate which has water absorption more than 1 percent shall be used in the concrete mix. The aggregates shall be tested for soundness in accordance with IS : 2386(Part – 5). After 5 cycles of testing the loss shall not be more than 12 percent if sodium sulphate solution is used or 18 per cent of magnesium sulphate solution is used. Coarse aggregates Los Angles Abration Value shall not exceed 35% when tested in conformity with IS– 2386(Part-4).

53.3.2 Dumping and stacking of aggregates shall be done in an approved manner. In case GE considers that the aggregates are not free from dirt, the same may be washed and drained for atleast 72 hours before batching as directed.

53.4 **FINE AGGREGATE**

PARTICULAR SPECIFICATIONS (Contd.../-)

53.4.1 Fine aggregate shall consist of naturally occurring coarse sand or crushed stone sand or a combination of the two and shall conform to IS-383. The fine aggregate shall be free from soft particles, clay, shale loam, cemented particles, mica, organic and other foreign matter. Fine aggregates shall not contain deleterious substance more than following: -

Clay Lumps	–	4%
Coal and Lignite	–	1%
Material passing IS sieve No 75 micron	–	4%

SI No	Material passing IS sieve No 75 Micron	
(a)	Natural sand	Shall not exceed 3 per cent by weight of natural sand.
(b)	Crushed stone sand	Shall not exceed 15 per cent by weight of crushed stone.
(c)	Blend of natural sand & crushed stone dust	Shall not exceed 8 per cent by weight of natural sand & crushed stone dust.

Cautionary Note :- Although IS :383 permits fines passing 75 microns up to 15 percent in the case of stone crushed sand, this provision should be used with caution when crushed stone dust is used as fine aggregate and when the mix produced in the laboratory and the field is satisfactory in all respects and complies with the requirement of specification

53.4.2 **GRADING OF AGGREGATES**

53.4.2.1 The grading of fine aggregate shall confirm to grading zones I, II, III & IV as given in IRC 15 or IS:383. The grading of combined coarse and fine aggregate for DLC shall be as per approved mix design with limits as under:-

IS Sieve Designation	% weight passing the IS Sieve
26.50 mm	100
19 mm	75-95
9.50 mm	55-70
4.75 mm	35-55
2.36 mm	17-42
600 micron	8-22
300 micron	7-17
150 micron	2-12
75 micron	0-10

53.4.2.2 Samples of the aggregate proposed to be used shall be approved by the GE, prior to bulk delivery of the same at site of work. Field tests for determining the contents of loam, clay etc, for fine aggregate shall be carried out by the Engineer-in-Charge from time to time to ensure that the materials brought to site are in conformity with the samples approved by the GE.

53.5 **WATER** : Water used for mixing and curing of concrete shall be clean and free from injurious amount of oil, salt, acid, vegetable matter or other substances harmful to the finished concrete. It shall meet the requirements stipulated in IS: 456.

53.6 **HANDLING OF AGGREGATES**

53.6.1 Stockpiles shall be made immediately on receipt of aggregates. Aggregates shall be stacked separately according to the nominal sizes of the single sized coarse aggregates. For fine aggregates separate stacks should be made for different grading zones, if required.

53.6.2 Aggregates shall be stacked on a hard surface so as to exclude the possibility of soil or grass being mixed up. When stacks are in close proximity the stockpiles shall be separated by the baulk heads to prevent the aggregates from mixing together. Special care shall be taken to clean and wash the last layer of aggregate in contact with ground surface before use.

PARTICULAR SPECIFICATIONS (Contd.../-)

- 53.6.3 Before batching, the aggregates shall have been stockpiled for at least 24 hours to allow for draining of water, if any. Contractor shall make adequate provisions for stock piling aggregates to an extent sufficient to meet the needs of the work taking into account the availability of supplies and rate of delivery, etc, and he shall include in his tender for necessary double handling and transportation of materials from stock piles to mixing plant etc.
- 53.7 **CONCRETE COMPRESSIVE STRENGTH AND CONCRETE MIX PROPORTIONING**
- 53.7.1 **CONCRETE STRENGTH**
- 53.7.2 The concrete mix shall be proportioned with a maximum aggregate cement ratio of 14:1 where OPC is used and 12:1 Where PPC or PSC is used. The minimum cementitious material shall not be less than 250 kg/Cum of concrete. Trial mix shall be carried out at site before laying concrete for DLC and tested for its 7 days compressive strength. The average compressive strength of each consecutive group of concrete cube shall not be less than 10 MPa at 7 days and any individual concrete cube less than 7.5 MPa at 7 days.
- 53.7.3 Design mix of DLC shall be got done from any of the **IITs/NITs/SEMT/IISC Bangalore/SERCs** and will be approved by Accepting Officer. Mix design shall be carried out without using polyester triangular fibre.
- 53.8 **BLANK**
- 53.9 **SUBGRADE**
- 53.9.1 The subgrade shall conform to the grades and cross-section on the drawings and shall be uniformly compacted to the modified Proctor density not less than 97 percent that is normally specified. Reference may be made to IS:2720 (Part 8) for this. The lean concrete sub-base shall not be laid on a subgrade softened by rain after its final preparation, surface trenches and soft spots, if any, must be properly back-filled and compacted to avoid any weak spot. As far as possible, the construction traffic shall be avoided on the prepared subgrade. A day before placing of the sub-base, the subgrade surface shall be given a fine spray of water and rolled with one or two passes of a smooth wheeled roller after a lapse of 2-3 hours in order to stabilise loose surface. If found necessary, another fine spray of water may be applied just before placing the sub-base.
- 53.10 **CONSTRUCTION OPERATION (DLC)**
- 53.10.1 **Trial mixes:** Trial mixes of dry lean concrete shall be prepared with moisture contents of 5.0, 5.5, 6.0, 6.5 and 7.0 percent using cement content requirement of aggregate-cement ratio specified above. Optimum moisture and density shall be established by preparing cubes with varying moisture contents. Compaction of the mix shall be done in three layers with vibratory hammer fitted with a square or rectangular foot. After establishing the optimum moisture, a set of six cubes shall be cast at that moisture for the determination of compressive strength at 3 and 7 days. Trial mixes shall be repeated if the strength is not satisfactory either by increasing cement content or using higher grade of cement. After the mix design is approved, a trial section shall be constructed.
- 53.10.2 If during the construction of the trial length, the optimum moisture content determined as above is unsatisfactory, suitable changes may be made in the moisture content to achieve a satisfactory mix. The cube specimens prepared with the changed moisture content should satisfy the strength requirement. Before production of the mix, natural moisture content of the aggregate should be determined on a day-to-day basis, so that the moisture content could be adjusted. The mix finally designed should neither stick to the rollers nor become too dry resulting in ravelling of surface.
- 53.10.3 The pace and programme of the lean concrete sub-base construction shall be matching suitably with the programme of construction of the cement concrete pavement over it. The sub-base shall be overlaid with Paving Quality Concrete (PQC) pavement not before 7 days after the sub-base construction.
- 53.11 **BATCHING AND MIXING**
- 53.11.1 The batching plant shall be capable of separately proportioning each type of material by weight. The capacity of batching and mixing plant shall be at least 25 percent higher than

PARTICULAR SPECIFICATIONS (Contd.../-)

the proposed capacity for the laying arrangements. The batching and mixing shall be carried out preferably in a forced action central batching and mixing plant having necessary automatic controls to ensure accurate proportioning and mixing. Calibration of the batching and mixing plant shall be carried out at regular intervals, normally every month. Other types of mixers shall be permitted subject to demonstration of their satisfactory performance during the trial length construction.

53.12 TRANSPORTING

- 53.12.1 Plant mixed lean concrete shall be discharged immediately from the mixer, transported directly to the point where it is to be laid and protected from the weather by covering with tarpaulin during transit. The concrete shall be transported by tipping trucks, sufficient in number to ensure a continuous supply of material to feed the laying equipment to work at a uniform speed and in an uninterrupted manner. The lead of the batching plant to the paving site shall be such that the travel time available from mixing to paving as specified above will be adhered to.

53.13 PLACING

- 53.13.1 Lean concrete shall be laid by a hydrostatic paver. The equipment shall be capable of laying the material in one layer in an even manner without segregation, so that, after compaction the total thickness achieved is as specified. The paving machine shall have high amplitude ramping bars to give good initial compaction to the sub-base. For more details, IRC:SP: 86, Guidelines for Selection, Operation and Maintenance of Paver Finisher's may be referred. The laying of the two-lane road sub-base shall be done in full width. For a pavement more than two-lanes, the operation may be carried out by two pavers in echelon separated by appropriate distance (15-20 m). Transverse and longitudinal construction joints shall be staggered by 500-1000 mm and 200-400 mm respectively from the corresponding joints in the overlaying joints in the overlaying concrete slabs.

53.14 COMPACTION

- 53.14.1 The compaction shall be carried out immediately after the material is laid and levelled. In order to ensure thorough compaction, rolling shall be continued on the full width till there is no further visible movement under the roller and the surface is closed. The dry density obtained (from the average of density obtained from the density holes of 200mm dia.) shall not be less than 97 percent of that achieved during the trial length construction. The densities achieved at the edges i.e. 0.5 m from the edge shall not be less than 95 percent of that achieved during the trial construction. Rolling shall commence on the lower edge of camber/one side slope and proceed towards centre/outer edge.
- 53.14.2 The spreading, compacting and finishing of the lean concrete shall be carried out as rapidly as possible and the operation shall be arranged so as to ensure that the time between mixing of the first batch of concrete in any transverse section of the layer and the compaction and final finishing of the same not exceed 90 minutes, when the concrete temperature is between 25 and 30 C and 120 minutes, if less than 25 C. This period may be reviewed in the light of the results of the trial length but, in no case shall it exceed 2 hours. Work shall not proceed when the temperature of the concrete exceeds 30 C. If necessary, chilled water or addition of ice may be resorted to for bringing down the temperature. It is desirable to stop concreting when the ambient temperature is above 35 C. After compaction has been completed, roller shall not stand on the compacted surface for the duration of the curing period except during commencement of next day's work near the location where work was terminated the previous day.
- 53.14.3 Double Drum smooth-wheeled vibratory rollers of minimum 80 to 100 KN static weight are considered to be suitable for rolling dry lean concrete. In case, any other roller is proposed, the same will be used after establishing its performance. The number of passes required to obtain minimum compaction depends on the thickness of the lean concrete, compatibility of the mix, and the weight and type of the roller etc. And the same as well as the total requirement of rollers for the job shall be determined during trial run by measuring the in-situ density and the scale of the work to be undertaken.
- 53.14.4 In addition to the number of passes required for compaction there shall be a preliminary pass without vibration to bed the lean concrete down and again a final pass without vibration to remove roller marks and to smoothen the surface. Special care shall be exercised during

Contd.../-

PARTICULAR SPECIFICATIONS (Contd.../-)

compaction near joints, kerbs, channels, side forms and around gullies and manholes. In case adequate compaction is not achieved by the roller at these points, use of plate vibrator will be permitted.

53.14.5 The final lean concrete surface on completion of compaction and immediately before overlaying, shall be well closed, free from movement under roller and free from ridges, cracks loose materials, pot holes, ruts or other defects. The final surface shall be inspected immediately on completion and all loose, segregated or defective areas shall be corrected by using fresh lean concrete material laid and compacted. For repairing honeycombed surface, fresh concrete of the grade of parent concrete, with aggregates of size 10 mm and below, shall be spread and compacted. It is necessary to check the level of the rolled surface for compliance. Any level deficiency should be corrected after applying concrete with aggregate of size 10 mm and below, after roughening the surface, when the concrete is still green. Similarly, the surface regularity also should be checked with 3 m straight edge. The deficiency should be made up with concrete with aggregates of size 10 mm and below. At the end of the day's work/stoppage of work due to breakdown of any machinery, in the chain, the work shall be finished straight by placing a channel at the end and placing concrete in slope beyond the channel. On the next day channel is removed and minor cutting to obtain vertical face as mentioned above may be needed.

53.14.6 Segregation of concrete in the dumpers shall be controlled by moving the dumper back and forth while discharging the mix into it and by other means. Even paving operation shall be such that the mix does not segregate.

53.15 **JOINTS** : Day's work shall be stopped by vertical joints. The edge of the compacted material shall be cut back to a vertical face, when work starts next day.

53.16 **CURING** : As soon as the lean concrete surface is completed, curing shall commence.

(a) Curing shall be done by covering the surface by hessian cloth in two layers which shall be kept continuously moist for 7 days by sprinkling water.

(b) If water-curing is not possible, the curing shall be done by spraying with liquid curing compound. The Curing compound shall be white pigmented type with water retention index of minimum 90 percent, when tested in accordance with the test method. To check the efficiency of the curing compound, the supplier shall be required to provide the test certificate from a recognized laboratory. Curing compound shall be sprayed immediately after rolling is complete. As soon as the curing compound has lost its tackiness the surface shall be covered with wet hessian for three days.

53.17 **TRIAL LENGTH CONSTRUCTION**

53.17.1 The trial length shall be construction (in two days), at least 14 days in advance of the proposed date of commencement of work. The length of trial construction shall be a minimum of 60 m length and for full width of the pavement. The trial length shall contain the construction of at least one transverse construction joint involving hardened concrete and sub-base to be laid subsequently, so as to demonstrate the soundness of the procedure. In one day trial length of not more than 30 m shall be laid. In order to determine and demonstrate the optimum moisture content which results in the maximum dry density of the mix compacted by the rolling equipment and the minimum cement content that is necessary to achieve the strength stipulated, trial mixes shall be prepared as per para above.

53.17.2 After the construction of the trial length, the in-situ density of the freshly laid material shall be determined by sand replacement method (as per IS : 2720 part -8) with 200 mm dia density hole. Three density holes shall be made at locations equally spaced along a diagonal that bisect the trial length average of these densities shall be determined. These main density holes shall not be made in the strip 500 mm from the edge. The average density obtained from the three samples collected shall be the reference density and is considered as 100 %. The field density of regular work will be compared with this reference density in accordance with this para. A few cores may be cut so as to check segregation or any other deficiency and also to ascertain strength.

53.17.3 The hardened concrete shall be cut over 3 m width and reverse to inspect the bottom surface for any segregation taking place. The trial length shall be constructed after making necessary changes in the grading of aggregates and the mix to eliminate any segregation of the mix.

PARTICULAR SPECIFICATIONS (Contd.../-)

The lower surface shall not have honey –combing and the aggregates shall not be held loosely at the edges.

53.17.4 The trial length shall be outside the main works. After the approval of the trial length construction has been given, the materials, mix proportions, moisture content, mixing, laying, compaction, plant, construction procedures shall not be changed.

53.18 CONTROL OF THICKNESS, DENSITY AND STRENGTH

53.18.1 The tolerance for thickness shall be + 10mm. The dry density of the laid material shall be determined from density holes at locations equally spaced along a diagonal that bisects each 2000 sq.m or part thereof, of material laid each day. The control of strength shall be exercised by taking samples of dry lean concrete for making cubes at the rate of 3 samples for each 1000 sq.m or part thereof laid each day. The cube samples shall be compacted, cured and tested in accordance with IS:516

53.19 QUALITY ASSURANCE / QUALITY CONTROL

53.19.1 Various test and frequencies as applicable for the quality control shall be as per MoRTH's specification for Roads and Bridges (5th Revision 2013)clause 903.5.1 and as given here-in-after.

53.19.1.1 QUALITY CONTROL TESTS

The quality control tests shall be as given below:-

SI No	Test	Test method	Minimum frequency
1	Cement	IS 269/455/1489	Once initially for approval of the source of supply and later for each consignment of the material.
2	Los Angeles Abrasion Value/Aggregate impact Value	IS 2386 Part IV	One test per 200 cum
3	Aggregate gradation	IS 2386 Part I	One test per 100 cum
4	Aggregate moisture content	IS 2386 Part III	As required
5	Control of grade, camber thickness and surface finish	As explained above	Regularly
6	Strength of cubes (Two specimens for each age 7 days and 28 days.	IS 516	One test for 50 cum.

53.19.2 TEST ON CURING COMPOUND

53.19.2.1 The efficiency of the curing compounds in terms of the extent, to which they reduce the evaporation loss of water from the surface of a standard mortar slab, can be determined by test. The test method provides the information on the escape of moisture from the surface of the mortar specimen, which may lead to loss of strength, shrinkage or low abrasion resistance of the hardened dry lean concrete.

53.19.3 TEST PROCEDURE

53.19.3.1 The metal rectangular mould shall be non-absorbent, watertight and rigidly constructed. The size of the mould is 150X300 mm at the top, 145X295 mm at the bottom, and 50 mm deep measured on the inside. Ordinary Portland cement and graded standard sand in the proportion 1:3 and a water-cement ratio of 0.40 to 0.44 (by weight) shall be used, to produce a flow of 35±5 percent ratio in 10 drops of the flow table. The mortar test slab specimen (3 No.) shall be made by placing mortar in two layers and tamping 50 times with the tamper, on each layer. The top surface of the test slabs will be finished with a float. On the dry surface of the specimens, within 1 hour of finishing, the curing compound shall be sprayed. The curing compound shall be of such character that, it hardens within 30 minutes after

PARTICULAR SPECIFICATIONS (Contd.../-)

application. The specimens along with the moulds shall be weighed accurately to the nearest 1 gm, and shall be kept in the humidity cabinet (with exposure temperature of 38 C and a relative humidity of 35 percent) for 72 hours. After taking out from the humidity cabinet, the specimens along with the moulds shall be weighed accurately again to the nearest 1 gm. The average percentage retention of the mixing water shall be calculated.

53.20 For Dry Lean Concrete (DLC) the various provisions given in clause No.20.B.6 to 20.B.6.14 of SSR Part – I (2009) as applicable shall be adhere to.

54.0 PAVEMENT QUALITY CONCRETE (PQC)

54.1 CEMENT

54.1.1 The grade of cement shall be OPC 43 grade only and as per Clause 20.B.2.2 of SSR Part-I.

54.2 COARSE AGGREGATE

54.2.1 Coarse aggregate shall consist of clean, hard, strong, dense, non-porous and durable pieces of crushed stone or crushed gravel and shall be devoid of pieces of disintegrated stone, soft, flaky, elongated, very angular or splintery pieces obtained from approved source of main land (India). The maximum size of coarse aggregate shall not exceed 31.5 mm in case of PQC unless otherwise indicated. No aggregate which has water absorption more than 1 percent shall be used in the concrete mix. The aggregates shall be tested for soundness in accordance with IS : 2386(Part – 5). After 5 cycles of testing the los shall not be more than 12 percent if sodium sulphate solution is used or 18 per cent of magnesium sulphate solution is used. A coarse aggregate Los Angeles Abration Value shall not exceed 35% when tested in conformity with IS– 2386(Part-4). Graded coarse aggregate for specified nominal size shall confirm to the table as specified herein after.

54.2.2 Dumping and stacking of aggregates shall be done in an approved manner. In case GE considers that the aggregates are not free from dirt, the same may be washed and drained for atleast 72 hours before batching as directed.

54.3 FINE AGGREGATE

54.3.1 Fine aggregate shall consist of naturally occurring coarse sand or crushed stone sand or a combination of the two and shall conform to IS-383. The fine aggregate shall be free from soft particles, clay, shale loam, cemented particles, mica, organic and other foreign matter. Fine aggregates shall not contain deleterious substance more than following: -

Clay Lumps	–	4%
Coal and Lignite	–	1%
Material passing IS sieve No 75 micron	–	4%

SI No	Material passing IS sieve No 75 Micron	
(a)	Natural sand	Shall not exceed 3 per cent by weight of natural sand.

Cautionary Note :- Although IS :383 permits fines passing 75 microns up to 15 % in the case of stone crushed sand, this provision should be used with caution when crushed stone dust is used as fine aggregate and when the mix produced in the laboratory and the field is satisfactory in all respects and complies with the requirement of specification

54.4 GRADING OF AGGREGATES FOR FINAL MIX

54.4.1 The grading of fine aggregate shall confirm to grading zones I, II, III & IV as given in IRC 15 or IS:383. The grading of combined coarse and fine aggregate for PQC shall be as per approved mix design with limits as under:-

PARTICULAR SPECIFICATIONS (Contd.../-)

Sieve designation	% by weight passing the sieve
31.50mm	100
26.50mm	85-95
19.0mm	68-88
9.50mm	45-65
4.75mm	30-55
600 micron	8-30
150micron	5-15
75 micron	0-5

Notes :

- (i) The grading given above are applicable both for natural river sand and crused stone aggregate.
- (ii) Where concrete of high strength and good durability is required, fine aggregates conforming to any one of the four grading zones as specified IS 383 or IRC 15 2011 may be used. From grading zones I to IV, the fine aggregate grading becomes progressively finer and therefore the ratio of fine aggregate to coarse aggregate should be progressively reduced. In all cases concrete mix should be properly designed as per IRC:44 recommendations. Mix design shall be guided by the actual grading, particle shape and surface texture of both fine and coarse aggregate.
- (iii) Where the grading in all Grading Zones falls outside the limits of any particular grading zone of sieves other than 600 micron IS sieve by a total amount not exceeding 5 percent, it shall be regarded as falling within that grading zone. This tolerance shall not be applied to percentage passing the 600 micron IS sieve or to percentage passing any other sieve size on the coarse limit of grading zone I or the final limit of grading zone IV.

54.5 WATER

- 54.5.1 Water used for mixing and curing of concrete shall be clean and free from injurious amount of oil, salt, acid, vegetable matter or other substances harmful to the finished concrete. It shall meet the requirements stipulated in IS: 456.

54.6 HANDLING OF AGGREGATES

- 54.6.1 Stockpiles shall be made immediately on receipt of aggregates. Aggregates shall be stacked separately according to the nominal sizes of the single sized coarse aggregates. For fine aggregates separate stacks should be made for different grading zones, if required.
- 54.6.2 Aggregates shall be stacked on a hard surface so as to exclude the possibility of soil or grass being mixed up. When stacks are in close proximity the stockpiles shall be separated by the baulk heads to prevent the aggregates from mixing together. Special care shall be taken to clean and wash the last layer of aggregate in contact with ground surface before use.
- 54.6.3 Before batching, the aggregates shall have been stockpiled for at least 24 hours to allow for draining of water, if any. Contractor shall make adequate provisions for stock piling aggregates to an extent sufficient to meet the needs of the work taking into account the availability of supplies and rate of delivery, etc, and he shall include in his tender for necessary double handling and transportation of materials from stock piles to mixing plant etc.

54.7 MIX PROPORTION AND STRENGTH (DESIGN PARAMETERS / CRITERIA)

- 54.7.1 The following data are required for mix proportioning of a particular grade of concrete:-
 - (a) Grade designation (Required compressive strength/flexural strength)
 - (b) Type of cement
 - (c) Maximum nominal size of aggregate
 - (d) Minimum and maximum cement contents
 - (e) Maximum water-cement ratio
 - (f) Workability
 - (g) Method of transporting and placement of concrete

PARTICULAR SPECIFICATIONS (Contd.../-)

- (h) Temperature of concrete at the time of placement. The temperature of the concrete at the time of placement shall not exceed 300 C and shall not be less than 50 C.
- (j) Type of aggregates.
- (k) Whether a chemical and mineral admixture shall or shall not be used and the type of admixture and the condition of use.
- (l) Whether fibres shall or shall not be used and type and specification of fibres to be used.

54.7.2 The following data shall be used :-

(a)	Minimum flexural strength (For which mix is to be designed)	The mix design should be designed to achieve the min flexural strength of 45 Kg/Cm ² in the field at 28 days.
(b)	Works test beams flexural strength (Minimum flexural strength to be achieved in field at 28 days)	Not less than 45 Kg/Cm ² in the field at 28 days (based on “Works test” conducted in the field or in a field laboratory or the specimen made on the works site out of the concrete being used there).
(c)	Aggregate/cement ratio by weight	As per mix design
(d)	Water cement ratio by weight	As per mix design
(e)	Degree of control	‘VERY GOOD’
(f)	Slump for concrete	Not more than 2.5 cm.
(g)	Type of aggregate	Crushed stone aggregate
(h)	Maximum size of Aggregate	31.5mm
(j)	Type of cement	As per clause here-in-before.
(k)	Exposure Condition	Severe

NOTE:

(i) Design Mix of PQC shall be got done from any of the **IITs/SEMT/IISC Bangalore/SERCs** and will be approved by **Accepting Officer**. Mix design shall be carried out using polyester triangular fibre. Polyester Triangular/ non circular synthetic fibre as secondary reinforcement to be mixed in cement concrete shall be measured and paid separately under respective item of BOQ.

(ii) Synthetic Fibre of Non circular fibre shall be used as specified hereinbefore.

54.8 **WATER CEMENT RATIO**

54.8.1 The actual and designed quantity of water shall be used in the mix. The water cement ratio shall be invariably kept between 0.35 to 0.42. Site document shall be maintained for use of different water cement ratio on daily basis.

54.9 **CEMENT CONTENT**

54.9.1 When Ordinary Portland cement is used the quantity shall not be less than 400 Kg/Cum. In case this minimum OPC content is not sufficient to produce concrete of the specified strength, it shall be increased as necessary by the Contractor at his own cost. The OPC content shall not exceed 425 Kg/Cum of concrete.

54.10 **TRIAL MIX**

54.10.1 Trial mix shall be made and beam tested for flexural strength as per requirement of IS 516-1959. Nine sets of beams shall be tested, three for 7 days and three for 28 days. If the difference between the highest and lowest value at 28 days in any trial mix is more than 15% of strength of these beams, the test shall be discarded and further trial mix made. Crushing Strength of concrete shall be approved for the flexural strength. The remaining three beams and three cubes, if the mix is finally approved, will be preserved carefully for one year from the completion of work for test or any subsequent check.

54.11 **FIELD MIX**

PARTICULAR SPECIFICATIONS (Contd.../-)

54.11.1 After the award of the contract, the proportions, i.e. the field mix or job mix determined for a particular aggregates approved by the GE shall govern. These proportions will be corrected and adjusted by the GE to compensate for moisture content in the aggregates or fluctuations in the grading of coarse and fine aggregates at the time of use. Any change in the source of materials or mix proportions found necessary during the work shall be assessed by making laboratory trial mixes. Contractor must make efforts to get the mix proportion approved at least one and a half month in advance of commencing paving operation in trial length.

54.12 PREPARATION OF BASE

54.12.1 Before fixing the formwork for laying concrete, the base shall be checked for proper compaction, density and levels. Base shall be laid using paver with sensor. Whenever specified approved standard waterproof, wrinkle free HDPE sheet 400 micron thick without puncture shall be laid over tack coat of 2.5kg/10sqm using paving bitumen to prevent absorption of water for the concrete mortar. Before placing the membrane, the surface shall be cleaned of all the extraneous material using air compressor. Wherever overlap is required, minimum overlap shall be 300 mm. The damage/punctured sheet should be replaced. In summer (when ambient temperature is more than 25 degree centigrade) before placing polythene membrane, the existing DLC surface shall be wetted with water.

54.12.2 **Trial Length:** Trial length shall be constructed as specified in Schedule 'A' Notes. The trial length shall be constructed at least 14 days in advance of the proposal date of commencement of work. At least 30 days prior to the construction of the trial length, the contractor shall submit for the Engineers approval a detailed method statement giving description of the proposed material, plant, equipment and construction methods. All the major equipment like paving train, batching plant, tippers, etc proposed in the construction are to be approved by the engineer before their procurement. The trial length should be constructed away from carriage way. The Engineer-in-Charge shall also approve the location and length of trial construction which shall be a minimum of 60m length and for full paver width of the paver. The trial length shall contain the construction of at least one transverse construction joint involving hardened concrete and freshly laid sub base. The construction of trial length will be repeated till the contractor proves his ability to satisfactory construct, the pavement in subsequent trials. The hardened concrete shall be cut over 3m width and reversed to inspect the bottom surface for any segregation taking place. The length shall be constructed after making necessary change in the gradation of the mix to eliminate segregation of the mix. The lower surface shall not have honey-combing and the aggregate shall not be held loosely at the edges. At the age of 28 days, two cores with diameter 150mm shall be cut from the slab. The cores shall be saw cut at both ends to provide a specimen height of 300mm and shall be tested for compressive strength at the age of 28 days. The Flexural strength shall confirm to 4.5 MPa at 28 days.

54.13 FORM WORK**54.14 STEEL FORMS**

54.14.1 Steel forms shall comply with the specifications given in clause No. 20.B.7.6.1 of SSR Part-I

54.15 **SETTING OF FORMS** Setting of forms shall comply with the specifications given in clause No. 20.B.7.6.3 of SSR Part-I

54.16 BATCHING MIXING AND HAULING OF COMPACTION CONCRETE

54.16.1 Pavement concrete materials shall be batched by weight by combined batching and mixing plants. Weigh batching shall be done with fully computerized batch weighing plants of capacity as specified in Schedule 'A' Notes. Power driven mechanical concrete mixers of adequate capacity with water measuring devices as per IS 1791 and IS 12119 in conjunction with weigh batchers shall be used. Standby plant will be catered for to avoid disruption of works. A small quantity of water will be added before loading of aggregate and cement. The remaining water will be added during the mixing operation. The mixing will be done for at least two minutes and until a uniform colour and consistency is achieved. The method of batching should be made full proof. Quality of concrete mixed in any one batch shall not exceed the rated capacity of the mixer. On cessation of work and during other stoppages exceeding 20 minutes, the mixer and other equipment/accessories used for handling wet mix shall be thoroughly washed with clean water. Blades in the drum of the mixer which are worn down 20 mm or more in depth shall be replaced with new blades. The contractor shall install two or more fully computerized batch mix plants at site to ensure that concrete is

Contd.../-

PARTICULAR SPECIFICATIONS (Contd.../-)

placed at desired location within 20 minutes of its pouring out from batching plant. It shall be ensured that during this transportation time of 20 minutes, the concrete is transported in tilting type rotary mixer or transit mixers of capacity 6.0 cum so that concrete does not get set during its transportation.

- 54.16.2 Polyester (non-circular) triangular synthetic fibres of approved make as secondary reinforcement shall be uniformly mixed at the rate of 0.25% of weight of cement (or at the rate of manufacturer's instructions).
- 54.16.3 The polyester (non-circular) triangular synthetic fibres shall be from the approved manufacturer and as approved by GE. Quantity of fibre used in the PQC work as applicable, shall be entered in Measurement Book with reference to original paid vouchers submitted to Engineer-in-Charge.
- 54.16.4 Admixtures conforming to IS-6925 and IS-9103 will be permitted to improve workability of the concrete or extension of setting time, on satisfactory evidence that they will not have any adverse effect on the properties of concrete with respect of strength, volume change and durability. The particulars of admixture and the quality to be used must be furnished to Engineer-in-Charge before design mix.

54.17 PLACING AND COMPACTION OF CONCRETE

- 54.17.1 Concrete shall be transported without delay and incorporated in the works before initial setting time as per clause 13.2 of IS 456-2000 from the time of discharge from the mixer unless special transportation devices are deployed. Temperature of concrete must be below 35 degrees centigrade. Concrete shall be placed and spread to such a depth that when compacted and finished, it shall conform to the grade and cross section specified in the plan to ensure the minimum slab thickness shown on the drawing to be obtained at all points. In order to obtain adequate compaction, the concrete shall be spread so as to stand proud of the finished level and produce a surcharge of 20% of the required slab thickness, Spreading, compacting and finishing (except final broom/belt finishing) operations shall be completed within a period not exceeding initial setting time from the time the mixing starts. In case of dry and hot weather, this time will not exceed 35 minutes.

54.18 USE OF PAVERS AND COMPACTION

- 54.18.1 The contractor shall use slip form pavers (with sensors) with string brooming arrangement for depositing, consolidation and finishing of concrete pavement. The paver shall be of adequate capacity and suitable width of work bridge so as to complete concrete pavement within stipulated / agreed period of completion. However fixed form pavers shall be allowed on fillets and turnings.
- 54.18.2 The slip form paving train shall consist of power machine which spreads, compacts and finished the concrete in a continuous operation. The slip form paving machine shall compact the concrete by internal vibration and shape it between the side forms with either a conforming plate by vibrating and oscillating finishing beams. The concrete shall be deposited without segregation in front of slip form paver across the whole width and to a height at all times in excess of the required surcharge. The deposited concrete shall be struck off to the necessary average and differential surcharge by means of the strike off plate or a screw auger device extending across the whole width of the slab. The equipment for striking off the concrete shall be capable of being rapidly adjusted for change of the average and differential surcharge necessitated by change in slab thickness or cross fall.
- 54.18.3 Slip form paving machines shall have vibrator of variable output with a maximum energy output of not less than 2.5 KW per meter width of slab per 300 mm depth of slab for a laying speed upto 1.5 m per minutes or prodata for higher speeds. The level of the conforming plate and finishing beams shall be controlled automatically for the guide wires installed by sensors attached at the four corners of the slip form paving machine. The alignment of the paver shall be controlled automatically from the guide wire by a least one set of sensor attached to the paver. The alignment and level of ancillary machines for finishing, texturing and curing of the concrete shall be automatically controlled relative to the guide wire or to the surface and edge of the slab.

54.19 FINISHING OF CONCRETE

- 54.19.1 **SURFACE FINISH** : Immediately after the compaction of concrete but before the concrete has hardened (within 90 min of placing concrete) and while the concrete is still in a plastic

Contd.../-

PARTICULAR SPECIFICATIONS (Contd.../-)

state, the pavement surface shall be inspected for irregularities with a profile checking template and any needed correction made by adding or removing concrete by means of long handled floats and scraping straight edge followed by further compaction and finishing. The long-handled floats may be used to smoothen and fill in open-textured areas in the pavement surface but the final finishing is to be made with scraping straight edge.

54.19.1.1 The scraping straight edges are to be 3 meters long with flexible handles long enough to reach the other side of slab when operated from inside of pavement. They are to be placed parallel to the form at the side of the pavement and worked backwards and forward uniformly across the width of the slab. After this operation has been completed and the surface has been brought up to the required finish, the straight edges are to be moved forward by not more than half their length and this process repeated. The straight edge testing and refloating is to continue until entire surface:-

- (a) Is free from observable departure from the straight edge.
- (b) Conforms to the required levels and cross section.
- (c) When the concrete has hardened, it shall conform to the specified surface levels.

54.19.1.2 After the concrete has sufficiently hardened to about 12 hours and not later than 24 hours, the surface shall be tested again for high spots. All high spots shall be marked and those exceeding 3 mm shall be ground down immediately. Care shall be taken to ensure that the grinding does not in any way damage the concrete surface.

54.19.1.3 **BELTING** : Just before the concrete becomes non plastic, the surface shall be belted with a two ply canvas belt not less than 20 cm wide and at least 1 m longer than the width of the slab. Hand belts shall have suitable handles to permit controlled uniform manipulation. The belt shall be operated with short strokes transverse to entire line of pavement and with a rapid advance parallel to the centre line.

54.19.1.4 **BROOMING** : After belting and as soon as surplus water, if any has arisen to the surface, the pavement shall be given a broom shall be pulled gently transversely and in straight strokes over the surface of pavement from edge to edge. Adjacent strokes shall be slightly overlapped. Brooming shall be perpendicular to the centre line of the pavement and so executed that the corrugation thus produced will be uniform in character and width and not more than 1.5 mm deep. No pressure will be applied to the broom and scoring will be done under the weight of the broom head without tearing the surface.

54.19.1.5 **EDGING** : Immediately after belting/brooming has been completed, the end edges of the slab and edges of expansion joints should be carefully finished with an edging tool of 6 mm radius and the pavement edges shall be left smooth and true to line.

54.19.1.6 **HONEY-COMBING** : Honey-combing exceeding 300 Sq cm in area shall be considered as major honey-combing. Major honey combed areas or segregated concrete or other defective work or areas damaged by removal of the forms of concrete, damaged by rain or any other reasons whatsoever will be considered as defective work and shall be removed and replaced. Minor honey combed areas shall be filled with mortar composed of one part of cement to two parts of fine aggregates.

54.19.1.7 **MARKING OF SLABS** : Every slab shall bear an impression not exceeding 3 mm in depth with text size of min 40 mm in height comprising the number allotted to the slab and the date on which it was laid. This impression shall be formed when concrete is green so as to leave permanent mark of setting. In case paver is used one or all these action are done by a separate attachments.

54.20 **CURING AND PROTECTION OF CONCRETE**

54.20.1 Immediately after the surface texturing, the surface and sides of the slab shall be cured by the application of approved resin based aluminized reflective curing compound which hardens in to impervious film or membrane with the help of a mechanical sprayer fitted to paver to avoid plastic shrinking. Curing compound shall contain sufficient flake aluminium in finely divided dispersion to produce a complete coverage of the sprayed surface with a metallic finish. The compound shall become stable and impervious to evaporation of water

PARTICULAR SPECIFICATIONS (Contd.../-)

from the surface of the concrete within 60 minutes of application and shall be approved type approved by GE.

- 54.20.2 The curing compounds shall have a water retention efficiency index of 90 percent in accordance with BS Specification No.7542 or ASTM-C-309-81, Type II/relevant IS/IRC code. The curing compound shall not react chemically with the concrete and the film or membrane shall not crack, peel or disintegrate within 3 weeks after application. Immediately prior to use, the curing compound shall be thoroughly agitated in its containers. The rate of spread shall be in accordance with the manufacturer's instructions and should be checked during the construction of the trial length and subsequently whenever required by the Engineer-in-charge. The mechanical sprayer shall incorporate an efficient mechanical device for continuous agitation and mixing of the compound during spraying. To give continuous covering curing compound may be spread in two layers.
- 8.16.2.3 In addition to spraying of curing compound, the fresh concrete surface shall be protected for at least three hours by covering the finished concrete pavement with tents supported on mobile truss during adverse weather conditions as directed by the Engineer-in-charge. After three hours, the pavement shall be covered including edges of the pavement shall be covered by moist hessian cloth in two layers and the same then be kept moist for entire period of curing. All damaged/torn hessian shall be removed and replaced by new hessian cloth on regular basis. If it becomes necessary to remove hessian for any reason, the concrete slab shall not be exposed for a period more than half an hour. If hessian is obtained in strip the shall be laid to overlap at least 150 mm.
- 54.20.4 **FINAL CURING** : After initial curing and joint cutting a system of transverse and longitudinal dykes of clay about 50mm high shall be laid and shall be immediately covered with blanket of sandy soil free from stones to prevent the drying up and cracking of clay. The rest of slab shall then be covered with sufficient sandy soil so as to produce a blanket of earth not less than 37mm deep, after wetting. The earth covering shall be thoroughly wetted while it is being placed on the surface and against the side of the slab and kept thoroughly saturated with water for 28 days and then covering shall be removed and the pavement shall be cleaned and swept. If the earth covering becomes displaced during the curing period, it shall be replaced to the original depth and restarted.
- 54.20.5 Concrete shall not be subjected to any load or weight of any plant until at least 14 days after laying. Concentrate loads or sharps objects like iron wheels of concrete mixer and any vehicular traffic including construction traffic will not be allowed on the concrete surface for 28 days. Contractor will appoint chowkidars at his expense to prevent workmen, cattle etc, straying on the concrete for a minimum of three days after laying concrete.
- 54.21 **CONCRETE DURING RAIN**
- 54.21.1 To prevent damage to properly laid concrete during monsoons or sudden rains the contractor shall provide an adequate supply of tarpaulins or other water-proof cloth. Any concrete damage by rain shall be removed and replaced by the contractor at his own cost as directed by the Engineer-in-Charge.
- 54.22 **QUALITY CONTROL**
- 54.22.1 The quality control tests as specified in clause 20.B.7.15.1 and 20.B.7.15.2 of SSR part-I shall be carried out all as directed at frequencies specified against each during progress of work.
- 54.23 **RECORD OF FINISHED LEVEL OF PAVEMENTS**
- 54.23.1 A record of the level of the finished rigid and flexible pavement surface shall be kept in a level book and shall form part of the documents maintained for the contract.
- 54.23.2 Temporary shelter of adequate size for concreting (PQC) to be erected on rails, in this connection refer Sch 'A' Note here-in-before.

PARTICULAR SPECIFICATIONS (Contd.../-)

- 54.24 **REPLACEMENT REJECTED SLABS**
- 54.24.1 Pavement Quality Concrete shall be tested and critically examined as given here-in-after. Concrete in slab which stand rejected shall be replaced by the contractor at no extra cost to Govt. The concrete cast in replacement shall satisfy the strength. The decision of the Garrison Engineer in this aspect shall be final and binding.
- 54.25 **CONCRETING IN HOT WEATHER** : No concreting shall be done when the concrete temperature is above 30 degrees Celsius. Besides, in adverse condition like high temperature, low relative humidity (below 25%), excessive wind velocity (more than 15 km/hr), imminence of rains etc, if so desired by the Engineer-in-charge, tents on mobile trusses shall be provided over the freshly laid concrete for a minimum of 3 hours as directed by the Engineer-in-Charge. The temperature of the concrete mix on reaching the paving site shall not be more than 30 degree centigrade. If necessary, chilled water or ice flakes (manufactured from non-chlorinated water) should be made use of. No concreting shall be done when the concrete temperature is below 5 degree Celsius and the temperature is descending. Checks shall be carried out in case plastic shrinkage crack of width 0.3 mm in case of normal weather condition and 0.2 mm in case of moderate/severe weather conditions appears. The aggregates shall be kept shaded to protect from direct sun rays.
- 54.26 The details of the tests to be performed in the lab and site and their frequency is as under:-

SI No	Name of test	Relevant	Frequency
AGGREGATES			
(a)	Gradation tests	IS 2386 Part I	One test for 15 Cum of each fraction of coarse and fine aggregate.
(b)	Deleterious constituents	IS 2386 Part II	One test for 15 Cum of each fraction of coarse and fine aggregate.
(c)	Moisture content	IS 2386 Part-III	Regularly subject to minimum of one test per day for coarse aggregate and two tests per day for fine aggregate. Once for each source for deriving the moisture content relationship.
(d)	Buling of fine aggregate (for volume batching)	IS 2386 Part-III	As required.
(e)	Los Angeles Abrasion Value/Aggregate impact value	IS 2386 Part-IV	Once for each source of supply and subsequently when warranted by change in quality of aggregate.
(f)	Soundness test for Coarse aggregate.	IS 2386 Part-V	As required.
(g)	Alkali aggregate reactivity	IS 2386 Part-VII	As required.
CEMENT CONCRETE			
(h)	Setting time	IS 4031	Once each bulk supply and as when required.
(j)	Soundness	IS 4031	- do -
(k)	Compressive strength	IS 4031	- do -
(l)	Specific gravity test	IS 4031	Once each bulk supply and as and when required.
(m)	Chemical analysis	IS 4032	- do -
(n)	Slump Test	IS-1199/ 1959	One test per 10 Cum
(o)	Compressive strength	IS 516	E cube / beam sample as specified for each age of 7 days and 28 days for every 30 cubic meter.
(p)	Flexural strength	IS 516	- do -

PARTICULAR SPECIFICATIONS (Contd.../-)

(q)	Core strength for hardened concrete	IS 516	As required
(r)	Compacting factor	IS 1199	One test per 10 Cum

Note :-

- (i) **Workability**: Any of concrete giving a compacting factor or slump which does not comply with the laid down value + or – 0.02 (in case of compacting factor only) should be rejected and removed from the site (Refer clause No. 20.B.7.14.4 of MES Schedule Part – I (2009).
- (ii) **7 days strength** : At least three beams should be casted and tested for flexural strength as per IS 516. The strength should be 70 to 75% of the 28 days strength. If it is less than the concrete mix should be redesigned and retested (Refer clause No. 20.B.7.14.2 of MES Schedule Part – I (2009).
- (iii) **28 days strength**: At least three beams for every slab will be cast and tested for flexural strength as per IS 516. At least 30 sample shall have been cast for slab laid in similar conditions their results should be tabulated and LCL (Local Control Limit) shall be determined. LCL shall not be less than flexural strength specified in the design (Refer clause No. 20.B.7.14.3 of MES Schedule Part – I (2009).
- (iv) **Honeycombing** : For slabs where honeycombing is expected, at least two cores per slab of 10 cm dia and 20 cm height shall be cut from slab which are at least 28 days old for visual inspection. The position of the cores will be decided by the Engineer-in-Charge. If any core shows honey-combing then at least two more cores should be cut as directed, to determine the extent of unsatisfactory concrete. The entire unsatisfactory portion should be cut and replaced.
- (v) **Size of moulds** : Size of mould for testing purpose should not be less than 3 to 4 times the maximum size of coarse aggregate. Standard mould size of 15 x 15x 70 (cm) and 15x15x15 (cm) are used for beams and cubes respectively. If the maximum size of aggregate bigger than 50mm, does not exceed 15% the same standard mould shall be used. If it exceeds 15% then size shall be 20x20x90 (cm) and 20x20x20(cm) for beams and cubes respectively. The results with the increased size shall be correlated with the values with the standard size by actual testes at site.
- (vi) **Core tests** : In case concrete fails in flexure test then the concrete will not be rejected unless it also fails in core test. In core test at least two cores of the dia not less than 150mm shall be cut per slab. The crushing strength of this core is then determined. The crushing strength should not be less than 0.8 times the corresponding strength of 15 cm cube, in case the L/D ratio of the core is between 1 and 2 then the crushing strength of the cube will be reduced. The correction shall be carried as per the formula as under:-

 $f = 0.11 n + 0.78$ Where f = correction factor and n = L/D ratio.

In case the concrete fails in both flexure and core test, then it will be rejected and replaced.
- (vii) All holes from which core have been cut, will be filled with same concrete with which original slab was laid. While filling the concrete, due care should be taken to ensure proper bond between old and new concrete.

54.27 **ACCEPTANCE OF CONCRETE**

54.27.1 Concrete shall only be accepted if it satisfies the following main condition:-

- (a) LCL of every lot (at least 30 samples) is not less than specified strength.
- (b) Co-efficient of variation is not greater than 10%.
- (c) Tolerance level factor is 1.5.
- (d) There is no honeycombing in the concrete.

54.27.2 **For Pavement Quality Concrete (PQC) the various provisions given in clause No.20.B.7 to 20.B.7.15.2 of SSR Part – I (2009) as applicable shall be adheres to.**

55.0 **JOINTS IN PAVEMENT CONCRETE**

PARTICULAR SPECIFICATIONS (Contd.../-)

- 55.1 **GENERAL** : Joints shall be of the types and dimensions specified and shall be located in all cases as indicated on the drawings or as directed. Location of joints should be transferred accurately on site as per stipulated dimension. The sawing of joints shall be carried out with diamond studded blades soon after the concrete has hardened to take load and vibration of the sawing machine and working personal without damaging texture of the pavement and without disturbing edges. Sawing operation may commence as early as 12 hours from the placing of concrete but after the concrete is suitably hardened.
- 55.2 **DUMMY JOINTS**
- 55.2.1 The size of joints shall be as specified in drawing and in BOQ and as directed and shall extend to a depth equal to 1/3 to 1/4 of the thickness of the slab.
- 55.2.2 The joint shall be formed using mechanical equipment (diamond cutter) as early as 12 hours of placing of concrete under moderate climatic conditions and when the concrete has sufficiently hardened. Cutting or sawing by a sawing mounted at movable frame and driven mechanical drill also is permitted for making the joint. Care shall be taken that the edge of the joints is not damaged. The edge will not stand proud of the concrete slabs.
- 55.2.3 In case of sudden rain or storm, the work can be concluded with the dummy joint but the latter will then be formed into a construction joint.
- 55.3 **CONSTRUCTION JOINTS**
- 55.3.1 Construction joints shall also be provided at places where concreting is stopped due to unforeseen circumstances. The size of joints shall be as specified in BOQ.
- 55.3.2 Construction joints shall be straight and vertical through the full thickness of the slab. The vertical edge of the concrete of the side of the joint shall be treated with two coats of bituminous primer before the adjacent bay is concreted. Construction joint shall be all as per clause 20.B.7.11.3.1 and 20.B.7.11.3.2 of SSR Part – I.
- 55.3.3 Sealing Compounds for joints in Concrete Pavement cold applied Polyurethane joint sealant of approved make will be used. The specifications shall conform to BS-5212, BS 4254 and EN- 141875-2003 (for hydrolysis/water resistance test). In addition, the Movement Accommodation Factor (MAF) of the sealant should be minimum (\pm) 30%. The sealant shall be cold applied polyurethane type approved make with minimum performance guarantee of ten years.
- 55.4 **EXPANSION JOINTS**
- 55.4.1 The size joints shall be as specified in drawing and BOQ.
- 55.4.2 Joints shall be straight and shall extend through the full thickness of the slab and shall be of the shape and dimensions as specified in BOQ. The slab edge adjacent to the joint shall be formed truly vertical. The joints shall be filled with approved joint filler placed in position and properly supported. Joint filler shall be as per IS-1838.
- 55.4.3 Sealing Compounds for joints in Concrete Pavement cold applied Polyurethane joint sealant of approved make will be used. The specifications shall conform to BS-5212, BS 4254 and EN- 141875-2003 (for hydrolysis/water resistance test). In addition, the Movement Accommodation Factor (MAF) of the sealant should be minimum (\pm) 30%. The sealant shall be cold applied polyurethane type approved make with minimum performance guarantee of ten years.
- 55.5 **PROCEDURE OF JOINT FILLING WITH POLYURETHANE SEALANT**
- 55.5.1 Polyurethane sealant complies with BS : 5212 and primer as per manufacturers specified here-in-after. Contractor shall not procure the materials required for joint filling unless the samples are approved by GE. The selection of the joint sealant of approved make will be a minimum performance guarantee of ten years offered by the firm. Contractor shall not procure the materials required for joint filling unless the samples are approved by GE and a ten years of guarantee is given in writing by the contractor. The primer and sealant shall got tested by GE from reputed testing laboratory with NABL accreditations. The test certificates shall be obtained for every 5 MT of material incorporated in the work.

PARTICULAR SPECIFICATIONS (Contd.../-)

- 55.5.2 The quantity of sealants used in the work shall be entered in Measurement Book with reference to original paid vouchers submitted to Engineer-in-Charge.
- 55.6 **JOINT PREPARATION**
- 55.6.1 Before commencing joint sealing operations, the criteria as specified in clause 20.B.7.11.5.2 of SSR Part-I shall be ensured.
- 55.7 **FIXING/MASKING TAPE**
- 55.7.1 Fix masking tape to prevent edges of joints becoming dirty due to spillage of sealant at the time of pouring.
- 55.8 **APPLICATION OF PRIMER AND POURING OF SEALANT**
- 55.8.1 Application of primer and pouring of sealant shall be done all as specified in Clause No. 20.B.7.11.5.4 to 20.B.7.11.5.7 of MES Schedule Part I. Contractor's attention is invited to Clause No. 20.B.7.11.5.8 of MES Schedule Part I with regards to precautions to be taken while applying and filling of sealants in Joints.
56. **INTERNAL ELECTRIFICATION**
- 56.1 **SCOPE OF WORK:** The extent of work under this contract is as indicated in relevant Para/section of MES Schedule, Schedule 'A', Particular Specification and drawings. All references to clauses in succeeding paragraphs pertain to MES Schedule 2009 Part-I (Specifications). The layout of conductors/cable, route shall be as directed by the Engineer-in-Charge.
- 56.2 **GENERAL REQUIREMENT**
- 56.2.1 The requirement pertaining to materials, conformity with Indian Electricity Act and rules, workmanship, testing, record of installations, safety procedures and practices and fire safety, shall be all as specified in MES Schedule 2009 Part-I (Specifications) Clause 19.2.
- 56.2.2 The installation shall strictly comply with the provision contained in the latest edition of the Indian Electricity Rules and IS-732 'Code of practice for electrical wiring and fittings in buildings' as applicable to these works except where such regulations and rules are modified by these specifications.
- 56.2.3 All electrical works shall be executed properly by skilled licensed electricians under the supervision of suitable qualified electrical supervisors. The contractor on demand by Engineer-in-charge shall produce such evidence of qualifications of his workmen and supervisor(s) either at the time of commencement of the work or any time there after during contract period. No wiring shall be done in the POL store.
- 56.2.4 The position of electrical fittings and fixtures shown on the drawings is tentative and may be changed by Engineer-in-charge at the time of execution if found necessary. Such change does not entail any price adjustment.
- 56.2.5 The runs of the wires shall be marked on the walls and soffits of roof/floor slabs for wiring. Approval of Engineer-in-charge shall be obtained in writing before fixing plugs, boards, cables and fittings etc.
- 56.2.6 Looping back system of wiring shall invariably be used throughout the installation.
- 56.2.7 All electrical fittings and wiring shall be clear off doors and windows and other openings.
- 56.2.8 Danger boards shall be provided as per IS/IE Rules on all three phase switches and DBs. Name of function of each distribution board shall be clearly and neatly painted on the distribution board.
- 56.2.9 No twisting, jointing in earth wire is allowed. All continuous earth wire shall be connected to main earth/switch boxes/DB's, socket plugs etc., by use crippling tools only.

PARTICULAR SPECIFICATIONS (Contd.../-)

- 56.2.10 The contractor is deemed to have included in rates, cost of making holes/ chases where required through masonry or concrete work for taking in cables/conduits and conductors, etc and making good the same to match with existing work.
- 56.3 **TYPE OF WIRING:**The type of wiring shall be as given in relevant section of Schedule "A", Particular Specification and as directed by Engineer-in-Charge. Point wiring for light/power/fan/bell point(s) includes all works comprising of: -
- (a) Supplying and fixing/drawing of cables for carrying out wiring.
- (b) Supplying and fixing of suitable size sunk steel terminal box covered with white plastic laminated sheet to accommodate requisite switches, fan regulator(s), sockets or switch socket combination.
- (c) Non metallic rigid PVC/ metallic rigid steel conduit stove enamelled black medium grade conduit with all fittings.
- 56.4 **LOCATION OF VARIOUS FITTINGS:** Particular attention is drawn to the neatness in appearance, which is to be achieved by judicious location of light fittings; switches socket outlets and main controls etc. Due regard shall be given to doors, windows, opening, etc in fixing the run of cables, position of fittings, control switches etc. The location of fittings etc. shall be marked in advance on walls etc. and approved by GE.
- 56.5 **APPROVAL OF SAMPLES:** All materials unless otherwise specified shall possess ISI mark or conform to relevant IS specifications or to BSS. If for any material, ISS is not available, approval of GE referred to in clause 19.2.1 and 19.2.2 of MES schedule shall be in writing. Approved samples shall be labelled as such and signed by the contractor and the Engineer-in-Charge. They shall remain in the custody of Engineer-in-Charge, till final completion of work.
- 56.5 **CABLES**
- 56.5.1 Cable for internal wiring for light, power shall be with copper conductor and bearing necessary ISI Certification mark on and shall be of following type:-
- (a) Wiring in non metallic rigid PVC conduit: PVC insulated single core multi stranded unsheathed cable upto 1100 volts grade conforming to IS-694.
- 56.5.2 **SUB MAIN WIRING:** PVC insulated un sheathed copper cable for sub main wiring shall conform to IS 1554 part-I, suitable for working voltage upto 1100volts. Cables shall bear ISI certification mark.
- 56.5.3 The contractor shall produce the certificate in original issued by the manufacturer stating that the cable proposed to be incorporated in the work by the contractor is manufactured all in conformity with the IS. The contractor shall also ensure this by keeping intact the manufacturer's original seal on the cable drum.
- 56.6 **CONDUIT AND CONDUIT ACCESSORIES/FITTINGS**
- 56.6.1 All conduit, conduit fittings and accessories shall be ISI marked and specified in clause 19.29 of MES Schedule 2009 Part-I (Specifications). The minimum external diameter of conduit shall be suitable to the number of run of cables all as mentioned in clause 19.125(B) of MES Schedule 2009 Part-I (Specifications).
- 56.6.2 Installation of conduit and conduit wiring shall be carried out as described in Schedule 'A' and as specified in MES Schedule 2009 Part-I (Specifications and in IS-732-1989.
- 56.6.3 The unit rates quoted for the appropriate items of conduit wiring include all the items such as supplying and fixing/drawing of cables for carrying out wiring, non metallic rigid PVC conduit with all fittings, suitable size sunk pressed steel terminal box covered with white plastic laminated sheet to accommodate requisite switches, fan regulators, sockets or switch socket combination etc., including continuous earth wire and earthing connections all as per section 19 of SSR Part I.
- 56.7 **PLUGS, SCREWS AND FASTENERS:** All as specified in clause 19.30 and 19.31 of MES Schedule.

PARTICULAR SPECIFICATIONS (Contd.../-)

- 56.8 **SUNK TYPE BOXES**: These shall be of pressed steel conforming to IS-14772-2000 Part -I and as specified in clause 19.38 of MES Schedule.
- 56.9 **SWITCH, SOCKET OUTLETS**: These shall be of bakelite flush type 5 or 15 amps multipurpose non-shuttered type conforming to relevant IS.
- 56.10 **MINIATURE CIRCUIT BREAKER**: These shall conform to IS 8828-1996. The MCB shall be of minimum 9 KA rating.
- 56.11 **LIGHT FITTINGS**: These shall be as specified in Schedule-`A`, Particular Specifications and as shown on drawings.
- 56.12 LED light fittings shall be provided as per Schedule A. After completion of work Contractor shall submit a written guarantee for a period of 05(Five) years (or more as per manufacturers instructions) for the LED light fittings provided by them from the certified date of completion of the entire work under the contract as certified by the GE. This guarantee shall be given in the form as approved by the GE on non-judicial stamp paper of appropriate value. During the aforesaid guarantee period of 05 years the Contractor shall be solely responsible for the functioning of the LED light fittings. Any defects noticed by the GE during this period shall be promptly rectified by the Contractor without any extra cost to the Government. An amount of security deposit equal to the individual security deposit calculated based on the amount of LED light fittings at contract rates for the item to be carried out shall be retained from the Contractor's final bill as security deposit for the light fittings which shall be released to the Contractor only after expiry of guarantee period. The Contractor may alternatively furnish a fixed deposit receipt in favour of the GE in lieu of sum to be retained as security deposit for LED light fittings from any approved Scheduled Bank.
- 56.13. **SITING OF ELECTRICAL EQUIPMENT**: The siting of cable conduit, controls, distribution boards, fittings and accessories etc. shall be as laid down in IS 4648 "Guide for electrical layout in building" or as directed by EIC/GE.
- 56.14 **SYSTEM OF WIRING**: Wiring shall be carried out with PVC insulated cable as specified in Schedule 'A' and shall run as far as possible near walls, ceiling so as to be easily accessible and capable of being inspected. Power wiring shall be kept apart and shall be distinct from other wiring. Separate conduit shall be used for power wiring.
- 56.15 **CONTROL AT POINT OF ENTRANCE OF SUPPLY**: There shall be a linked main switch gear with MCB on each live conductors of supply main at the point of entrance. No fuse shall be inserted in the neutral.
- 56.16 **TYPE OF SWITCH BOARD**: Standard Sheet metal enclosure for mounting MCB shall be of 16 gauge MS Sheet supplied by the manufacturer.
- 56.17 **EXHAUST FAN/CEILING FAN**: Ceiling fan shall be securely fixed by means of MS bolts and nuts in locations shown in drawings and as directed by E-in-Charge.
- 56.18 **EARTHING AND TESTING**: Earthing shall be carried out as described in IS 3043 and as per Schedule 'A' and as shown in drawing. It shall be conforming to the clause 19.137 of MES Schedule 2009 Part-I (Specifications)
- 56.19 **TEST CERTIFICATES**: Manufacturer's test certificates shall be furnished by the tenderer to the GE in respect of the following items:-
- (a) Moulded case circuit breakers
 - (b) Miniature circuit breakers and distribution boards.
 - (c) All light fittings
 - (d) Cables
- 56.20 **Tests on completion**: The following tests shall be carried out by the contractor after completion of the work in presence of Engineer-in-Charge. The results of such tests shall be recorded and signed by the contractor and Engineer-in-Charge. All testing equipment required to carryout the tests shall be arranged by the contractor without any extra cost. The work which does not withstand satisfactory test shall be re-executed by the contractor at his own expense.

PARTICULAR SPECIFICATIONS (Contd.../-)

- (a) (i) **Polarity Test:** A test shall be made to ensure all switches are connected to correct phases or line conductor of supply.
- (ii) **Effectiveness** of earth shall be tested by earth tester.
- (b) **Resistance of earth continuity path:** Maximum continuity resistance from any point in the installation including earth continuity wire and earth lead to earth plate shall not exceed one ohm or as specified in Schedule 'A'.
- (c) **Insulation test:** The insulation resistance shall be measured between all conductors connected to neutral and phases of supply and result shall be less than those specified in IS/IEEE rules and shall be such to ensure reliable operation of protection devices.

56.21 **Drawings:** The contractor shall submit 6 copies of the following drawings duly signed by him to the Engineer-in-charge without any extra cost: -

- (a) Internal wiring diagram to include: -
- (i) Lights, switches, sockets, fans etc and circuit diagram as per symbols adopted in the extract drawings.
- (ii) All outlets marked with circuit number to which they belong.
- (iii) Typical section indicating mounting heights adopted.
- (b) Drawing for each panel board shall be submitted by the contractor before execution for approval of the Engineer-in-charge.
- (c) One copy of the above drawings shall be submitted to the Engineer-in-charge within 45 days of the placing of the work order for his approval and remaining with any alterations as directed by the Engineer-in-charge within 15 days of the completion of work.

56.22 **End termination:** All cable terminations for internal electrification for various switches, light fittings, MCB's, switch fuse units, junction boxes, connectors etc., shall be provided with suitable crimped lugs/studs/sleeves as required to avoid any possibility of loose connections and sparking. The loose screwing and without providing suitable lugs/studs/sleeves will be strictly prohibited

56.A **GUTTER FOR RAIN WATER PIPES**

56.A.1 Wherever gutter has been shown in drawings, provide galvalume sheet factory made gutter made out of 1mm thick pre painted sheet. Galvalume sheet shall be all as specified in MES Schedule 2009 Part - I (Specification) and shall be provided to the full all as shown on drawing including all accessories. At junctions, joints and supports, the ends of the sheets shall be suitably over lapped into each other and made flush by riveting to obtain a leak proof joint.

56.B **RAIN WATER PIPES**

56.B.1 Rain water pipes and fittings shall be of UPVC pipe, type 'A' conforming to IS-13592 of size as shown in drawing. Size of pipe where not indicated in drawings shall be 150mm dia. Pipes and fittings shall be secured to wall and gutter all as specified in clause 18.52 of MES Schedule 2009 Part-I Specifications. For connecting gutter to down take pipe a funnel shaped connecting piece shall be made of aluminium sheet and riveted to gutter and the other end shall be tailed into the socket of rain water pipes.

56.B. The grating shall be of PVC, round type, provided and fixed at the inlet of rain water pipes

57. **EOT CRANE**

57.1 Crane of capacity 6 tons, double girder, electrically operated OH complete with working span of Over Head Crane is 16 Mtr spanning from edge to edge (inner) of walls, and crane moves longitudinally, Hook height of the crane 6.0 m from hanger floor to lowest point of crane (fully up) & cross travel of the crane moves along the width including electric control panel with gantry rail, DSL GI shrouded bus bar system and connected accessories and testing of crane on full load complete all as directed with following specification.

PARTICULAR SPECIFICATIONS (Contd.../-)

(Appx "EC")

TECHNICAL SPECIFICATION – DOUBLE GIRDER EOT CRANE

- (a) Product : Double Girder EOT Crane
- (b) Location : Indoor
- (c) Area Classification : Safe (Non-Hazardous)
- (d) Capacity : 6.0 MT
- (e) Span : 16 Mtr
- (f) Hook height of the crane : 6.0 Mtr from FFL
- (g) Travel Length : ____ Mtr
- (h) Class & Duty : Class-II (Medium Duty) as per IS-3177, IS-807
- (j) Crane Control : Floor Operated through push button station
- (k) Voltage : 415V±10%, 50 Hz, 3 Phase AC Supply
- (l) Control Voltage : 110 VAC
- (m) DSL (Down Shop Leads) : 4-Way DSL system includes MS Angle, Joints & Pick up Bracket
- (n) Speeds(m/Min) : Main/ Micro
- (o) Hoisting : 3.5/0.35m/min
- (p) C.T : 15m/min
- (q) L.T : 20/2.0 m/min
- (r) Motar **Make** & HP : BBL/CGL as IS 325, Class-f, 4 pole, 1440 RPM, crane Duty
- (s) Hoisting : 3.0 H.P.-Sq Cage with VFD
- (t) C.T : 1.0H.P. -Sq cage
- (u) L.T : 5.0 H.P. -Sq cage x 2 Nos with VFD
- (v) VFD : VFD will be provided in hosting and Long travel motions Make as recommended by OEM
- (w) Wire Rope Size : Ø10mm, 4 falls
- (x) Wire rope Con & Make : 6x36 construction, **Make:** USHA MARTIN
- (y) Brake : 'Fail to Safe' Type brakes
- (z) Limit Switches : Considered in all motions (Geared + Gravity & Roller type)
- (aa) Hook : 'C' Shank Type, Forged steel confirms to IS:3815 Make as recommended by OEM
- (ab) LT Wheel Size : Double Flange "L" Type Ø 400mm - 4 Nos
- (ac) C T Wheel Size : Double Flange 'L' Type Ø 160mm - 4 Nos
- (ad) Crane Girder : Box type, fabricated from M.S. Plate confirms to IS:2062
- (ae) End truck : Box type fabricated from M.S. Plate confirms to IS:2062
- (af) CT Power Feeding : 'C' Track type
- (ag) LT Rail : 60 LBS/yd with clamps (Old)
- (ah) Switch gear : Make as recommended by OEM
- (ai) Platform : Full length platform will be provided across one side of main girder
- (aj) Crane weight : 46.6 Ton (Approx)
- (ak) Wheel Load : 13.8 Ton (Approx)
- (al) Buffer : Rubber type
- (am) Paint : Two coats of red oxide & two coats of synthetic enamel paint

PARTICULAR SPECIFICATIONS (Contd.../-)

- 57.2 Load testing shall be arranged by the contractor at site In the presence of Sr IEM and test result for the same shall be kept in record duly signed by the Sr IEM and no extra payment made on this account
- 57.3 Contractor shall carry out load testing at 125% of the safe working load (dead load to be arranged by the contractor) and no extra payment shall be made by the department.
- 57.4 The following test shall be carried out at factory premises of manufacturer:
- (i) **Deflection test:** - As per IS 3177-1999
 - (ii) **Speed test:** - All motion will be tested with 25% over load
 - (iii) **Brake test:** - Hoist brake shall be capable of breaking with rated as well as overload
58. **FIRE FIGHTING SYSTEM**
- (i) Fire alarm, detection & fire hydrant system shall be carried out through specialist firm, The Tenderer /Contractor shall be submitted the details scheme through GE/CWE for approval of accepting officer as well as approval the firm.
 - (ii) Appropriate capacity of battery backup system shall be provided for the system for smooth operation.
 - (iii) Fire alarm and fire detection system shall be automatic functional as & when occurred and panel shall be given indication of zone affected including functioning of automatic operation of Hooter and repeater panel.
 - (iv) Contractor shall also responsible to trained the user's and MES Rep for operation & maintenance system of fire alarm, fire detection and fire hydrant system.
 - (v) Final testing shall be carried out by the officer detailed by the Accepting officer after successfully site testing carried by the Engineer-in-Charge/GE.
- 58.1 **FIRE DETECTION & ALARM SYSTEM** : All fire detection work shall be carried out as per IS-2189 and IS-2175.
- 58.1.1 **AUTOMATIC SYSTEM OR CIRCUIT** : A system or circuit in which alarm is originated without manual intervention.
- 58.1.2 **CONTROL POINT** : The place or room where the main indicator board or control panel which indicates the zone or section from where the alarm has originated is installed and from where the working of the alarm system is controlled.
- 58.1.3 **DETECTOR OR AUTOMATIC CALL POINT** : A device such as a fuse working at a given temperature, thermostat or a fluid filled tube or an electronic device, which gives an alarm on the occurrence of a predetermined condition of temperature.
- 58.1.4 **FAULT SIGNAL** A distinctive signal audible and /or visual, indicating a failure of electric supply, presence of a break, an earth or other electrical fault on a circuit or system of circuit.
- 58.1.5 **FIRE ALARM SYSTEM** An arrangement of call point or automatic fire detectors, sounders and other equipment for the transmission and indication of alarm signals for testing of circuits and where required, for the operation of auxiliary services. The type, number and location of alarm sounders shall be such that the alarm is heard distinctly above and background noise in every part of the premises and also in the adjacent public thoroughfares. Except in small buildings, the use of at least two alarm sounders shall be quite distinct from any others likely to be heard. Bells, hooters, sirens, and the like may be used, but it is essential that all sounders of the same kind on a particular installation shall produce a similar sound.
- 58.1.6 **INDICATOR** A device which reveals the number, name or both number and name of the call point or section from which call has originated like extinguishing or glowing of a lamp or lamps, or dropping of flag(s).

PARTICULAR SPECIFICATIONS (Contd.../-)

- 58.1.7 **OPEN CIRCUIT** A circuit connecting a number of call points or detectors in series to the indicating and controlling equipment wherein an alarm of fire is transmitted by the closing of the contacts of any call point.
- 58.1.8 **CLOSED CIRCUIT** A circuit connecting a number of call points or detectors in series to the indicating and controlling equipment wherein an alarm of fire is transmitted by the opening of the contacts of any call point.
- 58.1.9 **SOUNDER** Devices like bells, horns, sirens or the like which give the sound signals after the instrument has received the electrical alarm signals from the detectors or when there is fault in the system.
- 58.1.10 **SECTION** The portion of the premises which is covered by one alarm circuit at the fire alarm control panel. A delineation of section is done in regard to the size and accessibility and does not extend beyond one floor including mezzanine floor if any.
- 58.1.11 **ZONE** A number of sections on any one floor covered by one fire alarm control panel shall comprise a zone. There may be more than one zone in a floor depending upon the size and accessibility.
- 58.1.12 **SECTOR** In extensive installation it is desirable to divide the premises which may consist of one or more buildings or other structures into sectors, each comprising of number of zones, covered by one fire alarm control panel designed to assist in the quick and smooth mobilization of the firefighting staff by directing them to a scene of the fire by reference to the sector indicator.'
- 58.2 **GENERAL REQUIREMENTS**
- Sounders shall be bells, horns, sirens or the like, but is essential that all alarm sounders of the same kind on a particular installation shall provide a similar sound.
- 58.2.1 For large and intricate premises it is necessary that the origin of a call be indicated. For this, the premises shall be divided into sections/zones. All call points in each section shall be connected to the same indicator. The various drops or lamp indicators shall be grouped together on the main indicator boards may be used covering different sector of the premises. These should be supplemented by sector indicators for the various sectors at a central control point.
- 58.2.2 For every installation a control room or control point shall be provided at the control point the main indicator board or the zone and section indicating boards and all common control apparatus and supervisory equipment shall be located. The control point shall be under continuous and competent watch during the whole time the system is in operation.
- 58.2.3 The main indicator and control panel shall be cited where it can be under constant observation and when the premises are occupied and where it can be seen from outside when the building is closed. If necessary, a suitable notice should indicate its position.
- 58.2.4 Rate of Temperature Rise – These are particularly suitable for use where the normal ambient temperature is low (remains in the region of 0 degree Celsius or below most of the time) and/or may vary over a wide range slowly.
- 58.3 **IDENTIFICATION** - Every call point shall be allotted an identification number.
- 58.3.1 Where a structure has a monitor, saw-tooth, gable roof or lantern, a row of detectors shall be installed within 60 cm of the apex of the roof.
- 58.3.2 When storage is done on long racks and shelves, the detectors shall not be more than 1.5 m apart on every shelf.
- 58.3.3 Doors, windows, ventilators, elevators and similar flue – like openings should have a fire detector at the top of every 2 m of the width and within 1.5 m of the centre of the top of the opening.
- 58.3.4 Every detectors shall be so situated that its heat-sensitive element is in free and intimate contact with the atmosphere, unless special measures are taken, this means that detectors shall not be either partly or totally sunk in the building fabric.

PARTICULAR SPECIFICATIONS (Contd.../-)

- 58.3.5 Below every detector, a space of 60 cm radius shall be kept clear. Notices to this effect shall be posted in prominent positions.
- 58.3.6 Additional detectors shall be provided to deal with any features presenting special fire risk, such as spaces between roofs and false ceilings, ventilation, ducts cable chases or shafts.
- 58.3.7 To avoid serious adverse effects on their sensitivity of operation, detectors shall not be painted colour-washed, distempered, varnished, coated or covered in any way after installation.
- 58.3.8 Electrical contacts and other moving parts of a detector shall be enclosed in such a manner that will afford protection against moisture, dust, insect and other foreign matter.
- 58.3.9 A detector shall be provided with means for secure mounting independently of any support from attached wiring.
- 58.3.10 Any adjustment made in the factory shall be securely sealed and any adjusting screws shall be of appropriate type with reliable means of locking. The means of adjustment should be rendered in accessible to prevent tempering when the detectors are mounted.
- 58.3.11 All make and break contacts shall be of silver or other metal or alloy of equipment characteristics.
- 58.3.12 The make of the fire alarm panel and connected accessories shall be any of the following: - Agni safety / Agni Soni / Appolo / Bosch security / Safeguard industries

59 VALVES:**59.1 SLUICE VALVES**

These shall be of CI body (flanged and drilled ends), non-rising type with high tensile forged brass spindle and nut and bronze face rings. These shall be of class PN-1/PN 1.6 as described in Schedule 'A' and shall be IS-14846 marked.

59.2 TESTING OF SLUICE VALVE :

The sluice valve shall be tested by the contractor hydraulically to withstand, without leakage, pressure equivalent to double the maximum working pressure. The testing may be carried out in stretches as directed by Engineer-in-Charge. All defects in joints and leakage, if any, shall be rectified by the contractor to the satisfaction of the GE and the sluice valves retested if ordered. GE's approval shall be final and binding on the contractor. Materials, labour and equipment required for the test shall be provided by the contractor at his own cost and the rates in the Schedule 'A' are deemed to include for the same.

59.3 REFLUX VALVE :

Reflux valves for rising mains shall be of the specified makes and as described in Schedule 'A' and unit rate of the item shall include two flanged joints complete. The valve shall withstand hydraulic pressure test as per relevant class of pipe.

59.4 BUTTERFLY VALVES:

Butterfly valves shall be of slim seal, short wafer type with standard finish. The valves shall be suitable for mounting between flanges drilled to ANSI 125. The valve body shall be cast iron. The disc shall consist of disc pivot and driving stem. The disc shall move in bearings on both ends with 'O' ring to prevent leakage. The seat shall be molded black nitrile rubber or nylon. The valves shall be suitable for a working pressure of 16.0 kg/sqcm (PN 16) and shall be complete with flow control lever and notches, factory machined companion flanges, bolts & nuts.

59.5 GATE VALVES

All gates valves and check valves shall be of cast iron flanged type conforming to class 2 of IS 780/69 for sized up to 350 mm and IS 2906/69 for sizes 350 mm & above. All such valves shall be supplied with I.S.I marking and certification.

PARTICULAR SPECIFICATIONS (Contd.../-)

59.6 **BALL VALVES**

Ball valves shall have body of carbon steel. The ball and the shaft shall be of stainless steel. The seat shall be of PTFE. The valve shall be complete with socket weld ends.

59.7 **CHECK VALVES**

(a) Check valves shall be of Dual plate check valve with CI body, aluminum-bronze plates, SS 316 hinges pins, springs & Buna-N seals to ANSI series 125. The check valves shall be suitable for 210 psi 9 21 Kg/sqcm) test pressure with suitable ofr 15 Kg/cm2 operating pressure.

(b) Check valves shall be of non-slamming type to prevent water hammer either by providing springs or accumulators. All check valves must be only vertical type.

59.8 **STRAINERS** “Y” strainers up to 50 mm shall be of gunmetal and above 50 mm shall be of cast iron body. Strainers shall incorporate a removable bronze screen with 3mm perforations and a permanent magnet. Strainers shall be provided with flanges at both inlet and outlet of the chilled water pump set. They shall be designed to enable blowing out the accumulated dirt and facilitate removal/replacement of screen without disconnecting the main pipe.

59.9 **FLANGES & UNIONS**

Sufficient number of flanges and unions shall be provided as required to facilitate the maintenance work after the piping is installed. Mild steel ANSI 125 flanges shall be used for pipes of 65 mm dia and above.

59.10 **PRESSURE GUAGES**

(a) Pressure gauges shall not less than 100 mm dia. They shall be selected for appropriate range and shall be complete with siphon and cock, etc.

(b) Pressure gauges shall be provided at suction and at discharge of each pump, at chilled water supply and return at each air handling unit, at each chillers and condenser, and as shown on the Drawings and included in Schedule of Quantities. Care shall be taken to protect pressure gages during testing. Pressure gage sockets on insulated pipes and accessories shall be extended up to insulating to avoid damage of insulation for replacement of gages.

(c) Pressure gauges shall be provided as shown in the drawings & as per price schedule.

59.11 **THERMOMETERS**

(a) Thermometers shall be provided at chilled water supply and return at each air handling unit, at each chiller , and as shown on Drawings and included in Schedule of Quantities.

(b) Thermometers on CHW lines shall be with long stem. Thermometer socket shall be extended up to insulation thickness so that the thermometer shall be removable without damaging the insulation.

59.12 **AUTOMATIC AIR VENTS** It should be of compact & efficient design made of Brass construction to efficiently remove air pockets from hydraulic systems with a maximum working pressure of 4-6 bar& working temperature of 120 deg C.

59.13 **FLEXIBLE CONNECTIONS** : Flexible neoprene connectors shall be used on all equipment as indicated on drawings & on equipment schedule. They shall be manufactured in multiple ply's of nylon tire cord fabric and Neoprene both moulded & cured in hydraulic rubber presses. No steel wire or rings shall be used as pressure reinforcement.

59.14 **The flexible connectors shall be provided at**

Inlet & Outlet of Pumps
Inlet & Outlet of Pumps

PARTICULAR SPECIFICATIONS (Contd.../-)

- 59.15 **GATE / GLOBE VALVE :** Gate / Globe valves shall be IS-778 marked.
- 59.16 **GI FITTINGS :** These fittings shall be suitable for the class / grade of the pipe.
- 59.17 **VALVE IDENTIFICATION**

(a) Provide 30 mm dia brass valve tag, with embossed letters and number for each valve and attach the tag to valve handle by “S” hook or by suitable means. Contractor shall provide valve tag schedule and valve chart for each piping system, consisting of schematic drawing of piping layout, along with a valve list, showing and identifying each valve by number, service and location and describing its function.

(b) The contractor shall frame under glass in the air-conditioning plant room or as directed by Owner’s site representative two copies of valve chart. Two additional un-mounted copies shall be supplied to the owner’s site representative. (c) Tags shall correspond with the valve schedule and record drawings. In back of house areas, where ceilings are installed and the valve or valve tag is not visible, a self-adhering tag with the valve number shall be installed on the wall or directly under the ceiling. For public area ceiling valves, these tags are to be installed in the service corridor, leading to the public areas.

(d) All pipes shall have arrow marks to indicate the direction. Arrow shall be of radium sticker with navy blue colour.

(e) Condenser water piping after testing shall be given 2 coats of primer before final coat.

(f) All exposed ducts and pipe supports shall be given 2 coats of paint after primer coating as directed by the Architect. The cost of painting shall be included in unit rate of pipes and ducts.

SI No	Service Flow Colour
(a)	Chillers Water Supply Sky Blue
(b)	Chillers Water Return Cascade Green
(c)	Pumps & Motors Dark Adm, Grey (28-105)
(d)	Supports Black (28-122) Or as directed

Note:- 1) All colours and codes refer to ICI DULEX Synthetic Enamel Colours, nearest equivalent acceptable.

Distinguishing white bands in British white 28-100.

60 **PUMP SETS**

- 60.1 The pump sets shall be manufacturer’s factory assembled and tested complete with pump and motor coupled together including necessary base plate, couplings etc, as applicable for the type of pump sets. The pump set shall be tested for satisfactory performance as per IS by the manufacturer at his premises and test certificate for the same shall be produced by the contractor.
- 60.2 These shall be of the type and specifications as indicated in Schedule ‘A’ and PS hereinafter. The pump shall be coupled with a matching motor of HP, as recommended by manufacturer but not less than that specified. The contractor should check the market availability of the pump sets and offer comments, if any, well before DRT seeking for review. If at a later date, pump of the tender specifications is reported/projected as not available in the market, the nearest next higher capacity/rating pump shall have to be provided by the contractor without any extra cost and his quotation would be deemed to have catered for the same.
- 60.3 Foundation for pump shall be provided as per the manufacturer’s recommendations. All the civil / mech works for the same are deemed to be included in the rates quoted.
- 60.4 Electrical connections with PVC insulated multi-stranded copper conductor FRLS, IS-694 marked, LT cables laid in duct/GI pipe from panel to the centrifugal pumps is to be provided by the contractor and his rates are deemed to cater for the same.

PARTICULAR SPECIFICATIONS (Contd.../-)

- 60.5 The scope of work also include provision of matching/suitable starter, as specified, and rates quoted are deemed to include for the same. However, this starter shall be mounted in the LT panel (catered separately), which shall cater for space and panel connections required for the starter.
- 61 **PUMP**
- 61.1 The pump set shall be as specified in Sch..-'A'. Coupled with the flexible coupling to electric induction motor and both shall be fixed on common base plate. The mounting arrangement shall be secured on MS channel plate and shall be free from vibrations. The tenderer along with tender has too submit the details of pump set. The pump shall have the name plate indicating suction lift, delivery head capacity in LPM and RPM. Each pump shall have independent suction pipe. The foundation of pump shall be all as recommended by manufacturer.
- 61.2 The pump shall be any of the makes given in **Appendix 'C'** to particular specifications.
- 61.3 The motor shall be AC induction motor of suitable capacity as established with RPM given in sch 'A'. It shall be any of the makes given in **Appendix 'C'** to Particular Specifications.
- 61.4 The various parts of the pumps shall be made of materials as mentioned below :-
- (a) Body : Cast Iron.
 - (b) Impellers : Bronze
 - (c) Shaft : Stainless steel.
 - (d) Bearings : Heavy duty, NBC, SKF
 - (e) All other parts : Normal Ferrous parts.
- 61.5 The pump set shall be capable of giving 150% capacity at 65% rated load.
- 61.6 The motor shall be totally enclosed drip proof type. It shall have inlet and outlet protection with mashed wire panels to exclude rodent, reptiles and insects.
- 61.7 The motor shall wound for class 'C' insulation and winding shall be vacuum impregnated with heat and moisture resisting varnish and preferably glass fiber insulated to with stand tropical conditions. Anti-vibration pads of suitable size/quality as approved by GE shall be provided for all pump sets.
- 61.8 The contractor shall produce the test certificate from manufacturer's regarding capacity and efficiency of pumps sets. The test results shall confirm to relevant Indian standard specifications.
- 61.9 On satisfactory installation of pumps sets a field test for performance will be carried out on each pump for duration sufficient to obtain accurate and constant results. However each pump set shall be run continuously for not less than two hours to verify the mechanical condition of the pump. Observations should be made with regard to the following:-
- (a) Insulation resistance test for motor and cables.
 - (b) Earth resistance test for motor and wiring.
 - (c) Undue shock, hammering, Vibration and other mechanical defects.
 - (d) Lubrication of bearings.
 - (e) Water seal and gland packing devices.
 - (f) Bearing temperature as laid down by manufacture.
 - (g) Speed measurements by accurately calibrated instruments.
 - (h) Discharge measurements by water meter.
 - (j) Pressure test by pressure gauge and measurement of head.

PARTICULAR SPECIFICATIONS (Contd.../-)

(k) Electrical power input and measurements of efficiency.

61.10 All installation except water meter and electric meter for the above tests shall be arranged by the contractor at his own cost.

61.11 The installation will be taken over, only after the above mentioned tests are found to be satisfactory and certificate to this effect is issued by the Garrison Engineer. The tests shall be carried out by the Accepting officer or his authorised representative in the presence of contractor. The contractor shall offer all facilities regarding testing equipments, tools etc. and making all necessary arrangements for testing and commissioning without any extra cost to Department. The test shall be carried out to the entire satisfaction of Accepting officer.

61.12 **TESTING**

61.12.1 The contractor will be responsible for the arrangement and carrying out of testing. All the equipment, testing material etc will be arranged by the contractor at no extra cost.

61.12.2 During the currency of work and also on completion of work, testing shall be carried out for all items and installation as a whole as per SSR/IS/Manual on Water Supply and Treatment of Min of Wks & Housing to the entire satisfaction of GE and a record shall be maintained, duly signed by the Engineer-in-Charge and the contractor. For testing of pipe lines para 5.4 and Appendix 10 of Manual on Water Supply and Treatment of Min of Wks & Housing shall strictly be followed.

61.12.3 The entire installation shall be run continuously for 72 hours under normal operating conditions and contractor's engineer, fully familiar with the system and equipment, shall be available at the site during this period for proper rectifications of any defects.

61.12.4 Completion shall be issued only after satisfactory testing and commissioning and approval of the same by the GE.

61.13 **RECORD DRAWINGS**

The contractor shall, after successful completion and testing, submit record drawings prepared by Auto Cad software {(2 CDs + 2 soft copies (A2 size))} indicating the complete water supply network and circuitry to facilitate reference and maintenance, as under and as applicable to the scope of work :-

(a) Actual position of pipe lines, valves etc with details.

(b) (i) Position and depth of all cables, sewers, ducts etc which are met as obstructions to the pipe routes.

(ii) Size and type of the pipe.

(iii) Location of the pipe in relation to buildings, roads etc with depth.

(iv) Cross section showing where pipes are laid in culverts or ducts giving their sizes, type and depth.

(v) Location of other pipes which run along with or across the pipe route.

62 **FALSE CEILING**

62.1 False Ceiling shall be provided all as shown on drawings and as per details given in drawing. The workmanship and fixing shall be all as specified in clause 12.19, 12.20 and 12.31 of MES Schedule 2009 Part-I (Specifications).

62.2 Irrespective of whatever is shown on drawings, Fibre cement ceiling boards (E-boards) shall be provided at locations shown on drawings. Fibre ceiling boards 'E-board' manufactured by M/s Everest Ltd as approved by GE of 4mm thick shall be provided on aluminium frame work all as shown on drawing and as specified here in after.

62.3 Fibre cement ceiling boards shall be of uniform thickness, free from warp, cracks and other damages. Ceiling board shall be spray painted with two coats of synthetic enamel paint of

Contd.../-

PARTICULAR SPECIFICATIONS (Contd.../-)

approved shade over a coat of pink primer on exposed surface and other surface shall be applied one coat of pink primer. All other details i.e. fixing of ceiling boards, aluminium frame work etc., shall be all as shown in relevant drawings.

- 62.4 The aluminium section shall be of standard aluminium section manufactured by M/s JINDAL Co/ M/s HINDAL Co/ M/s INDAL Co and shall confirm to IS and shall be got approved from GE before incorporation in work.
- 62.5 False ceiling shall be with aluminum snap grid system irrespective of whatever is shown on drawing. Grid size shall be 600x600mm if not shown on drawing. Size of grid at the edges/perimeter may however vary to suit the geometric shape of the building all as shown on drawing. Size of aluminium main Tee, cross tee, aluminium angle, ceiling cleats and GI wire suspenders to achieve the height(s) of false ceiling shall be as shown in drawing. Aluminium wall angle shall be fixed to the wall using teak wood plugs embedded in wall. Wooden plugs shall be treated with tar as specified.
- 62.6 In case the sizes of various members of false ceiling not shown on drawings the same shall be as per manufacturer's instructions and the false ceiling shall be fixed to ceiling/wall all as directed by Engineer in Charge.

63 UNDERGROUND CABLES:

- 63.1 LT/HT underground cable shall conform to relevant IS specification and shall bear ISI certification mark. It shall be laid as mentioned in clause 19.74 to 19.78, 19.80 to 19.82.2 of MES Schedule. Cable termination and joint kits shall conform to clauses 19.22.1 and 19.22.2 of MES Schedule. Testing of underground cables during and after laying shall be done as per IS code and as mentioned in MES Schedule.
- 63.2 The sand for the purpose of cushioning and cover should be screened fine sand.
- 63.3 The cable covers for covering the cables shall be as described in Schedule 'A'.
- 63.4 The cables shall be snaked at all joints and junction boxes. Snaking shall be measured under respective items of Schedule 'A'. The quantity payable under Sch 'A' items shall be the length of cable laid including the length in snaking.
- 63.5 Where the cables run vertically, they shall be firmly fixed with flat iron clamps as directed by the Engineer-in-charge at one metre center to center along the supports.

64 TYTON RUBBER GASKETS & JOINTING TYTON PIPES

Tyton rubber gaskets shall be made of SBR and conform to IS-5382. Jointing of pipes shall be done strictly as per manufacturer's instructions. The joints surface of each pipe shall be neatly dressed and treated as necessary to make them smooth for accurate jointing. The make of tyton rubber gasket shall be as of pipes/pipe fittings.

64.1 WORKMANSHIP OF STEEL WATER TUBING (GI PIPES).

(a) The contractor shall use proper bends, elbows, tees at turning/corners. Bending of pipes is not permitted except where the pipe has to follow the contour masonry/brick work or where a fitting cannot be inserted. The bends shall be gradual and firm with the written permission of the Engineer-in-Charge.

(b) Width, depth of trenches for GI pipe shall be as per clause 18.50.1 of MES SSR Part-I.

65 ANCHORAGES/THRUST BLOCKS

- 65.1 Thrust blocks of the shape, size and design as directed by GE shall be provided at abrupt changes in direction/gradient. Location of thrust blocks shall be as ordered by GE in writing.
- 65.2 Anchorages for valves/fittings shall be provided as per design/size approved/ordered by GE.

PARTICULAR SPECIFICATIONS (Contd.../-)

66. **PRECAST INTERLOCKING PAVER BLOCKS** Precast concrete Paver blocks shall conform to IS 15658:2006, Specification for Precast concrete blocks for paving. Paver blocks shall be sound and free from cracks or other visual defects. The tolerance on length or breadth of paver blocks shall be +2mm and tolerance on thickness of tiles shall be +3mm. Water absorption shall not be more than 6 percent by mass. Shapes shall be triangular, Zigzag, Hexagon or other shape as indicated. Colour of paver blocks shall be as indicated or as decided by GE.
67. **ROLLING AND COMPACTION:** Rolling shall be done in accordance with clause No 20.A.15B.6.7 of SSR Part-I.
68. **PP-R Pipes** Polypropylene Random Copolymer (PP-R) Pipes and Fitting shall be as per Para 18.114 of SSR Part-I 2009 complete all as specified and directed.

69. STANDBY POWER SUPPLY (DG SET)

(a) The work of DG set under this contract shall be carried out in accordance with Sch- A'/BOQ description, particular specifications and drawing which shall be read in conjunction with the specification, general rules, special conditions and preambles contained in SSR Parts-I&II. Where at variance, the provision in the Schedule- A' shall take precedence over the aforesaid provisions of SSR.

(b) The work to be carried under this schedule comprise of supply, installation, testing and commissioning of diesel engine driven generating set on PCC foundation with anti-vibration pads. Common base plate, instrument panel board, fuel tank with fuel line and accessories manually operated, fuel pump and pipe, starting battery with cable lead, terminals, exhaust pipe, pipe connection with suitable insulation all as specified in Sch- A'

(c) Coupling of diesel engine with alternator should be through authorized original equipment manufacturers.

69.1 SPECIFICATIONS

(A) DIESEL ENGINE Multi cylinder, in-line 4 stroke radiator liquid cooled engine, turbo charged to deliver suitable BHP at 1500RPM under NTP conditions with an overload capacity of 10% for 12hrs of continuous operation with the following accessories.

- (a) Required power: As per OEM
- (b) Cooling: Liquid Cooled.
- (c) Aspiration: Turbocharged, Charge Air Cooled.
- (d) No of cylinders: As per OEM, in-line
- (e) Performance class of Gen Set as per ISO 8528-1.
- (f) Exhaust pipe size: As per OEM
- (g) Well-designed air handling system with, Dry type, replaceable paper element air cleaner with restriction indicator, air to air after cooler, optimised turbocharger for increased altitude capabilities
- (h) Best in class fuel economy with Bosch HPCR fuel system with A1 class electronic governing.
- (j) Dual fuel filter system: Pre filter including water separator and water in fuel (WIF) sensor and main filter.
- (k) Standard integral set-mounted radiator system designed and tested for 50oC ambient temperature.
- (l) Full flow spin on lube oil filter.
- (m) Plate type lube oil cooler. (n) First fill of lube oil and coolant.
- (o) Electrical starter motor with soft start engagement feature.
- (p) Battery charging alternator.
- (q) Starting system 24 V DC electrical, (2 x 12 DC batteries)
- (r) Silencer Hospital grade silencer suitably optimised to meet stringent exhaust air and noise emission standards laid down by MoEF/ CPCB IV+. As per the latest directives regarding reduction in air pollution issued under National Clean Air Program (NCAP), the DG Set shall meet the following smoke emission standards:-
 - i) $\text{NO}_x + \text{HC} \leq 4.0 \text{ (gm/kW hr)}$
 - ii) $\text{CO} \leq 3.5 \text{ (gm/kW hr)}$
 - iii) $\text{PM} \leq 0.2 \text{ (gm/kW hr)}$

PARTICULAR SPECIFICATIONS (Contd.../-)

- iv) Smoke limit ≤ 0.7 (m-1)
(Light Absorption Coefficient)

- (s) Mounting Arrangement Engine and alternator are mounted on a common MS fabricated base frame with AVM pads, Base frame with integral fuel tank is provided with drain plug, air vent, inlet and outlet connection, level indicator and provision for cleaning all as recommended by the OEM and directed by Engineer-in-Charge.
- (t) Shut off coil protection with safety for LLOP/HWT.
- (u) Stainless steel exhaust flexible bellows.
- (v) Exhaust piping made out of STIC 'C' class MS pipe inclusive of all accessories and hardware, necessary support as per manufacture's recommendations to sustain back pressure with rain cap.
- (w) Mineral insulation 2" thick covered with aluminium sheet of 30 gauges for the entire length of exhaust pipe.
- (x) Interconnecting copper cabling of adequate capacity between batteries and controller
- (y) Fuel Tank Built in diesel storage tank of capacity as per OEM specifications

(B) ALTERNATOR Designed / approved capacityd at 0.8 PF lagging, 415volts, 3 Phase, 4 wire system, 50Hz suitable for operation at 1500RPM self-excited and self-regulated through AVR brushless excitation band of voltage $\pm 1.0\%$ Voltage regulation (max) in static conditions- IP: 23 protection with insulation class H, IP-23 protection self-ventilated and suitable for above mentioned diesel engine complete all as per Alternator frame. Model No: as per OEM and Make: Stamford (CGT) / Kirloskar Green / Kirloskar Electric / Crompton Greaves.

- (a) Brushless type, screen protected, revolving field, self-excited alternator conforming to IS/IEC 60034-1
- (b) Better motor starting capability
- (c) Best in class efficiency
- (d) Compact design with sealed bearings for longer life and lesser maintenance
- (e) Impregnation on all wound components for better mechanical strength.

(C) ACOUSTIC ENCLOSURE Factory made acoustic enclosure (canopy) having size suitable for 250 kVA DG set as per OEM specifications.

- (i) This shall be specially designed to meet stringent MoEF/CPCB IV+ norms of 75dBA @1m at 75% load under free field conditions.
- (ii) The acoustic enclosure is made of CRCA sheets in munsel green shade and a structural/sheet metal base frame painted in black.
- (iii) High quality noise absorbent and fire-retardant grade acoustic insulation material (PU Foam) complying to IS 8183.
- (iv) Air inter-louvers specially designed to operate at rated load.
- (v) Two-point lifting for easy handling at customer site.
- (vi) Designed to have optimum serviceability.
- (vii) Made on special purpose CNC machines for consistency in quality and workmanship.
- (viii) 11 tank pre-treatment process and UV resistant powder coating of all parts to withstand extreme environment.
- (ix) Use of special hardware for longer life.
- (x) Flush styling - no projection.
- (xi) Fluid drains for lube oil and fuel.
- (xii) Fuel filling arrangement inside the enclosure.

(D) Control Panel Control panel is manufactured with 2 mm thick CRCA sheet and is powder coated for weather-proof and long-lasting finish, the control panel consists of the following parts:

- (i) Aluminium bus bars with 1500 Amps capacity with incoming/outgoing terminals.
- (ii) Indicating lamps for 'Load ON' and 'Set Running'.
- (iii) Instrument fuses duly wired and ferruled
- (iv) MCCB of 1000 Amps, 415 Volts, 50 kA rating with overload and short circuit protections.
- (v) Intuitive operator interface which includes LED backlit LCD display with tactile feel soft-switches and generator set status LED lamps.

Power command 1.1 with following features

- (vi) The power command control system is a microprocessor-based gen set monitoring.
- (vii) Digital AVR for shunt or PMG excitation with torque matching.
- (viii) Digital electronic governing with temperature compensation and smart starting.

PARTICULAR SPECIFICATIONS (Contd.../-)

- (ix) SAE J1939 interface to Full Authority Electronic (FAE) engines.
- (x) Remote start -stop.
- (xi) Engine metering: Oil pressure, coolant temperature, Battery voltage, Engine speed.
- (xii) AC Alternator metering: L-L voltage and L-N voltage, Current (1 and 3 phase), Volt- Amperes (phases and total) and Frequency
- (xiii) Engine protection: Low lube oil pressure, High/low coolant temperature, over speed, battery over/under/weak volts, fail to crank/start, sensor failure.
- (xiv) AC alternator protection: Over/under voltage, over/under frequency, over current, short circuit and loss of AC sensing.
- (xv) Data logging: Engine hours, control hours, Engine starts and upto 10 recent fault codes.
- (xvi) Configurable glow plug control.
- (xvii) Configurable cycle cranking.
- (xviii) 12 and 24 volt DC operation.
- (xix) Sleep mode
- (xx) Programmable I/Os (4 inputs and 2 outputs), expandable with AUX101/ 102 modules.
- (xxi) Modbus interface (RS485 RTU).
- (xxii) In power compatible (PC based service tool)

(E) Automatic Main Failure (AMF) control panel The AMF Panel shall be one of the following Make: OEM / Gen Set Assembler Powerica / Goyel / Neptune / L&T / Kala Gen Set Pvt Ltd.

Indoor type, factory fabricated cubical type, freestanding, floor mounted, AMF control panel, provided with removable rear panel and hinged front panel for easy accessibility, fabricated out of not less than 2.0mm thick CRCA Sheet including of powder coated paint and comprising of:

- (i) AMF control circuit with 4 pole MCCB 1000 Amps, micro-processor based with thermal and magnetic release setting 40% to 100% rupturing capacity 50 kA-02Nos, Make: L&T / Siemens / Legrand 2Nos. each one for commercial and DG set incoming supply with HRC back up fuse complete with all DC control relays/line voltage monitor (LVM) as per OEM specifications incorporating engine start, stop, three attempt starting facility and failure to start etc.
- (ii) Digital ammeter (0-1000 Amps) and voltmeter (0-500Volts) with selector switch
- (iii) Digital frequency meter.
- (iv) Digital power factor meter (-1.0 to +1.0).
- (v) Indicating lamps for supply "ON" and Load "ON ".
- (vi) Instrument fuses (HRC type)
- (vii) Push button 01No each for start, stop & reset
- (viii) Copper busbar of capacity 400amps for phases and neutral
- (ix) Bottom gland plate including glands for incoming and outgoing LT cables
- (x) Circuit diagram plate
- (xi) Automatic battery charging unit including facility for overcharging stop /trickle charging /boost charging 12volt complete with DC ammeter, DC voltmeter, Charging set selector switch,
- (xii) Facility for remote / auto start, auto/manual synchronizing, audio-visual announcing system and indication lamps for engine faults.

69.2 ACCESSORIES

- (a) FUEL TANK
 - (i) Fuel level indicator to indicate level of diesel in the tank.
 - (ii) Drain pipe with 2m piping
 - (iii) Fuel pipe for inlet, out let with connections.
 - (iv) Fuel strainer
 - (v) Air vent
 - (vi) Angle iron floor mounting bracket including minor civil works
- (b) MOTOR DRIVEN PUMP Motor driven fuel pump for filling diesel in the tank of adequate capacity with inlet connection to the tank. (Motor driven pump size and duty shall be intimated by tenderer in his offer)
- (c) BATTERIES: Starting batteries heavy duty set of 2 Nos of 12 Volts 180 AH of EXIDE / AMRON make connected to the system fully charged and ready for use. All batteries shall be supplied with leads and terminals.
- (d) BASE PLATE: Shall be MS structural channel fabricated base plate of rigidly welded construction duly ribbed suitable for receiving engine, alternator alongwith flexible coupling. It shall include foundation bolts, washers, nuts anti-vibration pads, drip tray and protective guards for coupling.

69.3 FOUNDATION Generating set shall be installed in accordance with latest engineering practice and adequately designed, vibration-proof. The tenderer shall submit details and drawings of PCC foundation immediately after acceptance of tender for approval of Engineer-in-charge. Necessary anti-vibration rubber device of adequate size and standard shall be provided.

Notes:

- (i) Voltage variation permissible is 415Volts + 2.5%

PARTICULAR SPECIFICATIONS (Contd.../-)

- (ii) The alternator shall be self-excited and self-regulated.
- (iii) Frequency variation permissible is 50Hz + 1%
- (iv) Generator set shall be provided with radio interference suppressor and surge arrestor.
- (v) Diesel, engine oil, grease etc required for commissioning and testing shall be supplied by the contractor at his own cost.
- (vi) Fuel tank- (service tank) MS tank of 8hours full load diesel storage capacity shall be mounted with feed line to the engine including all supports, foundation etc.
- (vii) Exhaust piping with silencer shall be provided with asbestos rope insulation of appropriate size and the insulation extended upto 30cm away to the external face of the wall.

69.4 Scope of work shall also include for submission of list of spares and tools required for normal maintenance and repair of generating set, fast moving spares for normal maintenance of the set for a period of two years as recommended by the manufacturers. The tenderer is specifically required to note that the unit rate quoted shall not include the cost of these spares and tools.

69.5 The tenderer shall include in his quoted rate for all the connected work which are required in the installation of generating set, viz. providing suitable opening on wall, wiring and other incidental works which are essential for the entire completion of the work

69.6 Diesel engine for generating set shall conform to BS-5514, IS-10002 and shall be of make as mentioned in Sch- A'. The engine shall be 4 stroke vertical and stationery design, water cooled and shall develop request at 1500RPM at NTP condition to drive alternator capacity as per schedule of 415 Volts 3 phase 4 wire. The diesel engine shall be rated for continuous operation and shall be able to operate 10% over load for a period of 12 hours operation reliability.

69.7 ALTERNATOR

Under normal condition the voltage regulation will be + 2.5% of rated voltage + 2.5% and that of frequency regulation with in alternator of suitable capacity to give 50HZ 3 phase,4 wire output of capacity as per schedule, 0.8 PF lagging 415Volts supply at 1500RPM. It shall be of make as specified in Sch- A'. The alternator shall be self-excited and self-regulated with automatic voltage regulation within +1% and the alternator will have Class H', IP-23 insulation. The alternator shall be screen protected drip proof and single shaft extension type with damper winding in pole faces and self-ventilated. The alternator shall be supplied with standard accessories and shall be fixed in common base plate/frame with nut, bolt and shall be coupled with diesel engine through flexible coupling. The cost of set shall include the cost of foundation bolts, nuts etc.

69.8 AMF CONTROL PANEL The AMF (Automatic on Mains Failure) panel shall be factory fabricated cubical type free standing floor mounted, provided with removable rear panels & hinged front panels for easy accessibility, fabricated out of not less than 2mm thick CRCA sheet duly painted as mentioned in Sch- A'. The AMF control panel shall comprise of all the accessories mentioned in Sch- A'. The Contractor will submit test certificate obtained from the manufacture before commissioning.

69.9 ACOUSTIC ENCLOSURE (CANOPY)

- (a) The acoustic enclosure (canopy) shall be suitable to reduce noise level to 75dB measured at 1.0m distance for audible frequencies as approved from ARAI for emission compliance as per the Central Pollution Control Board norms and manufacturer's specification.
- (b) Features The construction and design of the acoustic enclosure shall be very rugged durable and virtually maintenance free. All materials used for acoustic treatment will be fire resistant/fire retardant grade. For effective sealing necessary gasket material will be provided. The sheet steel treatment will consist of de-rusting followed by two zinc coats of synthetic enamel paint in the shade approved by the GE.
- (c) Performance Noise level from the outer surface of the enclosure, when measured at a distance of 1.0m will be maintained at not more than 75dB (A) under free field condition.

- 69.10** (a) The type of POL (Diesel, Engine oil, Grease) etc. to be used for running the set as per manufacturer's instructions shall be indicated with consumption per unit time.
- (b) The POL (Diesel, Engine oil, Grease) etc. required for the commissioning, testing shall be supplied by the Contractor at his own cost. The unit rate quoted in Sch- A' shall be deemed to include this aspect.
- (c) The contractor shall ensure that the complete equipment to produce the least noise level. For this purpose, the contractor shall provide all necessary insulator arrangement, vibration proofing and such other arrangement required to reduce the noise level.

69.11 PERFORMANCES

- (a) The entire plant shall be guaranteed for two years from the date of taking over the plant. The installation shall be taken over after the system has been commissioned and the Accepting Officer or his authorized representative is satisfied of tests specified hereinafter.
- (b) The test shall be carried out by the Accepting Officer or his representative in the presence of the contractor in accordance with IE rules and regulations.IS-732 and the test results.
- (c) The tests shall comprise of the following:

PARTICULAR SPECIFICATIONS (Contd.../-)

- (i) Trial test
- (ii) Generating set shall run for no load, full load and overload (10%) test
- (iii) Regulation test shall be carried out in accordance with BS-649-1958.
- (iv) The generating set shall run for total 12hours for conducting above test and the performances of the plant as a whole shall be recorded in test sheet
- (v) Efficiency test
- (vi) IR and earth test of cable, generator

(d) If the performance or the test result of the test of the test as detailed above are not found satisfactory, the Contractor shall, on his own cost shall rectify/replace the defective installation or part thereof as directed by the Accepting Officer or his representative before the installation is taken over. The decision of the Accepting Officer in this regard shall be final and binding in this regard. The test results shall be recorded in triplicate and signed by both the parties.

(e) The Contractor shall submit the following after completion of work:

- (i) Complete literature in English/catalogue giving technical information of components/parts of equipment offered by him.
- (ii) Complete literature on maintenance and operation and installation of generating set-6 sets.
- (iii) Spare part catalogue
- (iv) Maintenance chart of the installation duly framed with glass-1 set (v) Shock treatment chart (in English & Vernacular) framed with glass-1 set

(f) Artificial water load shall be arranged by the Contractor at his own cost for full load and overload test. The Contractor shall arrange a decibel meter to measure sound level during test.

(g) Rubber matting of full length of LT panel shall be provided by the contractor and rate quoted for the LT panel board is deemed to be inclusive of the cost of rubber matting.

69.12 The Contractor shall submit a copy type Approval certificate for generator set from the authorized dealer / manufacturer from one of the following five agencies:

- [a] Automotive Research Association of India (Pune)
- [b] National Physical Laboratory (New Delhi)
- [c] Naval Science and Technology Laboratory (Mumbai)
- [d] Fluid Control Research Institute (Palghat)
- [e] National Aerospace Laboratory (Bangalore)

69.13 SYNCHRONIZATION OF DG SET

250 kVA DG shall have a unified synchronizing panel with adequate relays, safeties, interlocks to run in isolation or in synchronization mode in case of requirement (i.e. when firefighting pump are required to be tested / operated)

70. TRANSFORMER

70.1 These shall be as mentioned in Schedule „A“ and as specified in clause 19.14 and 19.97 of MES SSR Part-I and shall be of IS-1180 marked . Transformer fittings and accessories shall conform to IS-39 and transformer oil shall be IS-285 marked, except as modified hereinafter.

70.2 The transformer shall have continuous maximum rating as specified in Schedule „A“ at the specified normal pressure, ratio frequency and temperature rise.

70.3 The transformer shall be AC, 3 phase, 50 Hz, oil immersed, naturally cooled with external cooling tubes (ONAN type), core type, suitable for indoor/outdoor installation as specified in Schedule „A“ and shall be insulated with high class materials with high dielectric strength and slow ageing characteristics, able to withstand the impulse voltage as laid down in IS. The winding shall be of double copper wound.

70.4 The insulation and magnetic induction shall be suitable for operating the transformer continuously at a voltage 10% more than that specified in Schedule „A“. The windings of transformer shall be fully insulated.

70.5 The transformer shall be provided with hand operated „off-load“ tap change on HV side for constant KVA output so as to alter secondary voltage of the transformer in five stages viz (±) 7.5% and each satge in 2.5%. The off load tap changing gear shall be suitable for external operation without removing the transformer cover or lowering the

PARTICULAR SPECIFICATIONS (Contd.../-)

oil level and shall be complete with locking arrangements.

70.6 The transformer tank shall be sufficiently strong to allow transformer complete with tank and oil, to be transported by rail, road, jacked or lifted without causing deformation and leakage and shall be provided with external cooling tubes/radiators. Case shall be taken to ensure that the joints between tubes and body of the tank are oil tight. The transformer shall be provided with four solid cast steel detachable rollers from its point of installation. Transformer shall be provided with approved arrangement of lugs suitable for lifting the transformer when necessary.

70.7 The transformer tank cover shall be designed so as to prevent collection of moisture on any part. The tank cover shall also be fitted with thermometer pockets.

70.8 The transformer shall be provided with an explosion vent fitted with diaphragm of standard material at the tank as well as the free end and shall be connected directly to main tank top and designed for certain and rapid release of any excessive pressure in the tank due to internal fault that may be generated in the transformer or in the cooling equipment. The pipe should be fitted with a wire net at the free end to prevent any dirt or insect entry.

70.9 All valves shall be of standard type and make. Means should be provided to lock the valve. Every valve shall be provided with an indicator to show clearly purpose of the valve and direction of rotation for/to „OPEN“ or „CLOSE“.

70.10 The transformer shall be fitted with disconnection chamber complete with HT/LT cable boxes and their bushing disconnecting chamber bushing for indoor transformer and in case of outdoor transformer the HT side shall have bushings (and not cable box), jumpers etc so that if the transformer becomes faulty, it can be taken out without opening the connections from cable boxes and healthy transformer replaced and connected in minimum possible time. The tenderer shall submit constructional details of disconnecting chamber proposed by him.

70.11 The transformer shall be fitted with conservator with a filling cap, sump and suitable means of drawing oil.

70.12 The dehydrating breather shall be fitted to each conservator vessel and shall be complete with first fill of dehydrating agent.

70.13 All steel work of transformer, not immersed under oil, shall be painted with a coat of anticorrosive paint. The transformer shall be painted with a weather and heat resistant paint of composition and tint as approved by the GE.

70.14 Earthing terminals shall be provided on the tank cover and on the tank for earthing purposes and shall be suitable for connections to the earthing strip of GI of 50 x 6 mm thick sections.

70.15 An oil gauge shall be provided for indicating clearly, to an observer standing on ground for indoor transformers and on the platform in case of pole mounted transformers, the oil level in the conservator tank. A tap shall be fitted with oil gauge for the purpose of drawing out quantity of oil for sampling.

70.16 The unit rate inserted in Schedule „A“/BOQ shall be deemed to include for the cost of jointing of cable box, including cable end joints, provision of all materials, cable box etc. The transformer shall be deemed to have undergone satisfactory tests as prescribed in IS. A test report shall be submitted, in original to the EIC before incorporating the transformer in the work. The cost of connecting the transformers of HT side and LT side as well as connecting the existing earthing is deemed to be included in the unit rate of transformer.

70.17 The cost of first fill of transformer oil shall be deemed to be included in the rate

PARTICULAR SPECIFICATIONS (Contd.../-)

inserted in Schedule „A“ for transformers. This oil shall have a dielectric strength not less than 40KV at 2.5mm gap.

70.18 The tenderer shall submit complete technical details and specifications alongwith make and illustrated pamphlet and test report of transformer to the GE for obtaining his approval of the make prior to incorporation in the work.

70.19 The transformer shall be inspected by the officer nominated by the Accepting Officer before dispatch of the transformer and allied equipments at the Factory Premises. The tenderer shall ensure that the following tests are conducted in factory premises in the presence of the nominated officer:-

- (a) Heat Run test/temperature rise test.
- (b) Impulse test.
- (c) All routine test.
- (d) Magnetization current test.

70.20 All the above test shall be carried out as per relevant IS and test certificate shall be submitted on completion of the test to the testing officer as well as to the Garrison Engineer.

70.21 The transformer shall be subject to the following pre commissioning test before commissioning. The tests shall be carried out in the presence of senior Electrical Inspectors to be nominated by department before issue of completion certificate.

- (a) Insulation resistance test.
- (b) Ratio test.
- (c) Measurement of magnetizing current.
- (d) Core balance test.
- (e) Measurement of winding resistance

70.22 For testing of the dielectric strength of insulating oil in oil immersed equipment test samples of liquid shall be drawn from equipment after filling. In case oil is supplied in separate containers for filling or topping up at the site a test also shall be made with samples drawn from such oil container before the equipment filled.

70.23 Minimum acceptable values for each test will be indicated by the Engineer-in Charge. However, dielectric strength of oil should be above 60 KV (RMS) as per IS-335.

70.24 While measuring the dielectric strength of the oil in the transformers if tests indicate the presence of undue amount of moistures, the insulation oil shall be filtered by streamline filter. No extra charges shall be paid for filtration and the contractor shall arrange his own filtration machine oil testing kit and other accessories.

70.25 Insulation, resistance shall be measured from primary and secondary to ground and between primary and secondary.

70.26 Pre-commission test for transformer shall be carried out by Senior Electrical inspector/Electrical Inspector. Tenderers to note that all the necessary arrangements shall be made by the Contractor and cost thereof shall be borne by the contractor without any extra cost to the Govt.

70.27 PROFORMA FOR TRANSFROMER TEST

Transformer rating:-

- (a) Insulation resistance test with megger.
- (b) Between primary to earth with 2500/5000 V megger.
- (c) Between secondary to earth with 1000 V megger.
- (d) Between primary & secondary with 2500/5000 V megger.
- (e) Dielectric strength of oil in the transformer (test voltage 40 KV for 1 minute for a gap to 2.5 gap).

PARTICULAR SPECIFICATIONS (Contd.../-)

- (f) Operation of the tap switch: - This should be off load tap changing unit to vary the voltage $\pm 7.5\%$ with steps of $\pm 2.5\%$.
- (g) Condition of silica gel crystals.
- (h) Earth resistance.

70.28 GUARANTEE

The transformer shall be guaranteed for trouble free operation for a period of 24 months from the date of commissioning. Any defects discovered during this period shall be rectified free of cost by contractor.

71 CENTRAL AC PLANT

71.1 Design, Supply, Installation, Testing & Commissioning of AHRI certified 3 star rated (ISEER not less than 3.9) air Cooled scroll type Chilled water Central AC Plant of suitable capacity but minimum 4 x 35 TR (2 working, 2 standby) complete of Blue Star/ Carrier/ Trane including the following to maintain inside conditions for year round at inside design condition DBT $23 \pm 2^{\circ}\text{C}$ and RH (60 ± 5) % with 2 air changes per hour as per floor plan suitable for climatic conditions of Andaman Nicobar Island. The units shall be air cooled, factory fabricated and factory assembled and shall be capable maintain the given temperature & RH complete.

71.1.1: Design, supply, installation, testing and commissioning of chilled water monoblock type centrifugal pump, capable of suitable LPS discharge suitable head, having cast iron casing, enclosed type dynamically balanced bronze impeller, SS shaft, mechanical seal, deep groove ball bearings, etc. with TEFC squirrel cage induction motor having class 'F' insulation complete all as specified and as directed (2 working 2 standby)

71.1.2: Design, Supply and fixing of Chilled water piping with MS, Heavy Grade(class C) ERW pipes of suitable diameter, including all weldable fittings for butterfly valves, NRVs & 'Y' strainers interconnection between chiller, chilled water pumps with AHUs and cooling coil units. Chilled water piping shall be insulated with 25mm thick nitrile insulation of suitable size covered with Aluminium foil including necessary supporting structure complete all as specified.

Design, Supply and fixing of Chilled water piping with MS, Heavy Grade(class C) ERW pipes of suitable diameter, including all weldable fittings for butterfly valves, NRVs & 'Y' strainers interconnection between chiller, chilled water pumps with AHUs and cooling coil units. Chilled water piping shall be insulated with 25mm thick nitrile insulation of suitable size covered with Aluminium foil including necessary supporting structure complete all as specified

71.1.3Supply and fixing of Butterfly valve, NRV, Y Strainer, Balancing valve of suitable size

PARTICULAR SPECIFICATIONS (Contd.../-)

71.1.3.6 Supply and fixing of Three way Mixing valve of suitable size with motorised actuator and modulating control for AHU including control wiring of suitable minimum size as per OEM.

71.1.3.7 Supply and fixing of Auto air vent of suitable size.

71.1.3.8 Design, supply, install, MS/ HDPE pressurized Expansion tank of suitable size duly insulated with 25 mm thick nitrile insulation and covered with 26 G al sheet.

71.1.3.9 Supply and fixing of Pressure gauge of 100mm dia.

71.1.3.10 Supply and fixing of Stem type thermometer (Brass)

71.1.3.11 Supply and fixing of Water flow switch

71.1.3.12 Dehumidification system: Design, Supply, installation and commissioning of electrical with sufficient strip heaters or duct heaters with control cable and controls/sensors for ensuring dehumidification system with duct type heaters or pan type dehumidifiers

71.1.3.13: Air Handling Unit: Design, Supply, installation, testing and commissioning of double-skin type horizontal, floor-mounted, top discharge air handling units – 02 Nos along with one no ceiling suspended type AHUs/FCU as per site requirement and capacity not less than 30,400 CFM (Qty/capacity as per OEM design) air in total at 80mm W.G. static pressure using gaskets and self-adhesive tapes and 0.6 mm thick pre-coated outer skin and 0.6 mm thick GI inner skin, 25±2 mm thick double skin panel with pressure injected CFC & HCFC free PUF having 'k' value of 0.02 W/°C/m & density 40 kg/m³, AMCA certified energy efficient plug fans with backward curved impeller, having pre filter section of 50 mm thick combination of 8 rows deep chilled water coils with anti-corrosion aluminium fins, suitable high efficiency (IE3) TEFC squirrel cage induction motor with VFD and marine lamp, limit switch, SS-304 drain pan, vibration isolators/rubber pads inspection windows / doors complete all as specified

71.1.3.14The AHU shall comprise of the following:

[a] Suitable DIDW backward curved plug fan, dynamically balanced, with AMCA certified blower.

[b] Foot mounted (B3 construction) 3-Phase squirrel cage induction motor 415 V ± 10%, 50 Hz ± 5 %, combined variation ±10%, insulation class F with VFD.

[c] Flexible connection made with airtight ASTM E84 (Class I) polyester fire retardant cloth riveted on periphery of cloth with extruded aluminium 'L' angle flange as per fan minimum size at discharge duct/plenum

[d] A wetted type or viscous type & Washable type of 'EU4' filter (pre-filter, efficiency 90% down to 10 micron)

PARTICULAR SPECIFICATIONS (Contd.../-)

[e] 8 rows deep chilled water cooling coil with 0.15 mm thick anti corrosive aluminium fins and 0.36 mm diameter copper tubes tested on 21 kg/cm², with SS sandwiched drain tray, etc

[f] Condensate drain pan fabricated from 18 gauge SS 304, powder coated and insulated with elastomeric insulation of suitable thickness.

71.1.3.15 Design, Supply, installation, testing and commissioning of fire damper, at least of 90 minutes fire-rating, spring activated on melting of fusible link having melting point 67.13° C complete with smoke detector / thermistor, fusible link etc. and actuator as required for operation, located in the SA / RA ducts, at all fire rated crossovers (shafts, walls, etc.). along with control panel (located in such a way that the reset can easily be done), interlocked with the building management system for the fire detection or HVAC to trip / close in the event of fire/smoke in the respective zone and tested as per ULL- 555 and certified by CBRI complete all as specified and as directed. The fire dampers shall meet the following criteria:

[a] Bare fire dampers with suitable size sleeve.

[b] Control panel actuator, including electrical spring type actuator, remote indication of the fire damper position.

[c] Interconnection wire for the fire detection & alarm system with the AHU and the smoke dampers.

[d] Sealing any openings around the sleeve of the fire dampers with approved fire sealant as per the specification. Motorized, spring return type, combination fire and smoke damper Control panel actuator, including electrical spring type actuator, remote indication of the fire damper position.

71.1.3.16 Design, Supply, installation, balancing and commissioning of site fabricated galvanized steel sheet metal (G.S.S.) rectangular ducting of following sheet thickness having zinc coating of 120 g/m² total on both sides and complete with neoprene rubber gaskets, elbows, splitter dampers, vanes, volume control dampers, hangers, supports, etc. as per approved drawings and conforming to the latest edition of IS 655: 2006 & HVAC Duct Construction Standards - Metal and Flexible of SMACNA along with required scaffolding work to install the ducts at site complete of minimum sizes 24 Gauge/ 22 Gauge all as specified. Design, S & F of aluminium powder coated supply grills with aluminium volume control dampers complete all as specified Design, S & F of aluminium powder coated return grills without aluminium volume control dampers complete all as specified.

71.1.3.17 Design, S & F thermal insulation of duct with 19 mm thick aluminium foil faced nitrile sheet insulation complete all as specified

71.1.3.18 Design, Providing and applying of acoustic insulation for air ducts with 10 mm thick open cell nitrile class 'O' complete all as specified

PARTICULAR SPECIFICATIONS (Contd.../-)

DESIGN DATA SHEET

Name of Room and Usage: PARKING SPL VEHICLE

1	Dry Bulb Temperature	24°C + 2° C
2	Relative Humidity	50 % to 60%
3	Occupancy (State Max & min Figures)	38 Persons
4	Electrical lights/Equipment load	5 KW
5	If recirculation is permitted, No of air charges per hour to be specified	2 Air charges/hr
6	Production of Gas odour	NIL
7	Acceptance of noise Level	70 +5 DB
8	Working Hours	24 Hrs
9	Size of dust particulars permissible inside	10 microns
10	Whether winter Heating and Humidification	No
11	Whether any explosive dust is floating in the air and/or obnoxious /toxic/explosive / Inflammable / hazardous gases /vapours are generated inside? Whether there is any special requirement of taking out exhaust air.	NO

71.3 Design, Supply, installation, commissioning and testing of factory made, CPRI type tested, outdoor, cubical compartmental type "HVAC Panel" of suitable minimum size, having both sides openable with hinged & locking arrangement and made out of 2mm thick mild steel CRCA sheet, supported and fixed on structural frame of angle iron of suitable minimum size, including earthing stud, labeling, painting to all internal & external exposed steel surfaces with powder coating paint (7 tank process), duly fixed in ground with with danger notice plate of 1.6 mm thick mild steel sheet, vitreous enameled (white) with letters figures and conventional skull and bones in signal red colour, suitable for 3- Phase 4 Wire system, 500 V grade with necessary wiring, PVC sheathed stranded copper conductor of appropriate length & minimum size, including fixing lugs, bolts, screws with all connected switch gears ,starters,control wiring etc,and complete all as specified.

71.4 SUB CONTROL PANEL FOR AHUs:

Design, Supply, installation, commissioning and testing of factory made, CPRI type tested, outdoor, cubical compartmental type "Sub control Panel" of suitable minimum size, having both sides openable with hinged & locking arrangement made out of 2mm thick mild steel CRCA sheet, supported and fixed on structural frame of angle iron of suitable minimum size, including earthing stud, labeling, painting to all internal & external exposed steel surfaces with powder coating paint (7 tank process), with danger notice plate of 1.6 mm thick mild steel sheet, vitreous enameled (white) with letters figures and conventional skull and bones in signal red colour, suitable for 3- Phase 4 Wire system, 500 V grade with necessary wiring, PVC sheathed stranded copper conductor of appropriate length & minimum size, including fixing lugs, bolts, screws with all connected switch gears ,starters,control wiring etc,and complete all as specified and as directed.

71.5 Design, Supply, Installation, testing and commissioning of 40mm dia UPVC pressure rating 10 kgf/cm2 (IS No- 4985) complete with fittings, supports complete as per specifications and as directed. (any length as per site requirement).

71.6 Supply & fixing of MS ODU stands complete all as specified and directed.

PARTICULAR SPECIFICATIONS (Contd.../-)

71.7 Environmental friendly Refrigerant shall be factory charged topping up if required during commissioning

71.8 Sluice valves, NRV, Strainers shall be of PN 1.6 rated of suitable size as per design.

71.9 Supply and fixing of Three way Mixing valve size as per coil capacity /piping design with motorised actuator and modulating control for AHU including control wiring of suitable size as per OEM.

Make of valve:- Rapid control/ Honeywell/ Belimo/Siemens

71.10 Structural steel for duct supports, panel, AHU etc complete as per OEM design.

71.11 The quoted rate shall deemed to include the cost of designing the AC plant including heat load calculations, duct design, diffusers, refrigerant piping, controls etc complete as per ISHRAE/ASHRAE standards as per site conditions. Duly completed design drawings with specifications shall be got approved from any IIT/NIT and shall be submitted to Accepting Officer for final approval before execution of work. The quoted rate inclusive of all equipments, controls wiring, switchgears, ducts, complete refrigerant piping, make up water tank piping etc complete as specified and mentioned above with quantity as required at site and any other materials required for making the AC plant fully functional to satisfaction of Department. Quoted rate shall deemed to include the cost of **24 Hrs Phase-I testing** and **72 Hrs phase-II testing** during **Summer and monsoon season** complete through Sr IEM/any testing Officer nominated by HQ CE (A&N) Zone through Accepting Officer. Provisional completion will be issued after completion of phase-I testing and an approx amount of 10% quoted rate will be kept reserve for phase-II testing. Final Completion and Final Bill shall be processed after successful completion of Phase-II testing. The quoted rate shall deemed to include the cost of all necessary foundations, structural steel for supporting of ducts, control wiring, control panel with switchgears, making good of disturbed surfaces such as flooring with tiles & mat, false ceiling etc complete.

The quoted rate inclusive of comprehensive maintenance of AC plant during defect liability period and the contractor shall depute service engineer along with staff for preventive maintenance for minimum once in three months in addition to breakdown call complete and contractor shall keep one set of spares for emergency maintenance in order to avoid any breakdown of plant and ensuring 24x7 running of AC plant

71.12 PIPE VALVES FITTINGS AND ACCESSORIES

71.12.1 All drain pipes from the drain connections on the plant room and other areas shall be provided.

71.13 REFRIGERANT PIPING AND ACCESSORIES:

71.13.1. The refrigerant circuit shall be factory sealed within the chiller unit, No site refrigerant piping required

71.14 PIPE INSTALLATION

71.14.1 The details of pipe sizes and lengths shall be furnished by the tenderer in his offer and got approved subsequently by the GE. The layout and alignment of the pipe lines shall be such that the pipes and valves shall not foul or interfere with any of the equipments, buildings or other facilities during operation and maintenance. It is the responsibility of the successful tenderer to prepare the layout and alignment of pipe lines and check for any interference with equipments, buildings or other facilities at site and shall furnish detailed working drawings of piping showing the cross sections, longitudinal sections, details of fittings locations of isolating, air valves etc. before installation of the piping, the piping shall be properly supported or suspended from stands, clamps, hangers, brackets, sidewalls etc. of approved design. All steel works additional to the building steel work necessary to support the pipe work including platforms and galleries/ladders etc. to give access to the pipe work shall be

PARTICULAR SPECIFICATIONS (Contd.../-)

provided. These shall be of structural steel conforming to IS-226. In locations where the pipes and clamps are of dissimilar material suitable gasket shall be used in between. The pipe hanger shall be fixed in wall/roof by means of grouting angle iron holdfasts.

71.15 DUCTS:-

71.15.1 All ducts shall be made of galvanized iron and shall conform to IS 655. The duct shall be compact simple design and air tight to minimum air losses. The GSS Sheets for duct work shall conform to class –VIII with zinc coating of 120 gm/sq mtr as per ISS-277. The ducts shall be of adequate capacity, reduce velocity of air and also to minimize the noise level to be compatible with human comfort. Frames and dampers for ducts shall be provided of rigid construction and properly based. The duct shall have adequate self-extinguishing insulation when these are run outside the conditioned rooms.

71.15.2 Ducts shall be supported on suitable MS section which may be fixed horizontally and cementgrouted on the either side of the wall or supported from the roof.

71.15.3 All ducts shall be adequately insulated with self extinguishing insulation conforming to IS 4671-1968. The contractor shall indicate the description of insulation material provided for and the thickness thereof.

PARTICULAR SPECIFICATIONS (Contd.../-)

71.15.4 RECTANGULAR DUCT

Larger Dimension of duct (mm)	Thickness (mm) GI sheet	Type of transverse Joint connection	Bracing
Upto 600	0.63 (24G)	25x25x3mm on 2.4m centres	Cross
601 to 750	0.63 (24G)	-do-	25x25x3mm, MS angles bracings at 1200mm from joints.
751 to 1000	0.80 (22G)	-do-	-do-
1001 to 1500	0.80 (22G)	40 x 40 x 3mm Angle Connection on 2.4m center	40 x 40 x 3mm MS angles bracings at 1200 mm from joints.
1501 to 2250	1.0 (20G)	40 x 40 x 3mm, Angle connection on 1.0m center	40 x 40 x 3mm, MS angles Bracings at 600mm from joints or 40 x 40 x 3 mm MS angles Diagonal Bracings.
2251 and above	1.25 (18G)	50 x 50mm angle Connection on 1.0m center	50 x 50 x 3mm MS angles Bracings At 600mm From joints or 50 x 50 x 3mm MS angle Diagonal bracings.

71.15.5 Longitudinal and transverse joints shall be flat and smooth inside the duct.

71.15.6 All rectangular ducts shall be flat on face and Pittsburgh type on corner of duct. The interconnecting flanges shall be connected with each other by 10mm galvanized bolts and nuts at about 125mm centers. All the flanges shall be connected to the ducts by rivets at about 125mm centers. The ducts shall be tapped 6mm across the flanges. All the flanged joints shall have 6mm thick neoprene rubber gasket stuck to the flanges with proper adhesive. The holes in the gasket shall be properly made without tearing the gasket.

71.15.7 Wherever duct passes through a wall, all holes in the walls must be made good with grout and the annular holes tightly plugged with fiberglass or similar material.

71.15.8 DUCT SUPPORTS

71.15.8.1 The ducts with larger side greater than 2250mm shall be supported by 15mm GI rods and GSS formed channels while those below 2250mm shall be supported by 10mm GI rods and GSS formed channels. The GI rods shall be hung from correctly sized anchor fasteners fixed to the ceiling slab. The GI rods should be threaded with one end screwed into the anchor fastener and the other end to facilitate fastening of the nuts to hold the GSS formed channel. Lock nuts along with washers should be provided. Welding of bolts to support rods is not permitted. The duct between AHU room and building to be air conditioned shall be mounted over suitably designed steel structure and necessary supports be provided at an interval of 1.00 mtr.

PARTICULAR SPECIFICATIONS (Contd.../-)**71.16. FLEXIBLE CONNECTIONS**

71.16.1 Where the sheet metal duct connects to the intake or discharge of fan units a flexible connection of at least 150mm width shall be provided. The material of the flexible connection shall be fire retardant type and of double layer. The materials shall be attached to angle iron frames on equipment and to similar frames on duct or casing by means of a steel band or collar fitting over the end of the flexible connection and bolted through angle iron frame so as to clamp securely between the band and the angle frame.

71.17 DAMPERS

71.17.1 Duct mounted dampers shall be constructed from Aluminium extrusions with blades assembled on non-ferrous bearings and controlled by fully concealed opposed blade link system. Frames are constructed from high quality extruded sections. Frames are screwed fixed and sealed to eliminate casing leakage. Blades shall be double skin aerofoil sections. Dampers shall incorporate only aluminium and steel alloy components within the air stream and shall be used for control and balancing applications. Dampers shall incorporate blade-to-blade seals to reduce air leakages and shall be used for control or isolation applications. Dampers shall be provided with a blade position indicator and manually operated knob.

71.18 FIRE DAMPERS

71.18.1 Fire dampers shall be made out of galvanized steel sheet blades and frames. The damper shall be fabricated out of 16 G GSS. Dampers shall be equipped with fail safe fusible links rated at 67.13 deg.C. All fire dampers shall be of minimum 1½ hour fire rating.

71.19 GRILLES AND DIFFUSERS

71.19.1 All grilles shall be constructed from aluminium alloy extrusions with welded frames or cleated frames. Vanes shall be individually adjustable.

71.19.2 All diffusers shall be constructed from aluminium alloy extrusions and of removable core type.

71.19.3 All Grills/diffuser dampers shall be opposed blade aluminium construction black anodized.

71.19.4 The Grilles/Diffusers shall be selected to match the interior layout in consultation with the Engineer-in-Charge/AGE(I). The necessary supports/frame work for fixing the Grilles/Diffusers shall be provided by the contractor.

71.20 FRESH AIR INTAKE AND EXHAUSE LOUVERS

71.20.1 All Louvers shall be constructed from aluminium extrusions and shall be factory fabricated. Frames shall be welded and blades screw fixed through the side frames. Louver blades shall be 75mm pitch and shall incorporate a rear rain trap profile for maximum weathering integrity and shall be complete with bird screen.

71.21 PLENUMS

71.21.1 All the plenum chambers or connections to fans, dampers etc., shall be constructed in 18 gauge GSS, supported on 40 x 40 x 6mm MS angle frames. However, cross bracing of the plenum will be similar to the bracing detail of rectangular duct as specified herein before.

71.22 PAINTING

PARTICULAR SPECIFICATIONS (Contd.../-)

- 71.22.1All the support rods for ducting shall be given two coats of synthetic enamel paint over and above one coat of primer paint.
- 71.22.2All support channels and Angle frames shall be given two coats of epoxy paint over one coat of epoxy primer.

71.23. INSULATION:-

71.24 GENERAL

- 71.24.1This specification covers the design, supply, constructional features, application, testing and commissioning at site of thermal and acoustic insulation for air conditioning system.

71.25 DESIGN REQUIREMENTS

- 71.25.1The insulation material shall be new and unused, vermin and rodent proof, and shall be designed to withstand the temperatures to which they may be subjected to under specified conditions.
- 71.25.2Insulation is applied on metal surfaces not seperated. Suitable teakwood reapers should be put in between insulation and support channel for ducting. The thickness & density of the Insulation material shall be generally in accordance with the details given hereunder: -

71.25.3 INSULATION DETAILS

Surface material	Insulation Kg/Cum/mm	Density/Thick
Supply air duct in non conditioned space	Class O cell elastometric nitrile rubber applied with rubber based adhesive	Thickness as per standards
Accoustic Insulation	Arma sound Nitrile rubber	Thickness as per standards

71.25.4 DRAWINGS, CATALOGUES / MANUALS:-

- The tenderer shall furnish in DUPLICATE; the following drawings and data after award of contract within 1 month for approval of Accepting Officer before placing order:-
- 71.25.4.1Drawings showing dimensional layout of equipment in Air conditioning plant proposed layout of equipment in plant room. Dimensional layout of Air Distribution system such as:-
- 71.25.4.1.1Duct size and dimensions with designed supply air velocity and section on air velocity in each section and room.
- 71.25.4.1.2. Location and sizes of supply air outlets and return air outlets.
- 71.25.4.1.3. Supporting details of ducts.
- 71.25.4.1.4. Quantity of air in CFM considered for each room.

PARTICULAR SPECIFICATIONS (Contd.../-)

- 71.25.4.2. Dimensional outline and cross sections of drawings of offered equipment with all accessories showing mounting details, approximate weights and descriptive catalogues of equipment.
- 71.25.4.3. Capacity rating chart of compressors at different suction and condensing temperature and speed.
- 71.25.4.4. Capacity rating charts of cooling coils for the adopted velocity.
- 71.25.4.5. Characteristic curves for the Air Handling Unit Fans.
- 71.25.4.6. Filter rating charts indicating capacity and pressure drop at different face velocities when new and when clogged.
- 71.25.4.7. Illustrative catalogues of the manufacturer's for the equipment offered.
- 71.25.4.8. Refrigerant piping layout with pipe sizes, location number and type all kinds of valves, pressure gauges, strainers and details of pipe insulation, controls as per standard norms and as specified.
- 71.25.4.9. Electrical wiring and control wiring diagram indicating details of all electrical equipments and inter locking system. Cabling iron panels shall be taken on over head MS frame stand up to each equipment at suitable height.
- 71.25.4.10. Detailed dimensioned drawings for foundation of all equipments indicating the equipment loads.
- 71.25.4.11. Any other drawings as and when considered necessary by department shall also be supplied by the tenderer.

71.26 FILTERS:-

- 71.26.1 Dry washable type air filters those are capable of eliminating dust particles of size as specified in Schedule "A" shall be provided.
- 71.26.2 Filters suitable for eliminating dust particles upto size as mentioned in the Schedule and relevant annexure. The filter element shall be fitted in GI casing. The filter casing shall be provided with a flanged reaction for each fitment on the filter drum. The tenderer shall furnish complete characteristic details of the filters and shall also submit the manufacturers test certificate in support..

71.27 THERMOMETERS:-

Wet and dry bulb thermometers of standard make for each air-conditioned room and AHU room shall be provided by the contractor.

71.27.1. CATALOGUES AND LITERATURE:-

The tenderer shall supply the following literature in English:-

- 71.27.1.1. After acceptance of tender:
 - (i) Manufacturer's instruction books on maintenance and operation of the plant.
 - (ii) Spare parts catalogues for each unit of plant.
 - (iii) Psychometric chart.

PARTICULAR SPECIFICATIONS (Contd.../-)**71.28 INSTALLATION OF EQUIPMENT / PLANT:-**

71.28.1 All plant and accessories such as compressors, condensing units, pumps etc., shall be installed in accordance with the latest engineering practice on adequately designed anti-vibration mountings / foundations. The tenderer shall furnish to the Accepting Officer detailed dimensional drawings and specifications of the foundations with necessary design calculations for approval. The foundation shall be as per recommendations of manufacturer.

71.28.2. All electrical equipment & wiring shall be electrically connected to electrical system and adequately earthed in accordance with the latest Indian Electricity Rules by the use of two separate independent earth leads of SWG GI wire to the earth bus. The earth bus and adequate earthing sets as per IE rules shall be provided by the contractor.

71.29. PLUMBING WORKS:

71.29.1 All pipes shall be ISI marked medium grade and fittings shall be authorized iron, medium quality conforming to ISS 1239. The joints shall be made with suitable jointing materials to form a complete watertight system.

71.30 ELECTRICAL WIRING:-

71.30.1 All wiring main/sub main and circuits from the point of supply in the main switch located in the plant room to the air-conditioning units and other auxiliary equipment shall be provided by the tenderer with PVC armored cable 1.1 KV grade conforming to ISS 1554.

71.30.2 The wiring shall conform to IS code of practice IS 732 for Electric wiring installation system voltage not exceeding 650 volts. The panels shall be wired with multi strand copper flexible cable ISI marked and supply extended up to various instruments.

71.30.3 The electric controlling devices and measuring instruments for compressor motor, pump motor and blower motor etc. shall be mounted on cubicle type of panel / panels with distinct sections comprise of necessary main switch fuses. Starters with thermal overload and no volt protection, voltmeter having 0-500 volts range with selector switch to measure the incoming voltage between any two phases and between any phase neutral. Ammeter of adequate range for each motor and other accessories required for the proper control and operation of the entire installation and KWH meter of suitable capacity shall also be provided in the panel board by the tenderer.

71.30.4 Insulating rubber matting suitable for the voltage of the system for the entire length of switch boards but not less than 90 cm in width shall be provided for each switch board and cost deemed to be covered under item No.1 of Schedule "A" Part I.

71.30.5 Complete electrical system shall be inter locked as per standard norms to avoid accidental start of heaters or compressor with out putting on blower and water pumps in circuit.

71.31. DECLARATION OF PERFORMANCE:-

71.31.1. The contractor shall submit curve showing progressively the time taken by the plant to obtain the desired temperature and humidity conditions. Plant shall be so designed that conditions are achieved within one hour of start.

71.31.2. The contractor shall guarantee all items of equipment including electrical machinery and wiring for a period of 24 months after completion of erection and satisfactory seasonal Phase-II tests as detailed in subsequent clauses.

PARTICULAR SPECIFICATIONS (Contd.../-)**71.32. TESTS PHASE I & II:****71.32.1. GENERAL:**

71.32.1.1. The contractor shall make arrangements for providing artificial heat load to compensate for the internal load up to the extent specified in the contract if the equipment load is not arranged by the users. Contractor shall make arrangements for providing the occupancy load, if testing with occupancy load is considered necessary.

71.32.1.2. The testing shall be carried out in the presence of contractor's qualified representative who shall make such connections, adjustments and modifications as considered necessary to ensure that 'PSYCHOMETRIC' conditions continue to be maintained with the tolerance specified for varying values of internal equipment and occupancy loads and outside conditions of temperature and humidity. All arrangements including various instruments required to facilitate testing shall be arranged by contractor.

71.32.1.3. The test results shall be recorded duly signed by accredited representative of contractor and department.

71.33. PHASE I TEST:

The installation shall be taken over after the plant has been commissioned and the GE is satisfied on the points given below, which constitutes phase I test:-

- (a) That the plant equipment and accessories provided are as per contract conditions and specifications.
- (b) That all plants, equipments and accessories are mechanically sound and other related items of air-conditioning work are of adequate structural strength and the installation is in conformity with the specifications embodied in the contract.
- (c) That the finish and the general appearance of the work is as per contract specifications.
- (d) That all ducts, pipes, fittings etc, are of specified size and type, quality design and workmanship and are neatly laid, fixed and painted to match the surrounding work.
- (e) That the design conditions are achieved across the cooling coils for the specified air flow at given ambient condition and inside condition. The initial take over shall be provisional and without prejudice to phase II test.
- (f) The plant shall be run continuously for minimum 24 hours to observe the efficiency, cop, behavior of various systems and capacity of plant achieved.

71.33.1. PHASE II TEST:

71.33.1.1. After completion of Phase-I test, the plant shall be continuously run of a 24 hour basis by contractor till completion of all the Phase-II tests. **Contractor shall deploy adequate technical staff to operate the plant continuously till completion of all the Phase-II tests and he shall be liable to carry out all the maint required during this period and quoted rates shall be deemed to cater.** The Phase II test will be carried out by the Accepting Officer or his authorized representative in the presence of Engineer-in-Charge and the contractor. Each test shall last continuously for 72 hours. The contractor shall afford all facilities and make all necessary arrangements for these tests. **The Phase II test shall be carried out in Summer & Monsoon season** as soon as the stipulated load and weather conditions are available but not later

PARTICULAR SPECIFICATIONS (Contd.../-)

than one year after Phase I test. In case the required load is not available arrangements will be made by contractor to provide artificial load. These tests comprise of the following: -

a) Hot weather test is to be conducted in summer months April/May, when the summer condition prevail. Performance results of the plant as a whole will be recorded and COP to be calculated.

(b) Monsoon season test is to be conducted in the months of June/July/Aug, when the monsoon condition prevail. Performance results of the plant as a whole will be recorded and COP to be calculated.

(c) Heat added by strip heaters and blower motor should be as far as possible taken into account when working out the output. Humidifier may be shut down, say after steady state conditions have been obtained to eliminate any error while taking reading against items for the purpose of calculating efficiency.

(d) **Plant shall be designed for COP more than 3**

e) The GE will be responsible for intimating the date of Phase I and II tests to the contractor.

(f) All expenditure in connection with the tests will be borne by the contractor; The charges for consumption of water and electricity for Phase II tests shall be borne by the department. However, energy charges for electricity will be borne by the contractor if Ph-II test fails and is redone after due repairs. If there are leakages of refrigerant / compressor oil after Phase I test the same shall be made good by the contractor at his own cost, if it is attributed to the faulty materials/workmanship of the contractor. In case of dispute the decision of the Accepting Officer will be final and binding.

g) If the Phase II tests do not show satisfactory results/the contractor shall at his own expense rectify / replace the defective installation or any part thereof as directed by the Accepting Officer or his 288authorized representative within three months. The decision of the Accepting Officer shall be final and binding. In such rectification of defect, power and consumption charges will be borne by the contractor.

(h) The installation shall be finally taken over after the contractor has given a satisfactory Phase-II test as certified by the Accepting Officer or his 288unauthorized representative. The defect liability period of two years as per condition 46 of IAFW-2249 shall start from the date of final taking over of plant AFTER PHASE-II TESTS. Thereafter he shall forward a certified final account as stipulated in General Conditions of contracts (IAFW – 2249) Condition 65. If the contractor fails to attend to repairs/renewals required in the plants/notified during Phase II test due to which next due seasonal Phase-II test is delayed or shifted over to next year season, this shall be at the cost of contractor.

71.34. While carrying out Phase I and II tests, the department may ignore few freak reading provided they do not indicate inefficiency of the plant. Decision of the Accepting Officer or his representative in such cases shall be final and binding.

71.35. **TRAINING OF MES / USERS PERSONNEL FOR RUNNING / MAINTENANCE PLANT:-**

71.35.1 The contractor shall during installation of the plant be responsible for training personnel (MES. Or users) deputed by the Government for running and maintenance of the installation/plant.

PARTICULAR SPECIFICATIONS (Contd.../-)

71.35.2 The lump sum amount shall include for the training of the personnel as described above.

71.36. GENERAL:

71.36.1 The entire air-conditioning installation shall be carried out in a workmen like manner and in accordance with modern engineering practice as adopted for such work. Safety measures shall be provided conforming to IS 655.

71.36.2 Special attention shall be paid to the finish and general appearance of the work. Painting of the unit and all other equipment shall be done to the entire satisfaction of the GE/Engineer-in-charge. All exposed pipe fittings etc. Shall be neatly laid fixed and painted with two coats of approved paint over a coat of primer to the entire satisfaction of the Engineer-in-Charge. The paint used shall conform to the IS code 2932-1974 as amended.

71.37 The lump sum offer shall be deemed to include for any minor details of construction, which are obviously and fairly intended and may not have been referred to in these documents but are essential for the entire completion of the work.

71.38 The tenderer shall quote the rates for supply, installation, commissioning and testing of plants all as per tender requirements

71.39 The tenderer may please note that their offer must be as per the requirements mentioned in the tender. The offer which is not as per the tender will be treated as non bonafide.

71.40 However, if the tenderer proposes any alternative design/specifications, their offer for the same may be submitted entirely as a separate proposal in addition to their offer as per tender documents.

71.41 The tenderers shall limit his offer to specifications and scope of Sch 'A' and PS clause only. He shall have to install equipment of one of the makes given in the list of makes. Equipments of other makes shall not be accepted without approval of Accepting Officer but on its merits.

71.42 After acceptance of tender, tenderer shall submit his offer of makes and models of various equipments selected out of the list in tender he intend to order for incorporation in the plant duly supported by balancing data and efficiency curves for approval of GE. Tenderer shall confirm the order only after approval of make, model and type of equipment by GE. To facilitate running payment, tenderer has to bring the material at site along with original test certificates from manufacturers, dispatch invoice and vouchers. However payment vouchers shall be returned after due defacement. Payment shall be made by GE only after material passing and satisfying himself with the genuineness of material and equipment.

OUTSOURCING FOR OPERATION OF CENTRAL AC PLANT TILL COMPLETION OF PHASE-II TESTS

71.43. The job of manning and operation of installations shall involve the following in each shift. The hours of commencement and closing of duties will be decided by GE/Engr-in-Charge.

- (i) All manual operations required for starting, up keeping of installations and equipments and connected services.

PARTICULAR SPECIFICATIONS (Contd.../-)

- (ii) Reading and recording of various meters and gauges including adjusting/operations of controls and filling/writing of daily log sheet of the installation as per direction of Engr-in-Charge or his accredited/nominated representative (JE E/M in charge of installation).
- (iii) Use of any tools or plants for operation and/or maintaining of installation and up keeping all such T & P, installation equipments stores and other items of inventory in safe custody.
- (iv) Providing assistance by way of manual labour/operation/T&P and /or installation machinery for rectifications/repair or the installation.
- (v) Any other job which can be reasonably expected to be performed by the operator of the installation in the opinion of Engr-in-Charge. In case of any dispute the decision of Accepting Officer shall be final and binding as to whether the said job can be expected to be performed by the contractor or not.
- (vi) Repair and rectifications of defects to installation to be necessitated due to negligence or wrong operation of the installation on the part of the operator. The decision of the Accepting Officer as to whether the repair/rectification is necessitated due to negligence or wrong operation of the operator or not shall be final and finding.

71.44. The installation will have to be manned and operated on all days including of Sundays or holidays as per instruction of the Engr-in-Charge and as called upon to do so. However, the rate quoted in Schedule 'A' shall be deemed to include for manning and operation of the installation on all days including Sundays and other closed holidays.

- (i) For shift duties required to be performed as per duty chart but not performed by the operator of the contractor, whatsoever reasons, a panel recovery at twice the rate quoted in Schedule 'A' shall be recovered from the contractor.
- (ii) All the payments shall be made based on duties allocated through duty charts and as actually performed and evidence through log sheets. No payment shall be made if no duty has been assigned or allocated as per duty chart or no operation necessitated due to breakdown of the installation.
- (iii) The cost of repairs/rectifications necessitated due to negligence of operator shall be recovered from the contractor as per assessment made by GE, if the contractor fails to repair the installation within the time given to him. The same will be got repaired by other agency at the risk and cost. The decision of Accepting officer in this regard shall be final and binding on the contractor.

71.45. The operation personnel shall be qualified and experienced in the trade for which he is employed. The contractor shall produce certificates of qualification and experience to Engr-in-Charge to his satisfaction. The GE reserves his right to reject the employment of any person on whatsoever reason and the contractor shall accept employment of such person/persons forthwith. No claims whatsoever shall be entertained on this account.

71.46. The operation personnel shall have thorough knowledge of safety precautions during emergency cases and also conversant with Indian Electricity rules/regulations and Indian factory Act rules etc. as applicable on installations which fall under the provision of the contract.

71.47. The contractor shall display necessary notice board indicating all precautionary measures to be taken by manning/operating staff.

71.48. Cost of consumable stores such as grease oil lubricants cotton waste and other connected stores etc. required for daily operation and routine maintenance is deemed to have been included in the unit rate quoted by the contractor against respective item of Schedule 'A'.

PARTICULAR SPECIFICATIONS (Contd.../-)

71.49. Central AC plant should be in good working condition when the plants shall be handed over to MES after successful completion of phase II test.

71.50 Makes of spares of AC Plants

S.No	Items	Brand/Makes
01	Chilled Water Piping Insulation	K Flex/ A flex
02	Air Handling Unit	Zeco/ Edgetech/ VTS/Blue Star or OEM approved
03	Fire Damper	NEW/ Carryaire/ Mapro/ Ravistar
04	Air Cooled Scroll type Chilled water System	Blue Star, Daikin,Carrier,Kirloskar Chiller Private Ltd. / Trane

72 LIST OF MANUFACTURERS

The makes of various items of materials are as under. The contractor shall ensure that the items of these makes only are incorporated in the work, which conforms to the relevant specification/requirements/ stipulation in the contract. Also other products which are equivalent in the specification having IS certificate shall be permitted in the work if approved by GE .The make of items which are not covered in the list of manufacturers / Schedule 'A' / BOQ shall be as approved by GE.

The makes of products below are expected to confirm IS specifications/bear ISI marking. In case, they do not confirm to IS, they automatically deemed to be deleted from this list. The Tenderer therefore, shall make market enquiry about the same and no claim whatsoever on this account shall be entertained. In such cases, the make shall be as approved by the Garrison Engineer. The makes if given in Schedule 'A' / BOQ shall take precedence over this list of makes given below.

SI No.	Material / Name of firms	Product Description
1	2	3
1	POLYMER MODIFIED BITUMEN (PMB) (Approved blender for PMB)	
	(i) M/s Ooms Polymer Modified Bitumen Pvt Ltd	Ooms Polymer (Elastomeric SBS Modified)
	(ii) M/s Indian oil total Pvt Ltd (ITPL)	STYRELF
	(iii) M/s Tiki tar and Shell india Pvt Ltd	SHELL CARIPHALTE
2	POLYMERIC BITUMEN EMULSION (PME)	
	(i) M/s Ooms Polymer Modified Bitumen Pvt Ltd	
	(ii) M/s LN Petro Chem Private Limited	EMULCOTE
	(iii) M/s Hindustan Colas Ltd	HINMAT PLUS (PME)
3	JOINT SEALANT	

PARTICULAR SPECIFICATIONS (Contd.../-)

	(i) M/s Choksey Chemicals Pvt Ltd	Techseal RDL940/941 Techseal PU-2 Techseal RDL 941 EH Techseal EH HPP
	(ii) M/s Thermax Ltd	MaxFlex PS MaxFlex PU1 MaxFlex PSPR MaxFlex PUPR MaxFlex ACS
	(iii) M/s Sika India Pvt Ltd	Sikasil 728NS/SL Sika Polysulphide Sikaflex Construction + Sikaflex PRO-3 Sikaflex 11FC
	(iv) M/s FOSROC CHEMICALS (India) Pvt Ltd	Colpor – 200 PF Expoband One
	(v) M/s STP Limited	Shali Seal PS GG ShaliSeal PU GG/PG 2K ShaliTex/ShaliJet Sealing Compound ShaliSeal CSS A
	(vi) M/s Asian Paints Ltd	SmartCare Hybrid PU Sealant SmartCare Polysulphide Sealant
	(vii) M/s Tiki Tar Danosa (India) Pvt Ltd	TIKISEAL PU 25/40/2K TIKI POLYSEAL/ POLYSEAL PLUS TIKISWELL TIKIPLAN WS TIKI JOINTSEAL A/ B
4	<u>REINFORCEMENT / CONCRETE PROTECTIVE COATING / SYSTEMS</u>	
	(i) M/s FOSROC CHEMICALS (India) Pvt Ltd	Nitozinc Primer, Dekguard S, Nitocote EP410 Nitocote EP405, Nitocote UR512 Nitocote BCS300, Nitocote ET140 Nitocote ET550, Nitocote SN522
	(ii) M/s STP Limited	ShaliSeal RS TC ShaliPlast LW + ShaliPlast LW ++ ShaliProtek PuR40 ShaliUrethane PC ShaliPoxy CTE 503
	(iii) M/s Tiki Tar Danosa (India) Pvt Ltd	DANOCOAT FG DANOKOTE PUC TIKI PROTECT AC
5	<u>CURING COMPOUND</u>	(i) M/s Choksey Chemicals Pvt Ltd (ii) M/s Thermax Ltd (iii) M/s Fosroc Chemicals (iv) M/s STP Limited (v) M/s Asian Paints Ltd
6	<u>GLASS GRID / FIBRE GLASS</u>	
	(i) M/s Saint Gobain Adfors India	Saint Gobain brand Glass Grid
	(ii) M/s Giridhar Techfab Pvt Ltd	(a) GTF Glass Geogrid, (b) GTF Polyester Geogrid

PARTICULAR SPECIFICATIONS (Contd.../-)

		(c) GTF Glass Reinforcement Mesh
	(iii) Maccaferri Environmental Solution Ltd	Glass Fibre Reinforced Grid Macgrid AR VA-10
7	<u>EPOXY / POLYURETHENE FLOORING</u>	
	(i) M/s Choksey Chemicals Pvt. Ltd	Techfloor ESD Masterprime 52 Techfloor EPU
	(ii) M/s Thermax Ltd	TecFloor EC 500, TecFloor ET 1000/2000/3000/ 4000, TecFloor UL, TecFloor PU CEM, TecFloor EC 100, TecFloor PR, TecFloor ESD
	(iii) M/s Fosroc Chemicals	Nitoflor SL 2000 Nitoflor FC 150 Nitoflor TF 5000 Nitoflor EU5 Nitoflor SL Conductive Nitoflor SL Dissipative Traffic guard UR150 Nitoflor SL 3000 UT
	(iv) M/s STP Limited	ShaliFloor SL PU ShaliFloor SL AS 3PU ShaliFloor NM ShaliPoxy SL/FC ShaliScreed SL UL 3ES ShaliDeck SL
	(iv) M/s Asian Paints Ltd	SmartCare Apcoflor HFP 120, 130, MFP 140, FP 110 SmartCare PU Crete 4K, XL SmartCare Apcoflor PU Screed , PU Screed HD,Screed SOL SmartCare Apcoflor TC 510, TC 650, AS 500, WPF 200 SmartCare Apcoflor ESD SL, ESD Primer SmartCare Apcoflor Car Deck TC, BC
	(v) Tiki Tar Danosa (India) Pvt Ltd	DANOFLOOR PRIMER EP/EPW DANOFLOOR UL EP/UL-CEM DANOPRIMER I-W DANOFLOOR SL/SL AS/SL STF TIKICRETE MF DANOKOTE EP/PU/PUW/PUC/PAVE
8	M/s Reliance Industries Limited, New Delhi	As approved by GE in consonance prevailing with IS code
9	Polyester (non circular) triangular synthetic fibre	As approved by GE in consonance prevailing with IS code
10	Polypropylene Geotextile	As approved by GE in consonance prevailing with IS code
11	Backup rod for Joints	(i) M/s Supreme Industries (ii) M/s Elcon Products Mumbai

PARTICULAR SPECIFICATIONS (Contd.../-)

12	HDD- Filler board for expansion joints	(i) M/s Supreme Industries (ii) M/s STP Ltd (iii) Tiki Tar Industries (Baroda) Limited
----	--	--

Appx ‘C’

SI No.	Items	Brand / Makes
<u>CONCRETE</u>		
1.	Ready Mix Concrete	Lafarge (RMC), Ultra Tech, ACC, RMC Ready Mix, Ramco
2.	AAC blocks	Siporex (Ecolite), BIRLA AEROCON HIL Ltd Hyderabad, Ultratech Mumbai XTRALITE AAC, JVS Comatsco Industries Pvt Ltd Pune, Delite Blocks Pvt Ltd Akola Maharashtra, ECO Green Product Pvt Ltd Ahmedabad, Ortilite AAC walling Block Kota Rajasthan, R.S. Greeninfra Pvt Ltd SolanHP, Renaatus Procon Pvt Ltd Chennai, N.J. Eco Build Pvt Ltd Gujarat, Kansal Building solutions New Delhi, Magicrete Building Solutions Pvt Ltd. Surat, Ascolite Aswani Industries Pvt Ltd Surat
<u>JOINERY</u>		
3.	Factory made wooden shutter / Flush doors / Frames	M/s Goel Brothers, Raipur / M/s Pioneer Timber, Chandigarh / M/s Goyal Industries, New Delhi / M/s Jain Doors Pvt Ltd, Haryana / M/s India Wood & Wood Products, Mangalore / M/s M P Wood Products, Indore/ M/s A1 Teak Products, Indore
4.	Factory made PVC, FRP shutters and frames	M/s Rajshri Plastiwood, Indore (Rajshri) / M/s Sintex Industries Ltd. (Sintex) / M/s Accucell / M/s Dura Plast Extrusion (Duraplast) / M/s Madhu Industries (Madhu Industries) / M/s Navratna Co Special Chemicals (GIZA) / M/s Accura Polytech (ACCUCEL)
5.	UPVC doors, windows and ventilators	M/s Poly Windows, Pune / M/s Aparna Profiles Pvt Ltd (APARNA VENTSAR OKOTECH) / M/s Rajshri Plastiwood, Indore (Rajshri) / M/s Madhu Industries (Madhu Industries) / M/s Accura Polytech (ACCUCEL)
6.	Steel windows, ventilators, door frames, shutters	M/s Madhu Industries (Madhu Industries), M/s Godrej & Boyce Steel Mfg., Mumbai, M/s Ashwani & Sons, Ghaziabad, M/s Multiwyn Industrial Corporation, Kolkata, M/s Agew Steel, Ahmedabad
6A.	PVC Foam Sheets/Boards	M/s Rajshri Plastiwood, Indore (Rajshri), M/s kumar Arch Tech Pvt Ltd (Echon), M/s navratna Specuiality Chemicals (Giza), Qute Extrusions Pvt Ltd (Brand: Qute), OM Industries, Duroplast
6B.	WPC Boards	M/s Rajshri Plastiwood, Indore (Rajshri), Kalinga, Ecoste, Hardyplast, Qute Extrusions Pvt Ltd (Brand: Qute)
6C.	Extruded PVC Profile Doors & Frames	M/s Rajshri Plastiwood, Indore (Rajshri), Qute Extrusions Pvt Ltd (Brand: Qute), OM Industries, Duroplast

PARTICULAR SPECIFICATIONS (Contd.../-)

7.	Aluminium section of shutters/frames for door/window/ventilators	(a) NALCO (b) M/s JINDAL (c) HINDALCO (d) M/s Deco Grill (e) M/s Indian A1 company
7A.	Rolled Formed GI section Pre Painted/ Pre Coated Windows	M/s NCL ALL TEK & SECCOLOR Elixir Met (SECCOLOR), JSW Steel
8.	Steel Rolling Shutters / g	M/s Shree Laxmi Engg Works, Bengaluru / M/s Prakash & Co New Delhi / M/s Senthil Rolling Shutters & Engg Co, Chennai / M/s Swastik Rolling Shutters, Mumbai / M/s Jayraj Industries, Chennai
8A.	Pulley System Wall Stands Floor Stands & Accessories	M/s EASY DRY Systems Pvt Ltd (EASYDRY)
9.	Hydraulic Door Closer	M/s Everlite / M/s Universal / M/s Hardwin / M/s Dyna
9A.	Stainless Steel Plate Rack	M/s Prayag (Prayag) / M/s Nirali / M/s Bluestar Sanitary Industries Pvt Ltd (SILVERSHINE)
10.	Aluminium Tower Bolt / Aldrops / Door handle / Butt Hinges	Argent Industries (ARGENT/DOORGLOW), Crown, ESSESS, M/s Aluminium Udhog
11.	Towel Rails/Ring	M/s Jaguar, M/s KICH, Jaquar, Somany, Kohler, Hindware
12.	Mortice Locks	M/s Harrison (HARRISON), M/s Godrej & Boyee Co Ltd, Dorset India, Spider Metal Products Ltd, ENOX, Jainson
13.	Drapery rod	M/s Vista Levolor, M/s MAC-DÉCOR, DECO Window, Jayesh Metal Corpn (JMC)
14.	Venetian Blinds	M/s Vista Levolor, M/s MAC-DÉCOR, Aerolux, MAC
15.	Mangalore Tiles	M/s Charminar / M/s Raja / M/s RECHO / M/s Prajapati / M/s Kerala Tile Works

PARTICULAR SPECIFICATIONS (Contd.../-)

16.	Non-asbestos Fibre reinforced (poly propylene), 6mm Cement Corrugated sheets	M/s Everest Industries Ltd (EVEREST) / M/s Charminar Fortune (M/s HIL Ltd) (Charminar Fortune) / M/s RAMCO Indus Ltd (RAMCO)
16A.	Pre Painted Galvalume/ Galvanised Corrugated Steel Sheets	M/s Tata / M/s JSW / M/s ESSAR
16B.	Galvanised Plain/ Corrugated Sheets	M/s Tata / M/s JSW / M/s ESSAR
17.	Pre-moulded non-bituminous joint filler board	M/s Elcon, M/s Duron Board HD-100
18.	Pre-moulded bituminous joint board	M/s STP Ltd, M/s Tikitar Industries Ltd., M/s Sikka
19.	AC Sheets & Ridges	M/s Charminar (CHARMINAR), M/s Everest, M/s UP Asbestos, M/s Ramco
20.	Water Proofing Compound	M/s Pidilite Industries Ltd (PIDILITE), M/s FOSROC, M/s Dr Fixit
21.	APP Membrane	M/s STP Ltd, M/s Texsa India Ltd, M/s IWL Ltd, M/s Tiki Tech, M/s Asian
22.	Perforated particle Board / tiles for insulation and acoustic	M/s Anchor Ceiling Tiles, M/s Armstrong Wood Ind, M/s GYP Board, M/s Bison Panel, M/s Lagyp
22A.	PVC False ceiling, Wall lining & Solid PVC Partitions	M/s Rajashri Plastiwood, Indore (Rajashri)
22B.	Dry Walling panels	M/s HIL Ltd (BIRLA AEROCON)
23.	Plywood	M/s Kitply (KITPLY)/ M/s Century Plywood / M/s Archid Ply (ARCHID)/ M/s Green Ply (GREEN PLY), M/s Anchor (ANCHOR)
24.	Particle Board Gypsum	M/s Mangalam Timber Product, M/s Gypsum Board, M/s Jolly Board, Mumbai, M/s Indian Gypsum product, M/s Armstrong World Industries
25.	Particle Board Cement Bonded	M/s NCL Industries Ltd (BISON PANEL)
26.	Laminated Sheets	M/s Formica, M/s SunGloss, M/s Sunmica, M/s Bakelite Hylum, M/s Eco Board
27.	Adhesives	M/s Pidilite, M/s Fevicol, M/s Vermicol
28.	Pre-laminated Particle board	M/s Nava Pan, M/s Eco Board Industries, Pune, M/s Kitply, M/s Green Ply, M/s Anchor Lam, M/s Century Plywood
28A.	Non asbestos Fibre Reinforced Cement	M/s RAMCO Indus Ltd (RAMCO)
29.	Block boards and veneered particle board	M/s Bajaj Boards, M/s Nu Wood, M/s A-1 Boards, M/s Bhutan Boards (Bhutan), M/s Charminar (Charminar)
29A.	Aluminium Formwork	M/s MIVAN, M/s S-FORM, M/s MFS, M/s KUMKANG KIND, M/s MAFS (Maini Aluminium Formwork System), M/s NAVKAR Aluminium Technocraft Industries Pvt Ltd
FLOOR FINISHES & PAVINGS		
30.	Glazed Ceramic wall / Flooring tiles	M/s Johnson Tiles, M/s Kajaria, M/s Somany, M/s Asian Granite Industried Ltd (AGI TILES), M/s RAK Cements Ltd (RAK CERAMICS)
31.	Non-skid Ceramic tiles	M/s Johnson Tiles, M/s Kajaria, M/s Somany, M/s Orient Bell Ltd
32.	Vitrified Tiles	M/s Johnson Marbonite, M/s Kajaria, M/s Somany, M/s Orient bell, M/s Asian Granite Industried Ltd (AGI TILES), M/s RAK Cements Ltd (RAK CERAMICS)

PARTICULAR SPECIFICATIONS (Contd.../-)

33.	Mosaic/Cement Flooring Tiles	M/s NITCO Mumbai / M/s Ultra / M/s Duracrete / M/s Mehtab Tiles Indore/ M/s National Tiles / M/s Bharat Tiles & Engg Co Bangalore / M/s Modern Tiles and Marbels
34.	Acid Resistant Tiles	M/S Johnson, Mumbai, M/s Somany, M/s Kajaria, M/S Burn Standard Co, Jabalpur, M/S Purshuram Pottery Wks, Marvi
35.	Cement Concrete Interlocking Paver Blocks / Tiles	M/s MehtabTiles, Indore, M/S Ultra Tiles, M/s Navya Tiles, Jodhpur, M/s NITCO, M/s Patel Fur Mart
36.	PVC Sheet and Tile flooring	M/s Krishna Vinyl Tiles, M/s Armstrong, M/S Marbles Tiles, M/s Polyfin Tiles, M/s Square Foot, M/s Krishna Vinyl tiles
WHITE WASHING, COLOURING & DISTEMPERING		
37.	Distemper oil-emulsion (OBD)	M/s Nerolac, M/s Asian Paints, M/s Berger Paints, M/s ICI India
38.	Plastic Emulsion Paint and Exterior Emulsion Paint	M/s Asian Paints, M/s Berger Paints, M/s Nerolac, M/s ICI India
39.	Cement Base Paint	M/s Super Snowcom, M/s Duracom, M/s Aquacem, M/s Shalimar Paints, M/s Berger Paints
40.	Cement Putty	M/s Birla Cement, M/s JK White Cement, M/s Golden Mohar, M/s Asian Paints, M/s Jehnson & Nicolson
GLAZING		
41.	Sheet glass (plain)	M/s Saint Gobain, M/s Asahi Works, M/s Atul Glass Indus, M/s Modi Guard
42.	Sheet glass frosted	M/s Saint Gobain, M/s Asahi Works, M/s Atul Glass Indus, M/s Modi Guard
43.	Heat absorbing glass& reflective solar control film	M/s Hindustan Pilkington GlassWorks, M/s Saint Gobain, M/s Modi Float, M/s Modi Guard
44.	Rough cast wired glass	M/s Hindustan Pilkington GlassWorks, M/s Saint Gobain, M/s Modi Float, M/s Modiguard
45.	Oil Putty	M/s Jehnson & Nicolson, M/s Berger Paints, M/s Asian Paints
45A.	Wall Putty	M/s Dalmia Magic Premium Skin Coat Bharat Ltd (DALMIA CEMENT)
46.	Mirror	M/s Modi, M/s Atul, M/s Saint Gobain
PAINTING		
47.	Synthetic Enamel Paint	M/s Asian Paints, M/s Nerolac Paints, M/s Dulux, M/s ICI Paints
WATER SUPPLY, PLUMBING, DRAINS & SANITARY APPLIANCES		
48.	CI Pipe and fittings	M/s Electro-Steel Casting Ltd, M/s Kejriwal, M/s NECO, M/s Kesoram
49.	GI Pipes & Fittings	M/s Tata, M/s Jindal, M/s Zenith, M/s Swastik, M/s Prakash
50.	DI Pipes & Fittings	M/s Jindal Ltd, Gujarat, M/s Electrosteel Castings Ltd, WB, M/s Tata Metallics, Kolkata, M/s SAW Pipes, M/s Srikalahasti Pipes Ltd
51.	MS Pipes & Fittings	M/s Tata, M/s Jindal Ltd Gujarat, M/s BST, M/s Zenith
52.	HDPE Pipes & Fittings	M/s Finolex, M/s Prince Pipes Fittings Ltd, M/s Supreme, M/s Jain Irrigation Systems
53.	CPVC pipes and fittings (Chlorinated polyvinylchloride)	M/s Finolex, M/s Dutron, M/s SFMC, M/s Prince Pipes Fittings Ltd (SMART FIT), M/s Birla Aerocon (HIL Ltd)
54.	PVC - Soil, waste, rainwater (SWR) & Drainage pipes	M/s Supreme, M/s Prince Pipes Fittings Ltd (ULTRA FIT), M/s Kisan, M/s Finolex
55.	PPR Pipes & Fittings	M/s Prince Pipes Fittings Ltd (GREEN FIT), M/s Finolex, M/s Supreme, M/s Savoir Fairo Mafg Co Pvt Ltd (SFMC)
56.	PVC Pipes & Fittings	M/s Prince Pipes Fittings Ltd (AQUA FIT), M/s Finolex, M/s Supreme, M/s Birla Aerocon (HIL Ltd)

PARTICULAR SPECIFICATIONS (Contd.../-)

57.	UPVC Pipes and Fittings	M/s Prince Pipes Fittings Ltd (AQUA FIT), M/s Finolex, M/s Supreme, M/s Birla Aerocon (HIL Ltd)
58.	UPVC Pipes & Fittings for SWR	M/s Prince Pipes Fittings Ltd, M/s Finolex, M/s Supreme, M/s Birla Aerocon (HIL Ltd)
59.	Polyethylene / Aluminium / Polyethylene Composite Pressure Pipe	M/s Prince, M/s Finolex, M/s Supreme
60.	Plastic Pipe (for non-pressure Drainage & Sewerage)	M/s Prince, M/s Finolex, M/s Supreme
61.	CI soil, waste, rainwater (SWR) & Drainage pipes	M/s NECO, Nagpur, M/s Singhal Iron Foundry, Mathura (SKF)
62.	AC - Soil, waste, rainwater (SWR) & Drainage pipes	M/S Everest Asbestos, Hyderabad, M/s Vishaka India Ltd, M/s Hyderabad Asbestos (Charminar), M/s Ramco
63.	RCC pipes, drain pipes	M/s Indian Hume Pipes, M/s Everest Asbestos, Hyderabad, M/s Himalaya, M/s Thuluvananikal pipes
64.	Air Release Valves	M/s Leader, M/s BIR, M/s Kirloskar, M/s Upadhyay, M/s Sant, M/s LAURITZ KNUDSEN ELECTRICAL AND AUTOMATION, M/s Kartar Valves
65.	Foot Valves	M/s Upadhyay, M/s Leader, M/s Kirloskar, M/s Sant, M/s Kartar Valves
66.	Reflex Valves	M/s Kirloskar, M/s Leader, M/s Sant, M/s LAURITZ KNUDSEN ELECTRICAL AND AUTOMATION, M/s Kartar Valves
67.	Sluice valves	M/s Leader, M/s Kirloskar, M/s LAURITZ KNUDSEN ELECTRICAL AND AUTOMATION, M/s Zoloto, M/s BIR, M/s Upadhay, M/s Kartar Valves
68.	Butterfly Valves/ Disc valves	M/s Upadhyay, M/s LAURITZ KNUDSEN ELECTRICAL AND AUTOMATION, M/s Kirloskar, M/s Zoloto, M/s Sant, M/s Kartar Valves
69.	Gate valves	M/s Leader, M/s Sant, M/s Zoloto, M/s Kartar Valves
70.	Water Meters	M/s Capstan, M/s Kirloskar, M/s Anand Asahi, M/s Dashmesh, M/s Kaycee, M/s Capital
71.	PVC / Polythylene water tanks	M/s Sintex, M/s Rotex, M/s Polycon, Jaipur
72.	C P Bib Cock, Stop cock, pillar cock and accessories	M/s Jaquar, M/s Marc, M/s CERA Sunitoro, M/s Kohler
73.	Copper/ Brass Alloy Bib Tap, Pillar Tap, Angle Valve & Stop Valves and accessories	M/s Soma, M/s Leader, M/s Zoloto, M/s Jaguar Vo Pvt Ltd
74.	PVC Stop Cock and Bib Cock /float valves and accessories	M/s Jaypee, M/s GMP, M/s Neta, M/s Zoloto, M/s Prayag Polymer, M/s Symet
75.	Gun-Metal Globe/ Gate valves/ Angle Valves	M/s Leader, M/s Bir, M/s Zoloto, M/s Kirloskar
76.	Shower rose	M/s Jaquar, M/s Kohler, M/s Crabtree, M/s CERA Sanitaryware
77.	CI / Brass Ball Cocks (float valves)	M/s Leader, M/s NETA, M/s Zoloto

PARTICULAR SPECIFICATIONS (Contd.../-)

78.	Water Closet-Vitreous China (European /Indian)/ squatting pan Orissa pattern	M/s Cera, M/s Parryware, M/s Jaquar, M/s Hindware, M/s Johnson, M/s Kajaria Sanitaryware (KEROVIT), M/s RAK Ceramics
79.	Flushing Cistern - PVC Low Level including Flush Valves and Fittings for WC and Urinals	M/s Parryware, M/s CERA Sanitaryware, M/S Johnson Peddar, M/s RAK Ceramics
80.	Plastic Seat Covers for EWC	M/s Cera, M/s Neycer, M/s Parryware
81.	Urinals - Vitreous China	M/s Cera, M/s Parryware, M/s Neyveli Ceramics (Neycer), M/s Hindware, M/s Jaguar, M/s Johnson, M/s Kajaria Sanitaryware (KEROVIT)
82.	Wash Basin –Vitreous China	M/s Kajaria Sanitaryware (KEROVIT), M/s Cera, M/s RAK Ceramics, M/s Parryware, M/s Neyveli Ceramics (Neycer), M/s Hindware, M/s Jaguar
83.	Sink Steel	M/s Jayna, M/s Nirali, M/s Neelkanth, M/s Parryware
84.	Centrifugal / mono-block Pump	Kirloskar, Beacon, Crompton Greaves, KSB, Wilo Mather & Platt, Jyoti, V Guard
85.	Submersible Pump / open well pumps	Kirloskar, KSB, Wilo Mather & Platt, Jyoti, V Guard, CRI Pumps
86.	Vertical Turbine Pumps	Kirloskar, KSB, Wilo Mather & Platt, Jyoti
87.	Non-clog Sewage submersible Pumps	Kirloskar, KSB, Wilo Mather & Platt
88.	Pumps for Fire Fighting	Kirloskar, Wilo Mather & Platt, Crompton, Bharat Bijlee
88A.	Brass Forged Pressure reducing valves	Zoloto
88B.	Loft tank	Sintex
<u>ELECTRICAL WORKS</u>		
89.	Pole - Pre-stressed concrete	M/s Cement Fabric India, Jodhpur, M/s Hindustan Pre-stressed Concrete, Faridabad, M/s Indian PCC Poles, M/s Concrete Udyog Jhansi, M/s Sankla Udyog, Jhansi
90.	Pole - Steel tubular	India Tube and Co., India Electric Poles Mfg Co., MaharaSheetra, Bombay Tubes, National Tubing Company, Kanpur, Kalinga Tubes, Singh Profile, Pune
90A.	GI octagonal pole	M/s Jindal, M/s Bajaj, M/s Philips, M/s Crompton
91.	Insulators HT/LT Disc / Pin / Shackle / loop / String Type	BHEL, Jayshree, W/S Insulators, Southern Insulators, MEI, Modern Insulators
91A	RMU & PSS	M/s Lucy Electric India Pvt Ltd, M/s LAURITZ KNUDSEN ELECTRICAL AND AUTOMATION
92.	Air Circuit Breaker (ACB) LT 1100Volts	Larsen & Tubro, English Electric, GEC, Crompton Greaves, Siemens, ABB, Schneider Electricals
93.	Vacuum Circuit Breaker (VCB) suitable for 36kV, 22kV and 12kV system including accessories	SIEMENS, Schneider, Crompton Greaves, Mumbai, ABB Ltd, Bangalore, Alsthom, BHEL, LAURITZ KNUDSEN ELECTRICAL AND AUTOMATION
94.	Automatic Power Factor and Correction (APFC) Panel	Larsen & Toubro, GEC, Siemens, ABB, Epcos
95.	Power Factor Improvement Capacitor Banks	Larsen & Toubro, Siemens, EPCOS, GE, ABB

PARTICULAR SPECIFICATIONS (Contd.../-)

96.	HT Switch Gear 66/33/11kV 3 Phase, Gas Circuit Breaker circuit breaker SF-6 Type	Crompton Greaves, Mumbai, Siemens Ltd, Mumbai, Schneider, New Delhi, ABB Ltd, Bangalore
97.	HT 11kV, 3 Ph Automatic switch Fuse Unit	ABB ltd, Bangalore, AREVA T&D India Ltd, Noida, Crompton Greaves, Mumbai, Schneider, New Delhi, M/s C&S Electric Ltd
98.	Air Brake Switch Gang	Pacfit, Mumbai, Jaipuria Brothers, HEI
99.	Air-break Switch (Isolators)	MEI, Southern Switchgear, Andrew Yule, Crompton Greaves
100.	Arresters Lightening LT / HT	Oblum, Crompton & Greaves, AREVA T&D, BHEL, GEC- ELPRO
101.	Change Over Switch/ Starter/ Soft Starter/ Contactor DOL/ Star-Delta/ Synchronous/Single phase preventer	Siemens, Larsen & Toubro, ABB, Crompton Greaves, GE
102.	Main Switch Iron Clad Switch Fuse Unit Fuse Switch unit	Siemens, LAURITZ KNUDSEN ELECTRICAL AND AUTOMATION, Crompton
103.	Transformers 66/11kV, copper wound all rating	ABB Ltd., Bangalore, Siemens Ltd., Mumbai, Bharat Bijlee Ltd, Mumbai, Crompton Greaves, Mumbai, Schneider, Alstom (GEC), M/s Kirloskar Electric, M/s EMCO, M/s BHEL, M/s Andrew Yule
103A.	Transformer 11kV/433V Step Down Indoor/Outdoor type upto 1000 kVA capacity dry resin type	M/s Schneider, M/s Crompton, M/s Kirloskar, M/s ABB
104.	Transformers 33kV & 11kV, current & potential	Crompton Greaves, Mumbai, Schneider, Siemens, LAURITZ KNUDSEN ELECTRICAL AND AUTOMATION
105.	Isolation Transformer	Vinitek Electronics (Volina)
106.	Transformers 6.6kV/433V three phase upto and including 100kVA	Indian Transformer, Gurgaon, M/s Voltech Manufacturing Co Ltd
107.	Transformers 11 or 6.6kV/0.433kV copper wound,500kVA and above	Schneider, Crompton Greaves, Mumbai, Bharat Bijlee Ltd, Mumbai, ABB, Andrew Yule, M/s Kirloskar, M/s ECE
108.	Transformers 11kV/ 0.433kV copper wound, below 500kVA	Voltamp Ltd., Baroda, M/s Indo Tech Transformers, Alstom (GEC), ABB, Schneider, Bharat Bijlee Ltd, Mumbai
108A.	Transformers 11kV/ 0.433kV copper wound,100kVA and below	M/s PME, M/s Rajasathan Transformers, M/s Everest, M/s R K Industries, M/s PACTIL, M/s Kotson, M/s Hi Tech Industries, M/s Jaybee Ind (Jaybeeti)
109.	Cable jointing kit for 11kV/22kV	Raychems, Densons, M-Seal, Birla-3M
110.	UG HT XLPE, PVC Insulated aluminum conductor for 3.3/33/22/11kV system	Cable Corporation of India, Mumbai, Havells India Ltd., Universal Cables Ltd, Satna, Asian Cables, Gloster, RPG Cables Ltd, Thane, Finolex, RR Kabel, KEI Ind, Polycab Pvt Ltd
110A.	HT Armoured XLPE Cable 132 KV Grade	M.s Polycab Pvt Ltd
111.	UG LT XLPE, PVC Insulated aluminum conductor for 1100Volts	Cable Corporation of India, Mumbai, Asian Cable Co, Chattisgarh, Finolex Cable Ltd, Pune, Polycab, Gloster, Universal
112.	BLANK	BLANK
113.	Aluminum conductor steel reinforced (ACSR)	All-Ind, ICC, Bharat Conductors, NICCO, Indian Aluminum Co

PARTICULAR SPECIFICATIONS (Contd.../-)

114.	Street light fittings (LED)	Bajaj, Phillips, Wipro, Crompton, GE, Havells, Luker, Jaguar, FIEM Ind Ltd, Pyrotech Electronic Pvt Ltd, BENTEC India Ltd (BENLO), Eveready Ind India Ltd, Orient Electric, Poly Cab, Surya Roshni (Surya), Halonise Technologies Pvt, Shri Sant Krupa Appliances (SYSKA)
115.	Solar street light fitting	Havells, Phillips, BHEL, Tata, Bajaj
116.	High Mast light	Bajaj, Phillips, Crompton
117.	Fluorescent tube light fittings/LED/ lamp holder	Wipro, Bajaj, Crompton, Phillips, Havells
118.	Flame proof light fittings (LED)/ Fan/well glass/bulk head including accessories	M/s Sudhir, M/s Batiga, Flexipro Electricals, Nasik, M/s Shyam Switchgears, Mumbai, Bajaj, Crompton
119.	Florescent lamp LT (CFL)/ HPSV lamp	Phillips, Crompton, Wipro, Bajaj, GE- Lighting, Havells, Osram
120.	Light fittings LED	Phillips, Crompton, Wipro, Bajaj, GE, Havells, Osram, FIEM Ind Ltd (FIEM), Pyrotech Electronics Pvt Ltd, Luker, Jaguar, Bentec (BENLO), Eveready, Orient, Polycab, Surya Roshni (Surya), Holonix, SYSKA
121.	LED Tubelights/bulbs	Phillips, Crompton, Wipro, Bajaj, GE, Havells, Osram, Luker, Bentec (BENLO), Eveready, Orient, Polycab, Surya Roshni (Surya), Jaguar, Halonix, Pyrotech, FIEM Ind Ltd, SYSKA
122.	PVC cable 450/750V	Plaza, Finolex, Havells, Polycab
123.	Electronic / Photo-electric switch for auto-operation of street lights	LAURITZ KNUDSEN ELECTRICAL AND AUTOMATION, Legrand, Bajaj, GE, Siemens
124.	DBs/MCB (Miniature Circuit Breakers & MCCB (Moulded Case Circuit Breakers)	LAURITZ KNUDSEN ELECTRICAL AND AUTOMATION, Havells, Schneider, Legrand, ABB, Siemens, Havells, Novatour (INDO ASIAN), C&S Electric
125.	Microprocessor based MCCB /RCCB LT 415 Volts	LAURITZ KNUDSEN ELECTRICAL AND AUTOMATION, Siemens, Schneider, ABB, Legrand, Novatour (INDO ASIAN)
126.	Electrical Panel (LT)	Standard, LAURITZ KNUDSEN ELECTRICAL AND AUTOMATION, Legrand
127.	Electric Accessories, Piano Suitables, Ceiling rose, call bells, Buzzers, Lamp Holders/ socket outlet, etc., Plug & Socket Boards	Panasonic Life solutions (Panasonic Anchor), Havells, Crabtree, Legrand, Leader, C&S Electric
128.	Ammeter / Voltmeter / Power Factor/frequency Meters	IMP, MECO, LAURITZ KNUDSEN ELECTRICAL AND AUTOMATION, Automatic Electric, Havells
129.	Digital Meters with built in selector switches for voltmeter, Ammeter, Frequency, Energy, kW, Power Analyser	LAURITZ KNUDSEN ELECTRICAL AND AUTOMATION, Havells, Automatic Electric, Enercon, Secure Meter
130.	Modular Switches /Sockets	Anchor Roma, Crabtree, Legrand, Havells, Indo Asian, Polycab, LAURITZ KNUDSEN ELECTRICAL AND AUTOMATION, Panasonic Anchor
131.	Electric Energy Meters, Tamper Proof	Larsen & Toubro, Secure Meters, Havells, Jaspuria Meters, Elmeasure, Bentec (BENLO)

PARTICULAR SPECIFICATIONS (Contd.../-)

131A.	SCADA System	Schneider, Elmeasure, Forbes Marshal
132.	Ceiling Fan	Bajaj, Orient, Crompton, Polar, Khaitan, Havells, V Guard, Polycab, Panasonic
133.	Exhaust fan/ Air circulators	Crompton, Almonard, Khaitan, Usha, Bajaj, Havells, Polycab
134.	Fan Regulator	Anchor, Legrand, Havells, Bajaj, Usha, Khaitan, GEC
135.	Electronic type fan regulator	Legrand, Orient, Crompton, Havells, Bajaj, V Guard, Polycab
136.	Geyser	Bajaj, Venus, Racold, Usha, Venus, Jaguar, V Guard
136A.	Water Heater (Only five star rating)	Jaguar, M/s Havells, M/s AO Smith, Bajaj, Usha, Racold
137.	PVC insulated copper/aluminium cable 1100V of all types	Plaza, Finolex, Anchor, Havells, Nicco, Polycab, RPG, Gloster, RR Kabel, KEI
138.	PVC conduits (Rigid or flexible)/ FRLS rigid PVC conduits/fittings	Anchor, Modi, Pressfit, Precision, Astral, Panasonic Anchor, Polycab
138A	PVC Tape	GM, Panasonic Anchor
139.	MS conduit	BEC Industries, Kalinga, Jindal, Bharat, AKG
140.	Casing capping & accessories	Precision, Modi, Presto Plast, Supreme, Polycab, Plaza, Pressfit
141.	Indication Lamps Neon / LED type	LAURITZ KNUDSEN ELECTRICAL AND AUTOMATION, Siemens, ABB, Schneider, EPCOS, Jaipuria
142.	LT Relay Numerical, Static/ Protective/ Auxilary	Siemens, Schneider, ABB, LAURITZ KNUDSEN ELECTRICAL AND AUTOMATION, EPCOS, Jaipuria
143.	BLANK	
144.	Automatic voltage stabilizer (servo controlled)	Automatic Electric, Aplab, V Guard, Vintek Electronics (Valina), Vinitec Electronic Laboratory (Vinitec)
145.	DG Set (engine)	Kirloskar, Cummins, Greaves –Cotton, Ashok Leyland, Caterpillar, Sterling Gen
146.	DG Set (alternator)	Kirloskar, Stamford, AREVA, Alstom, Jyoti, Crompton Greaves, Bharat Bijlee
147.	DG Set assembled with sound proof canopy	Kirloskar, Jackson, Sudhir, Greaves –Cotton, Cummins India
148.	Induction Motors	Crompton Greaves, Kirloskar Electric, Siemens, Bharat Bijlee, NGEF, ABB
149.	Gang operated devices (GOD)	Pactil (Metro), Jaipuria, Atlas, ECE, AREVA

PARTICULAR SPECIFICATIONS (Contd.../-)

150.	Precast concrete cable cover	Mehtab Tiles, Indore / M/s NITCO, M/s ULTR Tiles, M/s Topaz Tiles, M/s Patel Furniture Mart
151.	Air handling unit	Bluestar, Voltas, Zeco, National
152.	Air curtains	Almonard, AirCon, Crompton Greaves
153.	Cooling towers	Paharpur, Mihir, Delta, Advance
153A.	Centrifugal Chillers & Screw Chillers	Carrier, Voltas, Daikin, Hitachi
154.	Window type Air conditioner	Carrier, Bluestar, Voltas, Daikin, Hitachi
55.	Split type air conditioner	Carrier, Voltas, Daikin, Hitachi
156.	Solar water system	Tata-BP Solar System, BHEL, Best & Crompton, Noval Energy, New Delhi, Jain Solar, Racold, Whitline, Usha, Sudharshan, V Guard
156A.	5 pair / 10 pair / 50 pair telephone distribution box	DELTA
156B.	4-way splitter box for TV cable termination	STAR
156C	Bolard light / Spike light / Wall recessed light / Flexible LED strip light / Wall washers / Post top light LED	KLITE / HAVELLS / PHILIPS / BAJAJ / WIPRO / JAQUAR
156D	End line strainer for +ve suction / Double flange Ball type NRV / CI double flange butterfly valve	Zoloto / LAURITZ KNUDSEN ELECTRICAL AND AUTOMATION / Kirloskar
156E	Motor Actuated butterfly valve	RITETORK / LAURITZ KNUDSEN ELECTRICAL AND AUTOMATION / Leader / Kirloskar
156F	Float type point level sensor	RECKTRONIC Devices and Systems / Gems / Madison
156G	Outdoor type Wimax CPE stations	Siemens / Ubiquiti / Maksat Technologies Ltd / Sequans
156H	PN 1.6 rated CI _Yll type strainer for suction	Zoloto / Kirloskar / LAURITZ KNUDSEN ELECTRICAL AND AUTOMATION
156J	Bronze compact pressure reducing valve	Zoloto / Kirloskar / LAURITZ KNUDSEN ELECTRICAL AND AUTOMATION
FIRE FIGHTING		
157.	Firefighting equipment like hose reel, nozzles, couplings, valves, etc.	Safex, Cease fire, M/s Flame Guard Indus, M/s Nitin
157A.	Orifice Plate	Newage, AAAG, Minimax, Teleflo, Flowtech
157B.	Gas leak Detector	Honeywell, True Safe, LPG/ ProElite

PARTICULAR SPECIFICATIONS (Contd.../-)

157C.	Addressable Relay Module, Monitor Module, Isolator Module	Notifier, XLS-3000, IFC-JC
157D.	DC Power Supply	Notifier, XLS-3000, IFC-JC
157E.	Addressable Fire Fighter's Telephone Jack, Fire Fighter's Telephone Handset	Notifier, XLS-3000, IFC-JC
157F.	Digital Audio Amplifier	Notifier, XLS-3000, IFC-JC
157G.	Power Amplifier	Notifier, XLS-3000, IFC-JC, Honeywell
157H.	Multi-Tap Ceiling/ Wall Mount Speakers	Notifier, XLS-3000, IFC-JC, Honeywell
157J.	PA Rack for Power Amplifier	Walrack, Rittal, Ahuja
157K.	Hose Cabinet	Newage, AAAG, Minimax
157L.	Addressable Photoelectric	Notifier, XLS-3000, IFC-JC
157M.	Addressable Multi-criteria	Notifier, XLS-3000, IFC-JC
157N.	Heat Detector	Notifier, XLS-3000, IFC-JC, Honeywell
157O.	Addressable Manual Call Point	Notifier, XLS-3000, IFC-JC
157P.	Sounder cum Strobe	Notifier, XLS-3000, IFC-JC, Fire Finder, System Sensor
157Q.	Addressable Control Module for Sounders / Strobes / Sounder cum Strobes/Directional Sounder	Notifier, XLS-3000, IFC-JC
157R.	Remote response indicators	Honeywell, Agni
157S.	ICV / Alarm gong	HD Fire, Tyco, Viking
158.	Fire Alarm Panel	Notifier, New Age, Siemens, XLS-3000, IFC-JC
158A.	Network Repeater Panel	Notifier, XLS-3000, IFC-JC
158B.	Low Smoke Zero Halogen (LS0H) flame retardant fire alarm copper cable	Finolex, Polycab, RR Kabel
158C.	Pressure Switch	Danfoss, Potter, System Sensor
158D.	Pressure Gauge	L & T, Danfoss, Fiebig, H. Gure
158E.	Fire hydrant landing valve	Safex, Newage, Safe Pro, Safeguard Industries
158F.	Yard hydrant Post / Stand Post	Safex, Newage, Safe Pro, Safeguard Industries
158F.	Yard hydrant Post / Stand Post	Safex, Newage, Safe Pro, Safeguard Industries
158G.	Flow switch on sprinkler distribution header	Danfoss, Honeywell, Rapid Contro
159.	Higher Capacity Fire Extinguisher (Trolley Trailer/ Stud/ Vehicle mounted/ Portable Fire Extinguisher)	Vimal Fire Control Pvt Ltd, Safex, Minimax, Kalpex, Safeguard
160.	Fire hose delivery couplings, branch pipes, hand shower & nozzle spanners	Vimal Fire Control Pvt Ltd, Safex, Newage, Safe Pro, Safeguard Industries, Eversafe, Shah Bhogilal, HD Fire, Kalpex

PARTICULAR SPECIFICATIONS (Contd.../-)

	with all accessories	
160A.	Rubberised fabric reinforced rubber lined hose	Safex, Newage, Safe Pro, Safeguard Industries
160B.	Air Cushioning tank (Air vessel)	Sainath Fire, JMC Equipment Co, AN Exflame Fire Protection Pvt Ltd
160C.	Gun metal fire brigade inlet connection	Vintex Fire Protection, Safe Stakes Fire Safety Services, Fire Fighting India
160D.	Gun metal chrome finished Ball valves	Leader, Sant, Zoloto
161.	Fundamental requirement for stand post type water monitor for fire fighting (Water/ Foam/ DCP)	Vimal Fire Control Pvt Ltd
161A.	Glass-bulb type spray sprinklers - Pendent Sprinkler & Sidewall Sprinkler	Safex, Newage, Safe Pro, Safeguard Industries
161B.	S.S. Rosette	Shreeji Fire Safety, Qutak Security Devices, Safez Links
161C.	Stainless Steel Flexible Sprinkler pipe	Sadguru Safety Industries, Sai Fire Safety/ Easy Flex, Newage
161D	GI Duct (Pressurization System)	Ductofab , Techno duct , Rolastar, Allied Air, M K Enterprises, Hind fabricators & Engineers, Aircon Engineering Works, Unifrax India limited
161E	Flexible Duct Connectors	Cori, Resistoflex, Dunlop, Alfa Star
161F	GI Birdscreen	Jindal, TATA, API, Apollo, M K Enterprises, Hind fabricators & Engineers, Aircon Engineering Works, Unifrax India limited
<u>SOLAR WATER SYSTEM</u>		
162.	Solar Water System	Tata BP Solar System, BHEL, Best & Crompton Novel
<u>LIFT</u>		
163.	Lift	M/s KONE INDIA M/s SCHINDLER INDIA PVT LTD M/s MISTUBISHI ELEVATOR INDIA PRIVATE LIMITED M/s OTIS ELEVATOR COMPANY INDIA LTD

Notes:

1. Items shall be considered whichever is applicable only
2. Sources indicated are only for guidance and approval of the Garrison Engineer shall be taken in proper time before procurement of materials and its incorporation.
3. The above list is not exhaustive but indicative of all items required for work under the contract.
4. Sources of materials shall be as above or in the vicinity thereof. The tenderer shall ascertain the actual position/exact location of source before submitting his tender and no additional payment shall be made on account of misunderstanding of its distance from site of works. Contractor may bring material conforming to contract specifications from other sources without any price adjustment after obtaining written approval of the Garrison Engineer.
5. The tender shall amongst other things also ascertain all information such as royalties, taxes duties and other charges, etc. on the materials and no additional payment shall be made on account of the foregoing.

Signature of Contractor

AAD
for Accepting Officer

PARTICULAR SPECIFICATIONS (Contd.../-)

73. **LIST OF DRAWINGS** : Drawings forming part of these tender documents are laid hereinafter. Any drawings mentioned elsewhere in these tender documents and are not found enclosed the same shall form part of the tender documents. The tenderer may verify these drawings in the office of the Chief Engineer (A&N) Zone, Birchgunj, Junglighat PO, Port Blair-744 103 on any working day, during normal working hours on prior appointment. These drawings shall be deemed to be considered by the Tenderer before quoting the tender whether he actually verifies them or not. No claim whatsoever shall be entertained in this regard at later stages. **TD drawings which are not uploaded with the tender documents, the same shall be viewed /downloaded from the MES web site and deemed to be considered while quoting tender. The drawings given below are only for guidance and works shall be executed as per BOQ and as directed by GE.**

SL NO	DESCRIPTION	DRG NO	SHT NO	DATE	REV DATE
1	LIST OF DRAWINGS(LINE PLAN)	CE/SK/LD/2025/01	1/1	25 Aug 2025	
A	SITE PLAN				
2	SITE PLAN SHOWN B&R SERVICES	CE/SK/SP/2025/01	1/2	25 Aug 2025	
3	SITE PLAN SHOWN B&R SERVICES	CE/SK/SP/2025/01	2/2	25 Aug 2025	
B	ARCHITECTURAL WORKINGS DRAWINGS(LINE PLAN)				
1	SPECIALISED VEHICLE PARKING SHED & MAINTENANCE FACILITY(04 NOS) WITH A VEHICLE INSPECTION PIT, CCIS/CT20 STORAGE (AIR CONDITIONED), 04 NOS STORE ROOM & A/C PLANT ROOM/AHU BUILDING	CE/SK/2025/01	1/8	25 Aug 2025	
2	SPECIALISED VEHICLE PARKING SHED & MAINTENANCE FACILITY(04 NOS) WITH A VEHICLE INSPECTION PIT, CCIS/CT20 STORAGE (AIR CONDITIONED), 04 NOS STORE ROOM & A/C PLANT ROOM/AHU BUILDING	CE/SK/2025/01	2/8	25 Aug 2025	
3	SPECIALISED VEHICLE PARKING SHED & MAINTENANCE FACILITY(04 NOS) WITH A VEHICLE INSPECTION PIT, CCIS/CT20 STORAGE (AIR CONDITIONED), 04 NOS STORE ROOM & A/C PLANT ROOM/AHU BUILDING	CE/SK/2025/01	3/8	25 Aug 2025	
4	OFFICE SPACE WITH PARKING(G+1), GUARD ROOM, POL STORE, SENTRY BOX & WATCH TOWER	CE/SK/2025/01	4/8	25 Aug 2025	
5	SPECIALISED VEHICLE PARKING SHED & MAINTENANCE FACILITY(04 NOS) WITH A VEHICLE INSPECTION PIT, CCIS/CT20 STORAGE (AIR CONDITIONED), 04 NOS STORE ROOM & A/C PLANT ROOM/AHU BUILDING	CE/SK/2025/01	5/8	25 Aug 2025	
6	OFFICE SPACE WITH PARKING(G+1), GUARD ROOM, POL STORE, SENTRY BOX & WATCH TOWER	CE/SK/2025/01	6/8	25 Aug 2025	
7	SPECIALISED VEHICLE PARKING SHED & MAINTENANCE FACILITY(04 NOS) WITH A VEHICLE INSPECTION PIT, CCIS/CT20 STORAGE (AIR CONDITIONED), 04 NOS STORE ROOM & A/C PLANT ROOM/AHU BUILDING	CE/SK/2025/01	7/8	25 Aug 2025	
8	OFFICE SPACE WITH PARKING(G+1), GUARD ROOM, POL STORE, SENTRY BOX & WATCH TOWER	CE/SK/2025/01	8/8	25 Aug 2025	
9	DETAILS OF RETAINING WALL (DRAFT)	-	-	-	-

PARTICULAR SPECIFICATIONS (Contd.../-)

(D) <u>TD DRAWINGS</u>					
1	ARCHITECTURAL NOTES AND NORMS	CE/TD/2022/01	½ TO 2/2	17 Jan 2022	
2	MISCELLANEOUS DETAILS	CE/TD/2022/02	1/8 TO 8/8	17 Jan 2022	
3	TYPICAL DETAILS OF SOLID CORE MOULDED PVC DOOR	CE/TD/2022/04	1/3 TO 3/3	17 Jan 2022	
4	TYPICAL DETAILS OF ALUMINIUM DOOR	CE/TD/2024/01	1/5 TO 5/5	01 May 2024	
5	TYPICAL DETAILS OF ALUMINIUM SLIDING WINDOWS AND VENTILATORS	CE/TD/2024/03	¼ TO 4/4	12 Sep 2024	
6	TYPICAL DETAILS OF FLUSH DOOR WITH PRESSED STEEL FRAME	CE/TD/2024/04	1/5 TO 5/5	18 Sep 2024	
7	TYPICAL DETAILS OF CUPBOARD (CB)	CE/TD/2025/01	1/1	17 Jan 2025	
8	TYPICAL DETAILS OF STEEL DOOR FOR GARRAGE/SCOOTER & CYCLE SHED	CE/TD/2022/33	½ TO 2/2	17 Jan 2022	
9	TYPICAL DETAILS ALUMINIUM FALSE CEILING	CE/TD/2022/09	1/1	17 Jan 2022	
10	TYPICAL DETAILS OF BUILT IN WARDROBES-PROJECTED WITH PRESSED STEEL FRAME & STEEL SHUTTER	CE/TD/2022/11	1/3 to 3/3	17 Jan 2022	
11	TYPICAL DETAILS OF WARDROBES (BUILT-IN)	CE/TD/2022/12	1/3 to 3/3	17 Jan 2022	
12	TYPICAL DETAILS OF FIXING OF HDPE TANK OVER RCC ROOF SLAB	CE/TD/2024/05	1/1	18 Sep 2024	
13	TYPICAL DETAILS OF CRUMPLE SECTION	CE/TD/2022/23	½ to 2/2	17 Jan 2022	
14	HUME PIPE CULVERT WITH CLASS I BEDDING FOR HEIGHT OF FILL 1000	CE/TD/2022/13	1/1	17 Jan 2022	
15	ROAD, HARD STANDING, PCC FOOT PATH, DRAIN & FLOWER BED	CE/TD/2022/14	1/1	17 Jan 2022	
16	TYPICAL DETAILS OF MAN HOLES	CE/TD/2022/15	1/1	17 Jan 2022	
17	SEPTIC TANK FOR 10 TO 100 USERS	CE/TD/2022/16	1/1	17 Jan 2022	
18	TYPICAL DETAILS OF SOAKAGE PIT	CE/TD/2022/17	1/1	17 Jan 2022	
19	STEEL GATE, SECURITY FENCING, CONCERTINA COIL, CATTLE FENCING, TYPICAL DETAILS OF COMPOUND WALL	CE/TD/2022/18	1/5 to 5/5	17 Jan 2022	
20	DETAILS OF RCC POST WITH CHAIN LINK FENCING WITH ANGLE IRON SWAN NECK(2100 TO 2000)	CE/TD/2022/22	1/1	17 Jan 2022	
21	DETAILS OF CATTLE TRAP	TD/217	1/1	29 Mar 1991	20 Nov 2006
22	BUILT IN BOOK CASE WITH SLIDING GLASS SHUTTER (800 TO 1200)	TD/353	1/1	01 Jun 2002	
23	FILTER UNIT FOR RUN OFF RWH	CE/TD-381	1/1	18 Dec 2003	
24	TYPICAL DETAILS OF CULVERTS	TD/93	1/1	08 Feb 1985	20 Jul 1985
25	TYPICAL DETAILS OF STEEL LADDER	CE/TD/13/7	1/1	12 Sep 2024	
26	TYPICAL DETAILS OF GARBAGE BIN	CE/TD/2022/37	1/1	17 Jan 2022	

Signature of Contractor

AAD
For Accepting Officer

PARTICULAR SPECIFICATIONS (Contd.../-)

Appendix 'G'

(On Stamp Paper of value for Rs 100/-)

FORM OF GUARANTEE CERTIFICATE FOR ANTI-TERMITE TREATMENT WORK

CA No :
Name of Work :
Date of commencement :
Date of completion :
Name of the contractor :

We, the M/S _____ do here by undertake that the Pre construction **Anti-termite treatment** carried out to the buildings included in the above Contract is guaranteed for a period of ten years from the certified date of completion of the work. If during this guarantee period of **Ten** years, any defect is noticed in the work carried out by us, the same will be rectified by us without any extra cost to the department to the entire satisfaction of the **Garrison Engineer (I) Campbell Bay** at our own risk and cost.

Date : _____

M/S _____

PARTICULAR SPECIFICATIONS (Contd.../-)

Appendix 'I'

(On Stamp Paper of value for Rs 100/-)

FORM OF GUARANTEE CERTIFICATE FOR WATER PROOFING TREATMENT

CA No :
Name of Work :
Date of commencement :
Date of completion :
Name of the contractor :

We, the M/S _____ do here by undertake that the water proofing treatment carried out to the buildings included in the above Contract is guaranteed for a period of ten years from the certified date of completion of the work. If during this guarantee period of **Ten** years, any defect is noticed in the work carried out by us, the same will be rectified by us without any extra cost to the department to the entire satisfaction of the **Garrison Engineer (I) Campbell Bay** at our own risk and cost.

PARTICULAR SPECIFICATIONS (Contd.../-)

Appendix ‘J’

(On Stamp Paper of value for Rs 100/-)

FORM OF GUARANTEE CERTIFICATE ANTI FUNGAL PAINT

CA No :
Name of Work :
Date of commencement :
Date of completion :
Name of the contractor :

We, the M/S _____ do here by undertake that the external treatment of **Anti-fungal paint** carried out to the buildings included in the above Contract is guaranteed for a period of **03 (Three) years** from the certified date of completion of the work. If during this guarantee period of **03 (Three) years**, any defect is noticed in the work carried out by us, the same will be rectified by us without any extra cost to the department to the entire satisfaction of the **Garrison Engineer (I) Campbell Bay** at our own risk and cost.

Date : _____ M/S _____

S M CONSULTANTS

INTERIM REPORT ON
SUB SOIL INVESTIGATION

NAME OF WORK:

SOIL INVESTIGATION FOR CONSTRUCTION OF DEFICIENT OTM
ACCN FOR INS BAAZ AND PROVISION OF PERMANENT DSC ACCN
AND SECURITY INFRASTRUCTURE AT INS BAAZ AND PROVISION OF
NEW DISPERSAL WITH TWO TAXITRACK AT INS BAAZ
CAMPBELL BAY.

SUB NAME OF WORK:

SOIL INVESTIGATION FOR CONSTRUCTION OF DEFICIENT OTM ACCN
AT INS BAAZ CAMPBELL BAY

(B.H NO-1 & B.H NO-5)

13 . MARCH. 2018

Submitted to:

GARRISON ENGINEER CAMPBELL BAY,
CAMPBELL BAY -PO,
GREAT NICOBAR.

Report prepared by



M/S S.M. CONSULTANTS
PLOT NO: 170/2/24, SIBAJEE HOUSING COLONY
BEHIND MARUTI SERVICE STATION, GARACHARMA-PO
PORT BLAIR-744105

CONTENT

Sl.	Subject	Page No.
1	Introduction	1
2	Field Tests	1
3	Information about Laboratory Testing	1
4	Finding After Test	2
5	Discussion of Findings & Results	2
6	Abstract of Bearing Capacity	4
7	Conclusion & Recommendations	6
8	Location Map	8
	Annexure	9
A	Bore Logs	10
B	Laboratory Test Results	15
C	UDS graphs	20
C	Chemical test of water	28

1.0 INTRODUCTION

The Garrison Engineer, Campbell Bay, Great Nicobar has entrusted sub soil investigation works required for the work Soil investigation for construction of deficient OTM accommodation for INS Baaz . The said sub soil investigation works thus entrusted to M/S S.M. Consultants, Port Blair consist of field as well as laboratory tests. The works have accordingly been taken up as under.

2.0 FIELD TESTS

The following in-situ tests have been conducted

- Boring works including Standard Penetration Tests (SPT) as per IS 9640:1980 & IS 2131:1988.
- Collection of UDS as well as disturbed soil samples from various depths from each of the bore holes. (IS10108:1988).
- Observation of Ground water table (GWT) in the bore holes.
- Preparation of location map of testing site.

3.0 LABORATORY TESTS

The soil samples obtained from the borings are further tested in the testing laboratory at Port Blair in accordance with relevant Indian Standard Code of Practices and the geotechnical properties are obtained for use in arriving at the safe bearing capacity of the founding strata. The results so obtained have been brought out in a comprehensive manner according to the codes for use by the Design Engineer during finalization of foundation of the structure.

In this case the following tests have been conducted in the laboratory at Port Blair according to Indian Standards mentioned below:

Sl. No.	Laboratory tests	IS Codes
1	Grain size analysis	IS: 2720(part-4)
2	Index properties	IS: 2720(part-5)
3	Field moisture content	IS: 2720(part-2)
4	Triaxial shear test	IS: 2720(part-11)
5	Specific gravity	IS: 2720(part-3)
6	Free swell Index	IS: 2720(part-40)
7	Bulk density	---

8	Permeability	IS: 2720(part-17)
9	Consolidation	IS: 2720(part-15)

3. ANALYSIS OF SOIL PROFILE

The findings of the investigation test result of the soil samples collected during boring from the BH No - 1 to 5 conducted for Soil investigation for construction of deficient OTM accommodation for INS BAAZ ,Campbell bay under is as follows.

B.H. No. -1. Admin Block (Double stored)

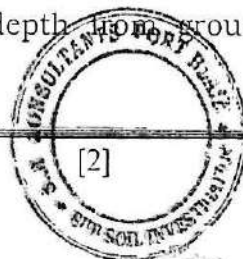
- It is seen that from N.G.L. to 7.5 m depth a medium plastic, low to moderate expansive & medium to hard consistency silt & clay with low compressibility stratum exists, whose N value from SPT are varied from 8 to 32 .At 1.5m and 4.5m depth UDS were collected.
- From 7.5 m to 10.0 m depth broken weathered rock pieces were collected, whose field SPT N value was found to be more than 50.
- Water table was at 1.1 m depth from ground level after 24 hours of the exploration.

B.H. No. -2. Garage (Single stored)

- It is seen that from N.G.L. to 6.6 m depth, a medium plastic, low expansive & stiff to hard consistency silt & clay with low compressible stratum exists, whose N value from SPT are varied from 20 to more than 50 .At 1.5m and 4.5m depth UDS were collected.
- From 6.6m to 10.0 m depth broken weathered rock pieces were collected, whose field SPT N value was found to be more than 50.
- Water table was at 1.2 m depth from ground level after 24 hours of the exploration.

B.H. No. -3. MI Room (Single stored)

- It is seen that from N.G.L. to 7.5 m depth, medium plastic, low expansive & stiff to hard consistency silt and clay with low compressibility stratum exists, whose N value from SPT are varied from 14 to 83 .At 1.5m and 4.5m depth UDS were collected.
- From 7.5m to 10.0 m depth broken weathered rock pieces were collected, whose field SPT N value was found to be more than 50.
- Water table was at 1.5 m depth from ground level after 24 hours of the exploration.

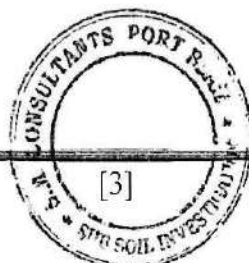


B.H. No. -4. Library (Single stored)

- a) It is seen that from N.G.L. to 6.5 m depth medium plastic, low expansive & stiff to hard consistency silt and clay with low compressibility stratum is exists, whose N value from SPT are varied from 15 to more than 50 .At 1.5m depth UDS was collected.
- b) From 6.5m to 10.0 m depth broken weathered rock pieces were collected, whose field SPT N value was found to be more than 50.
- c) Water table was at 1.5 m depth from ground level after 24 hours of the exploration.

B.H. No. -5. Armory (Single stored)

- a) It is seen that from N.G.L. to 1.5 m depth a medium plastic & low expansive clayey sand stratum exists from which D.S was collected at 0.5 m depth.
- b) From 1.5 m to 5.0 m depth a medium plastic, low expansive & very stiff to hard consistency silt & clay with low compressibility stratum exists, whose N value from SPT are varied from 19 to 38. At 1.5m depth UDS was collected .
- c) From 5.0 m to 6.5 m depth a medium plastic, low expansive & dense compacted clayey sand stratum exists, whose field SPT N value was found to be 54 at 5.0 m depth.
- d) From 6.5 m to 8.0 m depth, a medium plastic, low expansive & hard consistency silt & clay with low compressibility stratum exists, whose field SPT N value was found to be 67 at 6.5 m depth. At 7.5m depth UDS was not possible to collect the strata.
- e) From 8.0 m to 10.0 m depth, a medium plastic, low expansive & dense compacted clayey gravel stratum exists, whose field SPT N value was found to be 73 at 8.0 m depth.
- f) At 10.0 m depth, a medium plastic, low compressible & hard consistency silt & clay with low compressibility stratum exists, whose field SPT N value was found to be 80 at 10.0 m depth.
- g) Water table was at 2.1 m depth from ground level after 24 hours of the exploration.



4. ABSTRACT OF BEARING CAPACITY

Considering square and rectangular footing of different size the net safe bearing capacity and settlements of the soils are given below.

Borehole ref.	Depth in m.	Type of sample collected	Size of footing in m B X L	NSBC in T/m^2	Gross SBC in T/m^2	Settlement In mm	SBP in T/m^2 (considering safe settlement as 75mm)
BH 1	1.5	UDS	1.5 x 1.5	8.49	9.96	46.8	8.49
			1.5 x 2.5	7.34	8.81	50.9	7.34
			2.0 x 2.5	7.30	8.77	58.6	7.30
			2.0 x 3.0	7.14	8.61	62.8	8.53
	2.0	SPT	1.5 x 1.5	9.08	11.08	33.6	9.08
			1.5 x 2.5	7.82	9.82	37.2	7.82
			2.0 x 2.5	7.67	9.67	42.9	7.67
			2.0 x 3.0	7.47	9.47	45.4	7.47
	2.5	SPT	1.5 x 1.5	9.55	12.05	29.9	9.55
			1.5 x 2.5	8.23	10.73	31.7	8.23
			2.0 x 2.5	7.99	10.49	37.8	7.99
			2.0 x 3.0	7.78	10.28	40.1	7.14
BH 2	1.5	UDS	1.5 x 1.5	18.42	19.98	78.3	17.63
			1.5 x 2.5	15.95	17.51	84.8	14.11
			2.0 x 2.5	15.81	17.37	100.4	11.80
			2.0 x 3.0	15.46	17.02	107.0	10.84
	2.0	SPT	1.5 x 1.5	22.69	24.69	63.3	22.69
			1.5 x 2.5	19.55	21.55	69.6	19.55
			2.0 x 2.5	19.18	21.18	83.2	17.29
			2.0 x 3.0	18.68	20.68	87.4	16.02
	2.5	SPT	1.5 x 1.5	23.87	26.37	57.1	23.87
			1.5 x 2.5	20.56	23.06	60.3	20.56
			2.0 x 2.5	19.98	22.48	74.3	19.98
			2.0 x 3.0		21.96	78.3	18.65



Borehole no.	Depth in m.	Type of sample collected	Size of boring in m B & L	WCBT in T/m ²	Correct SPT in T/m ²	Settlement in mm	SPT in T/m ² considering safe settlement as 75mm)
BH 3	1.5	UDS	1.5 x 1.5	15.76	15.99	65.4	11.44
			1.5 x 2.5	13.78	14.47	75.4	11.38
			2.0 x 2.5	12.19	14.73	93.0	11.34
			2.0 x 3.0	12.89	15.55	91.0	10.63
	2.0	SPT	1.5 x 1.5	15.88	17.88	50.0	15.88
			1.5 x 2.5	13.68	15.68	54.1	13.68
			2.0 x 2.5	13.42	15.42	64.0	13.42
			2.0 x 3.0	13.08	15.08	67.5	13.08
	2.5	SPT	1.5 x 1.5	16.71	19.21	44.2	16.71
			1.5 x 2.5	14.40	16.90	46.8	14.4
			2.0 x 2.5	13.98	16.48	56.9	13.98
			2.0 x 3.0	13.62	16.12	60.1	13.62
BH 4	1.5	UDS	1.5 x 1.5	16.47	18.05	77.3	15.89
			1.5 x 2.5	14.25	15.83	84.2	15.70
			2.0 x 2.5	14.13	15.71	99.1	10.67
			2.0 x 3.0	13.82	15.40	105.9	10.60
	2.0	SPT	1.5 x 1.5	17.02	19.02	34.7	17.02
			1.5 x 2.5	14.66	16.66	62.2	14.66
			2.0 x 2.5	14.38	16.38	73.6	14.38
			2.0 x 3.0	14.01	16.01	77.3	13.96
	2.5	SPT	1.5 x 1.5	17.9	20.40	50.7	17.9
			1.5 x 2.5	15.42	17.92	53.6	15.42
			2.0 x 2.5	14.98	17.48	65.4	14.98
			2.0 x 3.0	14.59	17.09	69.0	14.59



Borehole ref.	Depth in m.	Type of sample collected	Size of footing in m B X L	NSBC in T/m^2	Gross SBC in T/m^2	Settlement In mm	SBP in T/m^2 (considering safe settlement as 75mm)
BH 5	1.5	UDS	1.5 x 1.5	17.11	18.69	75.9	16.90
			1.5 x 2.5	14.83	16.41	82.3	13.52
			2.0 x 2.5	14.71	16.29	97.2	11.35
			2.0 x 3.0	14.38	15.96	103.6	10.41
	2.0	SPT	1.5 x 1.5	21.56	23.56	59.5	21.56
			1.5 x 2.5	18.57	20.57	65.4	18.57
			2.0 x 2.5	18.22	20.22	78.0	17.52
			2.0 x 3.0	17.74	19.74	82.0	16.23
	2.5	SPT	1.5 x 1.5	22.68	25.18	53.6	22.68
			1.5 x 2.5	19.54	22.04	56.6	19.54
			2.0 x 2.5	18.98	21.48	69.6	18.98
			2.0 x 3.0	18.48	20.98	73.3	18.48

7.0 CONCLUSION & RECOMMENDATION

The following conclusions, suggestions and remarks are made based on the available test data and sub-soil profiles as per bore logs contained in this report.

a) For the location of BH1 (Admin Block, Double Stored building)

- ⊕ Based on the provision of proposed structure and properties of the sub-strata present at Site, open foundation could be suggested at 2.5 m depth below the E.G.L. For safety precautions, Soil from 2.5m to 3.5m depth should be removed and replaced with good soil & compacted .

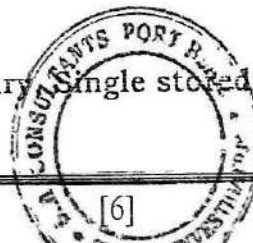
b) For the location of BH 2 (Garage, Single stored building)

- ⊕ Based on the provision of proposed structure and properties of the sub-strata present at Site, open foundation could be suggested at 1.5 m depth below the E.G.L .

c) For the location of BH 3 (MI Room, Single stored building)

- ⊕ Based on the provision of proposed structure and properties of the sub-strata present at Site, open foundation could be suggested at 1.5 m depth below the E.G.L .

d) For the location of BH 4 (Library Single stored building)



- ↓ Based on the provision of proposed structure and properties of the sub-strata present at Site, open foundation could be suggested at 1.5 m depth below the E.G.L .

e) For the location of BH 4 (Armory, Single stored building)

- ↓ Based on the provision of proposed structure and properties of the sub-strata present at Site, open foundation could be suggested at 1.5 m depth below the E.G.L .

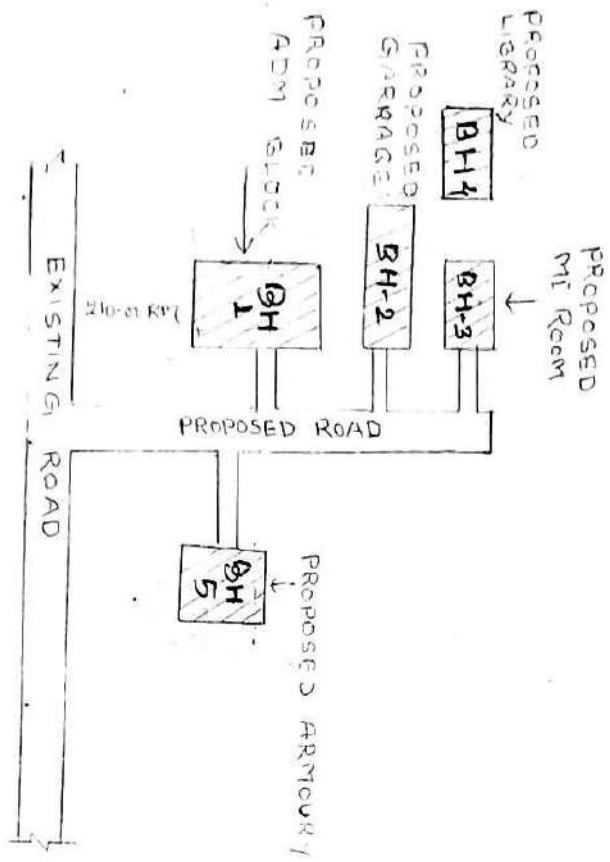
NOTE:

1. Footing should be placed on 150 mm thick PCC (1:3:6) and this 150 mm thick PCC shall placed on the 500 mm thick compacted coarse sand layer (sand cushion).
2. Suitable plinth protection works at the finished ground level may also be provided for watch tower so that ingress of water to foundation could be avoided. Adequate surface drains should be provided.
3. This general recommendation is not structure specific and the designer is therefore at liberty to decide the depth and other parameters basing on the sub surface characteristics made available in this report and the type of foundation intended.


For S.M. CONSULTANTS



REISED SITE PLAN: CONCEPT OF DEFICIENT OTTI ACEN AT 1113 11AAZ



	PROPOSED BLDGS	LENGTH		WIDTH		HEIGHT		LEGEND
		RVL	RVL	RVL	RVL	RVL	RVL	
1	ADM BLOCK [B15]	54.35	12.10	7.40	////	////	////	
2	ARMOURY	32.05	12.10	3.20	////	////	////	
3	GARAGES	23.75	6.10	3.20	////	////	////	
4	MI ROOM	13.55	29.15	3.20	////	////	////	
5	LIBRARY	17.10	8.20	3.20	////	////	////	

05
END

EXISTING RUNWAY

23
END

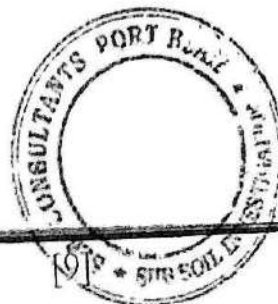


4.4.00
PCL 8/8

11.1.00
11.1.00

GE

A N N E X U R E



A.1 BORE LOGS(BH-01)

Name of consultants: S.M. CONSULTANTS.

Bored for: Garrison Engineer, Campbell Bay

Sub Name of Work: Soil investigation for Construction of deficient OTM Accn at INS Baaz

Proposed for Admin Block.

Ground surface level: NA

Type of boring: Rotary boring

Diameter of boring: 150mm


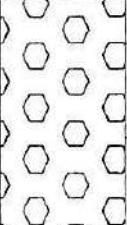
Ground water table: 1.1m

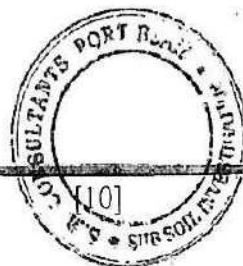
Boring No. : 01

Location -INS Baaz, Campbell Bay

Date of starting: 13/12/2017

Date of completion: 14/12/2017

Sl. No	Thickness of soil strata in mt.	Graphical representation of soil strata from lab observation	Depth from ground level in mt.	R.L. in mt.	Type of soil strata from visual observation.	Type of sample collected	No. of blows for 1st 15 cm penetration (1)	No. of blows for 2nd 15 cm penetration (2)	No. of blows for 3rd 15 cm penetration (3)	S.P.T. value = 2+3 = N	Penetration of soil strata in mt.	Remarks
01	7.5		0.0	---	Silt & Clay with Low Compressibility	D.S	---	---	---	---	---	D.S was collected
02			0.5	---		U.D.S	---	---	---	---	0.45	
03			1.5	---		S.P.T	04	04	04	08	0.45	U.D.S was collected
04			2.0	---		S.P.T	04	05	06	11	0.45	
05			3.5	---		U.D.S	---	---	---	---	0.45	
06			4.5	---		S.P.T	04	06	07	13	0.45	U.D.S was collected
07			5.0	---		S.P.T	09	15	17	32	0.45	
08	2.5		6.5	---	Broken weathered rock pieces	U.D.S	---	---	---	---	0.10	Due to broken rock UDS was not possible to collected
09			7.5	---		S.P.T	>50	---	---	---	0.05	Rock sample collected by barrel
10			8.0	---		S.P.T	>50	---	---	---	0.10	Rock sample collected by barrel
11			9.0	---		S.P.T	>50	---	---	---	0.10	Rock sample collected by barrel
			10.0	---								



A.2 BORE LOGS(BH-02)

Name of consultants: S.M. CONSULTANTS.

Bored for: Garrison Engineer, Campbell Bay

Sub Name of Work: Soil investigation for Construction of deficient OTM Arca at INS Baaz
Proposed for Garage.

Ground surface level: NA

Type of boring: Rotary boring

Diameter of boring: 150mm

Ground water table: 1.2m

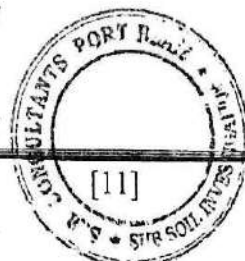
Boring No. : 02

Location -INS Baaz,Campbell Bay

Date of starting: 15/12/2017

Date of completion: 16/12/2017

Sl. No	Thickness of soil strata in mt.	Graphical representation of soil strata from lab observation	Depth from ground level in mt.	R.L. in mt.	Type of soil strata from visual observation.	Type of sample collected	No. of blows for 1st 15 cm penetration(1)	No. of blows for 2nd 15 cm penetration(2)	No. of blows for 3rd 15 cm penetration(3)	S.P.T. value = 2+3 = N	Penetration of soil strata in mt.	Remarks
01	6.60		0.0	---	Silt & Clay with Low Compressibility	D.S	---	---	---	---	---	D.S was collected
02			0.5	---		U.D.S	---	---	---	---	0.45	
03			1.5	---		S.P.T	04	07	13	20	0.45	U.D.S was collected
04			2.0	---		S.P.T	09	14	17	31	0.45	
05			3.5	---		U.D.S	---	---	---	---	0.45	
06			4.5	---		S.P.T	15	17	25	42	0.45	U.D.S was collected
07			5.0	---		S.P.T	50	---	---	>50	0.10	
08	3.4		6.5	---	Broken weathered rock pieces	S.P.T	50	---	---	>50	0.05	Rock sample collected by barrel
09			6.6	---		S.P.T	50	---	---	>50	0.05	Rock sample collected by barrel
10			8.0	---		S.P.T	50	---	---	>50	0.05	Rock sample collected by barrel
11			9.0	---		S.P.T	50	---	---	>50	0.10	Rock sample collected by barrel
			10.0	---								



S M CONSULTANTS

A.3 BORE LOGS(BH-03)

Name of consultants: S.M. CONSULTANTS

Bored for: Garrison Engineer, Campbell Bay

Sub Name of Work: Soil Investigation for Construction of deficient OTM Accn at INS Baaz

Proposed for MI Room.

Ground surface level: NA

Type of boring: Rotary boring

Diameter of boring: 150mm


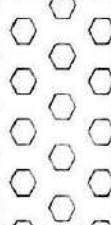
Ground water table: 1.5m

Boring No. : 03

Location - INS Baaz, Campbell Bay

Date of starting: 17/12/2017

Date of completion: 18/12/2017

Sl. No	Thickness of soil strata in mt.	Graphical representation of soil strata from lab observation	Depth from ground level in mt.	R.L. in mt.	Type of soil strata from visual observation.	Type of sample collected	No. of blows for 1st 15 cm penetration(1)	No. of blows for 2nd 15 cm penetration(2)	No. of blows for 3rd 15 cm penetration(3)	S.P.T. value = 2+3 = N	Penetration of soil strata in mt.	Remarks
01	7.5		0.0	---	Silt & Clay with Low Compressibility	D.S	---	---	---	---	---	D.S was collected
02			0.5	---		U.D.S	---	---	---	---	0.45	
03			1.5	---		S.P.T	03	05	09	14	0.45	
04			2.0	---		S.P.T	07	10	14	24	0.45	
05			3.5	---		U.D.S	---	---	---	---	0.45	
06			4.5	---		S.P.T	11	17	28	45	0.45	
07			5.0	---		S.P.T	27	35	48	83	0.45	
08	2.5		6.5	---	Broken weathered rock pieces	U.D.S /DS	---	---	---	---	0.02	Due to broken rock UDS was not possible to collected
09			7.5	---		S.P.T	>50	---	---	---	0.05	Rock sample collected by barrel
10			8.5	---		S.P.T	>50	---	---	---	0.10	Rock sample collected by barrel
			10.0	---								



A.4 BORE LOGS(BH-04)

Name of consultants: S.M. CONSULTANTS.

Bored for: Garrison Engineer, Campbell Bay

Sub Name of Work: Soil investigation for Construction of deficient OTM Accn at INS Baaz
Proposed for Library.

Ground surface level: NA

Type of boring: Rotary boring

Diameter of boring: 150mm


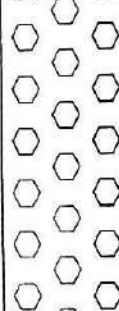
Ground water table: 1.5m

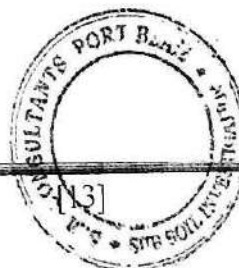
Boring No. : 04

Location -INS Baaz,Campbell Bay

Date of starting: 18/12/2017

Date of completion: 19/12/2017

Sl. No	Thickness of soil strata in mt.	Graphical representation of soil strata from lab observation	Depth from ground level in mt.	R.L. in mt.	Type of soil strata from visual observation.	Type of sample collected	No. of blows for 1st 15 cm penetration(1)	No. of blows for 2nd 15 cm penetration(2)	No. of blows for 3rd 15 cm penetration(3)	S.P.T. value = 2+3 = N	Penetration of soil strata in mt.	Remarks
01	6.6		0.0	---	Silt & Clay with Low Compressibility	D.S	---	---	---	---	---	D.S was collected
02			0.5	---		U.D.S	---	---	---	---	0.45	
03			1.5	---		S.P.T	05	07	08	15	0.45	U.D.S was collected
04			2.0	---		S.P.T	08	20	40	60	0.45	
05			3.5	---		U.D.S	---	---	---	---	0.45	U.D.S not possible to collected,so DS was collected
06			4.5	---		S.P.T	21	30	43	73	0.45	
07	3.4		5.0	---	Broken weathered rock pieces	S.P.T	50	---	---	>50	0.10	
08			6.5	---		S.P.T	50	---	---	>50	0.02	Rock sample collected by barrel
09			8.0	---		S.P.T	50	---	---	>50	0.01	Rock sample collected by barrel
10			9.0	---		S.P.T	50	---	---	>50	0.00	Rock sample collected by barrel
11			10.0	---		S.P.T	50	---	---	>50		



S M CONSULTANTS

A.5 BORE LOGS(BH-05)

Name of consultants: S.M. CONSULTANTS.

Bored for: Garrison Engineer, Campbell Bay

Sub Name of Work: Soil investigation for Construction of deficient OTM Accn at INS Baaz

Proposed for Armory.

Ground surface level: NA

Boring No. : 05

Type of boring: Rotary boring




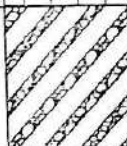
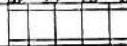
Diameter of boring: 150mm

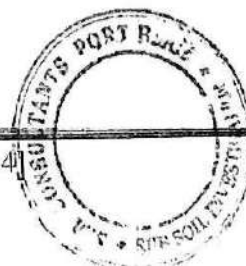
Location: INS Baaz, Campbell Bay

Ground water table: 2.1m

Date of starting: 20/12/2017

Date of completion: 21/12/2017

Sl. No	Thickness of soil strata in mt.	Graphical representation of soil strata from lab observation	Depth from ground level in mt.	R.L. in mt.	Type of soil strata from visual observation.	Type of sample collected	No. of blows for 1st 15 cm penetration(1)	No. of blows for 2nd 15 cm penetration(2)	No. of blows for 3rd 15 cm penetration(3)	S.P.T. value = 2+3 = N	Penetration of soil strata in mt.	Remarks
01	5.0		0.0	---	Silt & Clay with Low Compressibility	D.S	---	---	---	---	---	D.S was collected
02			0.5	---		U.D.S	---	---	---	---	0.45	
03			1.5	---		S.P.T	07	09	10	19	0.45	U.D.S was collected
04			2.0	---								
05			3.5	---		S.P.T	11	17	21	38	0.45	
06			4.5	---		U.D.S /D.S	---	---	---	---	0.45	U.D.S not possible to collected,so DS was collected
07	1.5		5.0	---	Clayey Sand	S.P.T	21	28	36	54	0.45	
08	2.0		6.5	---	Silt & Clay with Low Compressibility	U.D.S /D.S	---	---	---	---	0.45	U.D.S not possible to collected,so DS was collected
09			7.5	---		S.P.T	24	32	41	73	0.45	
10	1.5		8.0	---	Clayey Gravel	S.P.T	28	36	44	80	0.45	
11	0.45		10.0	---	Silt & Clay with Low Compressibility							



S M CONSULTANTS

B.1. LABORATORY TEST RESULT (BH-1)

B.1. NAME OF WORK: SOIL INVESTIGATION FOR CONSTRUCTION OF DEFICIENT OTM ACCN AT INS BAAZ.

TEST CONDUCTED AS PER IS : 2720 (Pt. II, Pt. III, Pt. IV, Pt. V, Pt. XI / Pt. XIII, Pt. XXXX) AND IS: 1498 - 1970

Sl No	Samples (soil/rock) collected at	Type of sample collection	Grain size analysis					Atterberg's Limits			Shrinkage Limit in %	Field Moisture Content in %	Wet bulk density in g/cc	Dry density in g/cc	Cohesion (c) Kg/cm ²	Angle of shearing resistance(ϕ) in degree	Specific gravity	Void ratio	D.F.S. In %	Consolidation test (Cc)	Field S.P.T Value (N)	Group of soil	[Permeability (KT in cm/sec)]
			Fine Gravel In % (20mm to 4.75mm)	Coarse Sand In % (4.75mm to 2.0mm)	Medium Sand In % (2.0mm to 0.425mm)	Fine Sand in % (0.425mm to 0.075mm)	Silt & Clay in % (0.075mm to 0.001mm)	Liquid Limit In %	Plastic Limit In %	Plasticity Index in %													
1	At 0.5m depth	D.S	0.90	0.08	1.02	20.45	77.55	32	18	14	8	21.470	1.892	1.558	0.30	6	2.71	0.74	10	0.198	8	CL	0.7x10 ⁻⁶
2	At 1.5m depth	UDS	1.02	0.21	2.34	19.57	76.86	32	18	14	8	21.470	1.892	1.558	0.30	6	2.71	0.74	10	0.198	8	CL	0.7x10 ⁻⁶
3	At 2.0m depth	SPT	3.44	1.98	2.33	28.94	63.31	30	18	12	7	21.470	1.892	1.558	0.30	6	2.69	0.74	10	0.198	8	CL	0.7x10 ⁻⁶
4	At 3.5m depth	SPT	3.65	1.31	2.59	16.49	75.97	31	17	14	8	21.470	1.892	1.558	0.30	8	2.70	0.69	10	0.189	11	CL	0.7x10 ⁻⁶
5	At 4.5m depth	UDS	1.47	1.22	1.91	14.37	81.26	31	18	13	8	21.470	1.892	1.558	0.30	8	2.70	0.69	10	0.189	13	CL	0.7x10 ⁻⁶
6	At 5.0m depth	SPT	1.67	2.09	2.50	1.39	92.36	33	19	14	8	21.470	1.892	1.558	0.30	8	2.71	0.69	10	0.189	32	CL	0.7x10 ⁻⁶
7	At 6.5m depth	SPT	2.95	4.17	10.10	7.54	75.25	34	18	16	9	21.470	1.892	1.558	0.30	8	2.71	0.69	10	0.189	32	CL	0.7x10 ⁻⁶
8	At 7.5m depth	UDS/DS	1.85	3.19	8.58	8.14	78.24	33	18	15	9	21.470	1.892	1.558	0.30	8	2.71	0.69	10	0.189	20	CL	0.7x10 ⁻⁶
9	From 7.5m to 8.0m depth	SPT	BROKEN WETTERED ROCK PIECES COLLECTED																				
10	From 8.0m to 9.0m depth	SPT	BROKEN WETTERED ROCK PIECES COLLECTED																				
11	From 9.0m to 10.0m depth	SPT	BROKEN WETTERED ROCK PIECES COLLECTED																				



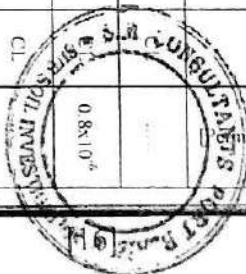
S M CONSULTANTS

B.2. LABORATORY TEST RESULT (BH-2)

B.1. NAME OF WORK: SOIL INVESTIGATION FOR CONSTRUCTION OF DEFICIENT OTM ACCN AT INS BAAZ.

TEST CONDUCTED AS PER IS: 2720 (Pt. II, Pt. III, Pt. IV, Pt. V, Pt. XI/ Pt. XIII, Pt. XXX) AND IS: 1498 - 1970

Sl No	Samples (soil/rock) collected at	Type of sample collection	Grain size analysis					Atterberg's Limits			Sinkage Limit in %	Field Moisture Content in %	Wet bulk density in g/cc	Dry density in g/cc	Cohesion (c) Kg/cm ²	Angle of shearing resistance(ϕ) in degree	Specific gravity	Void ratio	D.F.S. in %	Consolidation test (Cc)	Field SPT. Value (N)	Group of soil	Permeability [KT in cm/sec]
			Fine Gravel In % (20mm to 4.75mm)	Coarse Sand In % (4.75mm to 2.0mm)	Medium Sand In % (2.0mm to 0.425mm)	Fine Sand in % (0.425mm to 0.075 mm)	Silt & Clay in % (0.075mm to 0.001mm)	Liquid Limit In %	Plastic Limit In %	Plasticity Index in %													
1	At 0.5m depth	D.S	0.00	0.10	1.88	18.07	79.95	32	17	15	8	19.847	1.982	1.653	0.40	10	2.71	0.64	10	0.189	20	CL	0.8x10 ⁻⁶
2	At 1.5m depth	UDS	1.14	1.05	3.24	14.74	79.83	31	17	14	7	19.847	1.982	1.653	0.40	10	2.71	0.64	10	0.189	20	CL	0.8x10 ⁻⁶
3	At 2.0m depth	SPT	2.07	2.66	5.52	12.26	77.49	31	17	14	7	19.847	1.982	1.653	0.40	10	2.70	0.64	10	0.189	20	CL	0.8x10 ⁻⁶
4	At 3.5m depth	SPT	0.00	1.38	7.40	6.58	84.64	34	17	17	10	19.847	1.982	1.653	0.40	10	2.72	0.64	19	0.189	31	CL	0.8x10 ⁻⁶
5	At 4.5m depth	UDS	6.88	4.18	10.91	8.20	69.83	31	18	13	7	18.221	1.994	1.686	0.35	11	2.71	0.61	14	0.189	42	CL	0.5x10 ⁻⁶
6	At 5.0m depth	SPT	12.23	6.94	11.73	9.85	59.26	30	17	13	7	18.221	1.994	1.686	0.35	11	2.70	0.61	10	0.189	42	CL	0.5x10 ⁻⁶
7	At 6.5m depth	SPT	14.00	7.89	10.12	6.79	61.20	31	18	13	8	18.221	1.994	1.686	0.35	11	2.70	0.61	10	0.189	42	CL	0.5x10 ⁻⁶
8	From 6.0m to 8.0m depth	SPT	BROKEN WETTERED ROCK PIECES COLLECTED																				
9	From 8.0m to 9.0m depth	SPT	BROKEN WETTERED ROCK PIECES COLLECTED																				
10	From 9.0m to 10.0m depth	SPT	BROKEN WETTERED ROCK PIECES COLLECTED																				

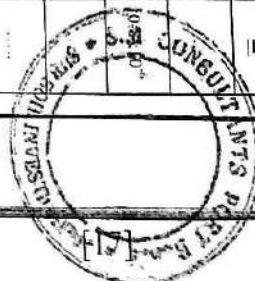


B.3. LABORATORY TEST RESULT (BH-3)

B.1. NAME OF WORK: SOIL INVESTIGATION FOR PROPOSED ADM BLOCK.

TEST CONDUCTED AS PER IS : 2720 (Pt. II, Pt. III, Pt. IV, Pt. V, Pt. XI / Pt. XIII, Pt. XXXX) AND IS: 1498 - 1970

Sl No	Samples (soil/rock) collected at	Type of sample collection	Grain size analysis					Atterberg's Limits			Shrinkage Limit In %	Field Moisture Content in %	Wet bulk density in g/cc	Dry density in g/cc	Cohesion (c) Kg/cm ²	Angle of shearing resistance(ϕ) in degree	Specific gravity	Void ratio	D.F.S. In %	Consolidation test (Cc)	Field S.P.T. Value (N)	Group of soil.	[Permeability [KT in cm/sec]
			Fine Gravel In % (20mm to 4.75mm)	Coarse Sand In % (4.75mm to 2.0mm)	Medium Sand In % (2.0mm to 0.425mm)	Fine Sand in % (0.425mm to 0.075 mm)	Silt & Clay in % (0.075mm to 0.001mm)	Liquid Limit In %	Plastic Limit In %	Plasticity Index in %													
1	At 0.5m depth	D.S	9.52	0.72	2.04	33.20	54.52	30	17	13	8	17.248	1.954	1.649	0.35	9	2.7	0.64	10	0.18	14	CL	0.68x10 ⁻⁶
2	At 1.5m depth	UDS	13.76	1.32	3.87	27.43	53.62	30	16	14	8	17.248	1.954	1.649	0.35	9	2.7	0.64	10	0.18	14	CL	0.68x10 ⁻⁶
3	At 2.0m depth	SPT	24.01	1.87	1.56	22.05	50.51	30	16	14	8	17.248	1.954	1.649	0.35	9	2.7	0.64	10	0.18	24	CL	0.68x10 ⁻⁶
4	At 2.5m depth	SPT	2.78	3.18	5.93	18.34	69.77	31	17	14	9	16.245	1.972	1.696	0.40	11	2.71	0.6	12	0.189	45	CL	0.68x10 ⁻⁶
5	At 4.5m depth	UDS	3.54	2.07	7.85	15.98	70.56	31	18	13	9	16.245	1.972	1.696	0.40	11	2.71	0.6	12	0.189	45	CL	0.68x10 ⁻⁶
6	At 5.0m depth	SPT	2.12	2.97	5.31	9.87	79.73	33	17	16	9	16.245	1.972	1.696	0.40	11	2.71	0.6	12	0.189	45	CL	0.68x10 ⁻⁶
7	At 6.5m depth	SPT	0.91	1.42	6.13	27.55	64.09	31	16	15	8	16.245	1.972	1.696	0.40	11	2.71	0.6	12	0.189	83	CL	0.68x10 ⁻⁶
8	At 7.5m depth	UDS/DS	0.65	1.89	3.86	29.54	64.06	31	17	14	8	16.245	1.972	1.696	0.40	11	2.71	0.6	14	0.189	83	CL	0.68x10 ⁻⁶
9	From 7.5m to 8.5m depth	SPT	BROKEN WETTERED ROCK PIECES COLLECTED																		>50		
10	From 8.5m to 10.0m depth	SPT	BROKEN WETTERED ROCK PIECES COLLECTED																		>50		

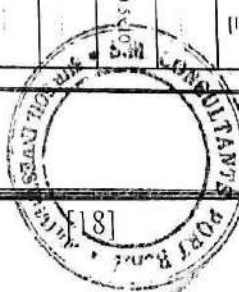


E.4. LABORATORY TEST RESULT (BH-4)

B.1. NAME OF WORK/SOIL INVESTIGATION FOR PROPOSED ADM BLOCK

Test Conducted as Per IS : 2720 (C.B.R. Method)	Atterberg's Limits	%	

TESTS CONDUCTED AS PER IS : 2720 (Pt. II, Pt. III, Pt. IV, Pt. V), Pt. VI / Pt. VII, Pt. VIII, Pt. IX(XIX) AND IS: 1498 - 1970																								
Sl No.	Sample (soil/rock) collected at	Type of sample collection	Grain size analysis					Atterberg's limits			Shrinkage Limit In %	Field Moisture Content in %	Wet bulk density in g/cc	Dry density in g/cc	Cohesion (c) Kg/cm ²	Angle of shearing resistance(ϕ) in degree	Specific gravity	Void ratio	D.F.S. In %	Consolidation test (Cc)	Field S.P.T. Value (N)	Group of soil	[Permeability [KT in cm/sec]	
			Fine Gravel In % (2.0mm to 4.75mm)	Coarse Sand In % (4.75mm to 2.0mm)	* Medium Sand In % (2.0mm to 0.425mm)	Fine Sand in % (0.425mm to 0.075 mm)	Silt & Clay in % (0.075mm to 0.001mm)	Liquid Limit In %	Plastic Limit In %	Plasticity Index in %														
1	At 0.5m depth	D.S	0.00	0.00	0.17	12.03	82.80	33	17	16	8	.....	.....	.....	.....	.....	2.71	.....	10	.....	0.198	.....	CL	0.5x10 ⁻⁶
2	At 1.5m depth	UTDS	4.26	5.17	6.28	10.74	73.55	32	18	14	8	17.245	1.962	1.673	0.38	8	2.71	0.62	10	.....	.....	.....	CL	.....
3	At 2.0m depth	SPT	0.00	0.49	0.67	16.93	81.91	33	17	16	8	.....	.....	.....	.....	.....	2.71	.....	10	.....	.....	.....	CL	.....
4	At 2.5m depth	SPT	11.75	3.08	4.40	14.27	66.50	31	16	15	7	.....	.....	.....	.....	.....	2.7	.....	10	.....	.....	.....	CL	.....
5	At 3.5m depth	UTDS-D/S	0.05	2.60	3.714	7.017	85.63	33	16	17	8	.....	.....	.....	.....	.....	2.71	.....	10	.....	.....	.....	CL	.....
6	At 5.0m depth	SPT	9.27	8.16	11.25	7.92	63.40	30	17	13	7	.....	.....	.....	.....	.....	2.71	.....	10	.....	.....	.....	CL	.....
7	At 6.5m depth	SPT	7.32	5.92	8.52	4.38	75.66	32	18	14	8	.....	.....	.....	.....	.....	2.71	.....	10	.....	.....	.....	CL	.....
8	From 6.6m to 8.0m depth	SPT	BROKEN WETTERED ROCK PIECES COLLECTED														>50	.....	.....	.....	.....
9	From 8.0m to 9.0m depth	SPT	BROKEN WETTERED ROCK PIECES COLLECTED														>50	.....	.....	.....	.....
10	From 9.0m to 10.0m depth	SPT	BROKEN WETTERED ROCK PIECES COLLECTED														>50	.....	.....	.....	.....

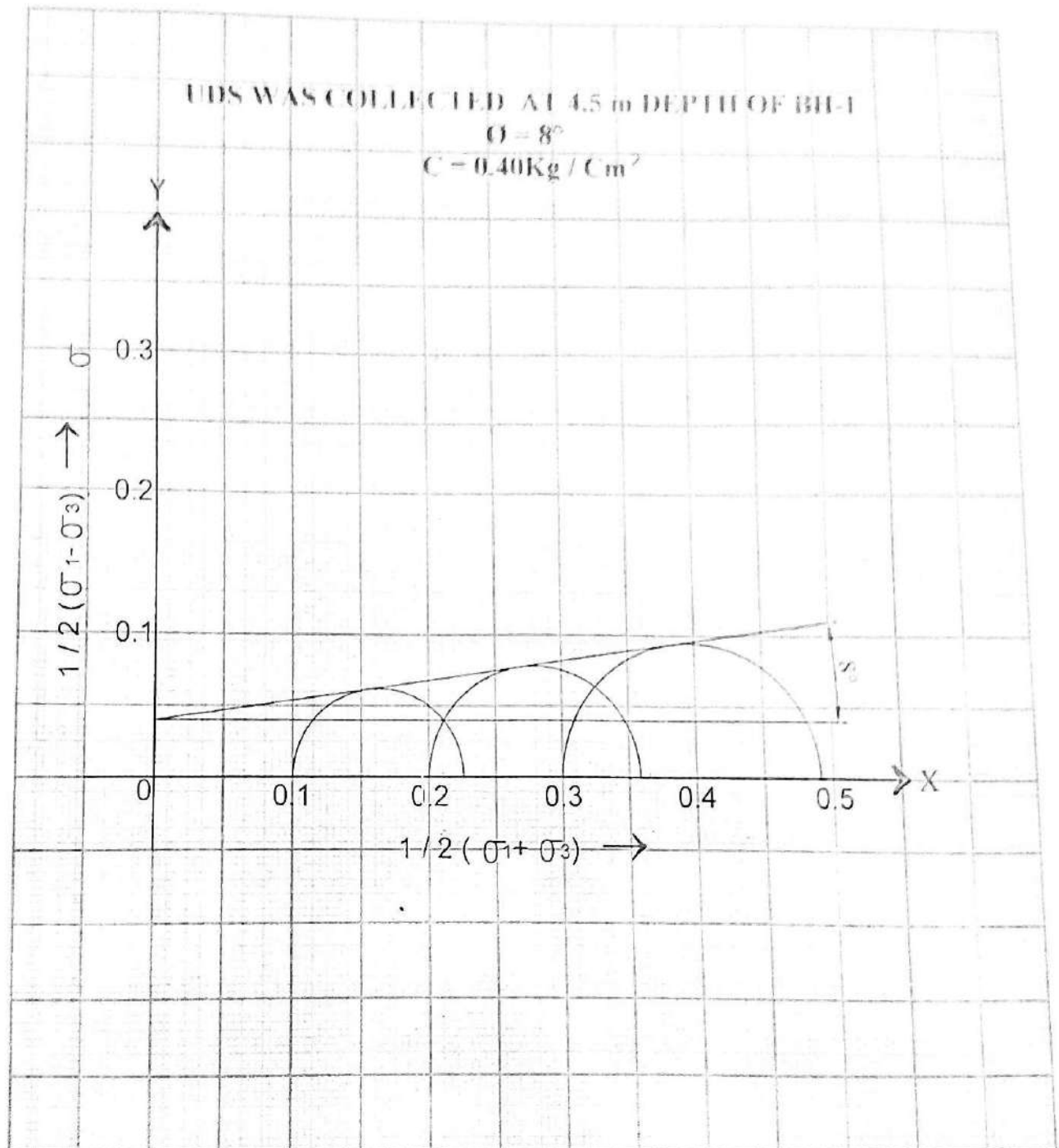


BIOLABORATORY TEST RESULT (BHS)

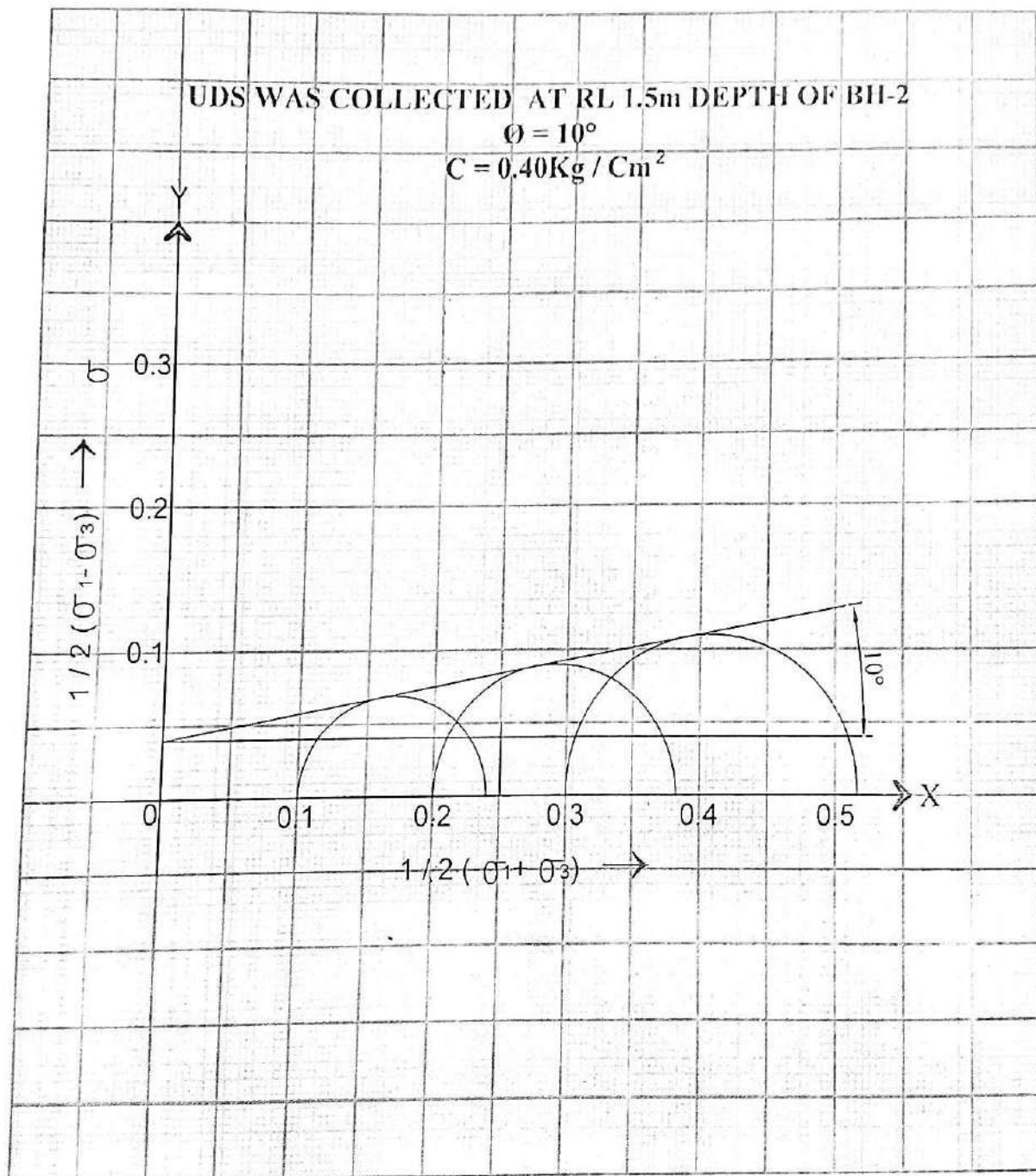
本行在 2013 年 12 月 31 日及 2012 年 12 月 31 日，均无因或有事项而确认的或有负债。

[illegible]

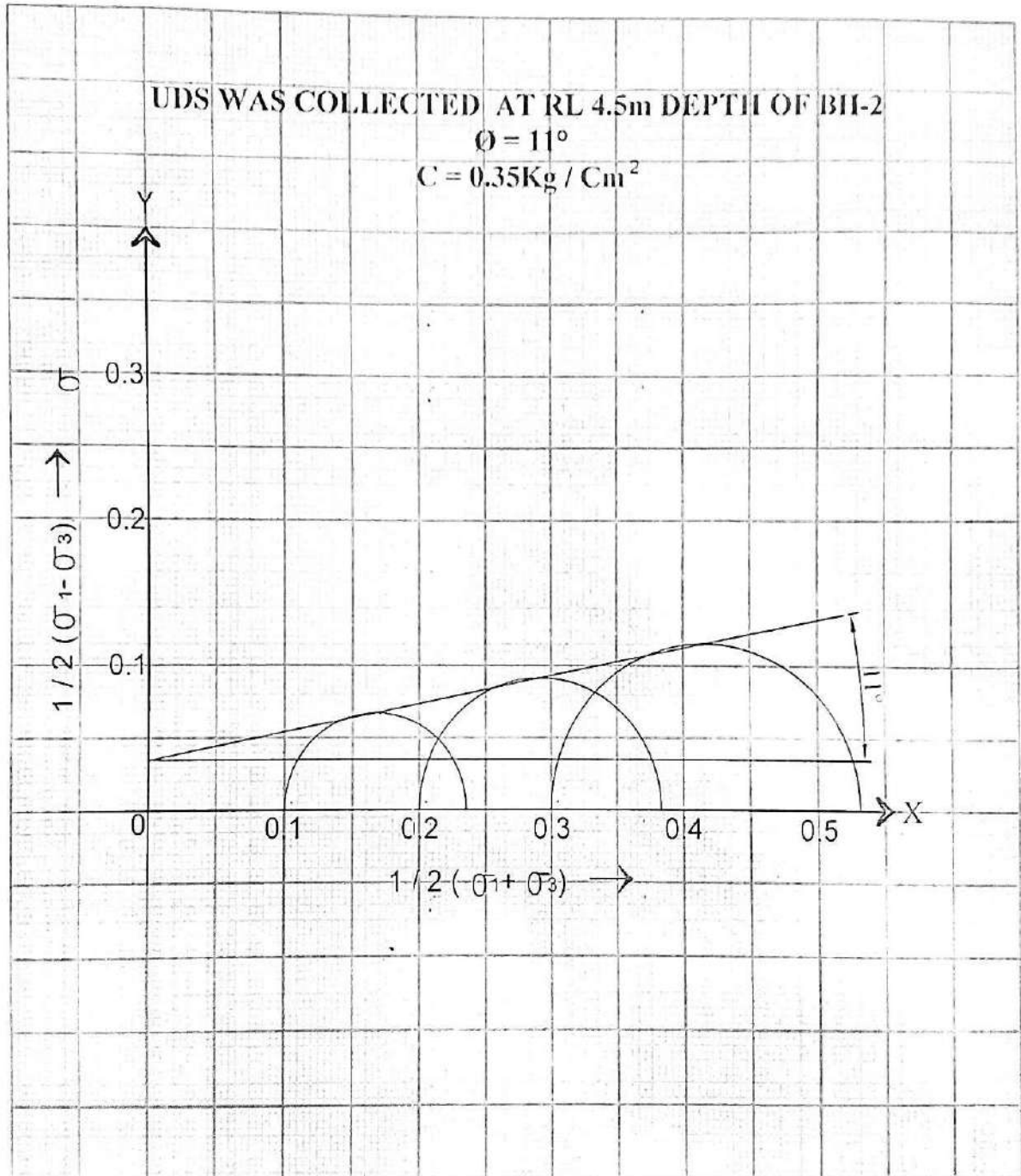
C.2 UDS GRAPH



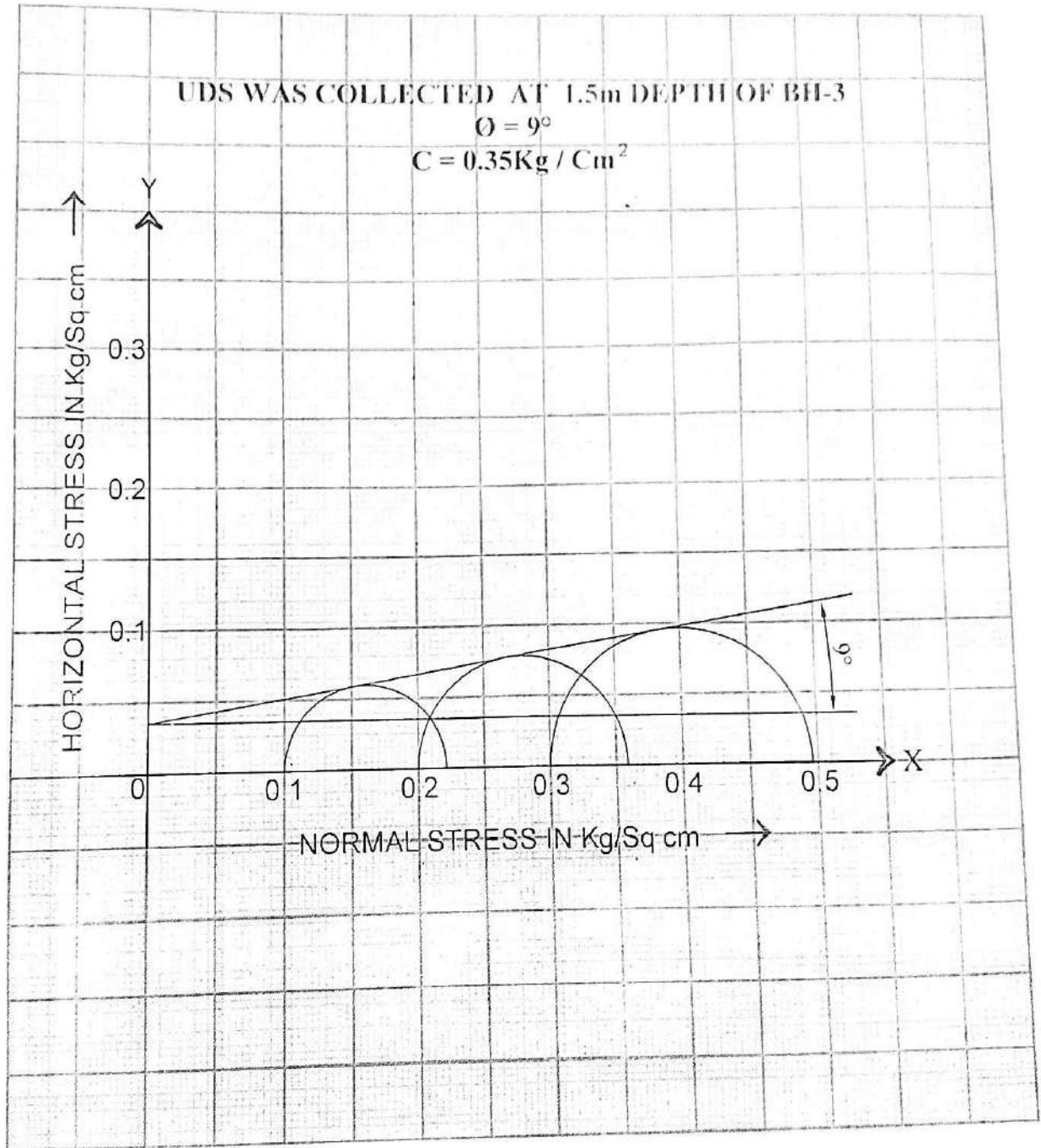
C.3 UDS GRAPH



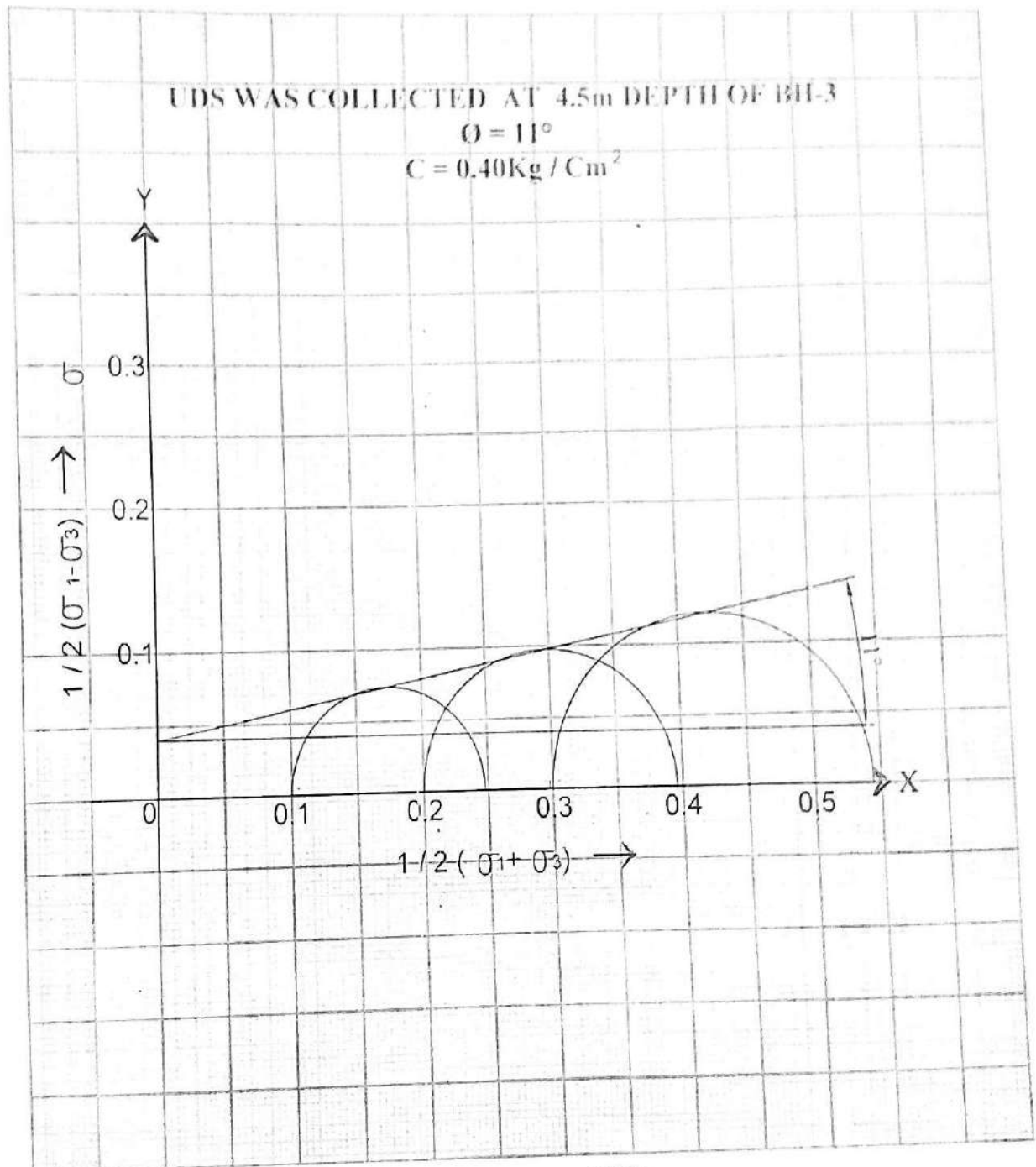
C.4 UDS GRAPH



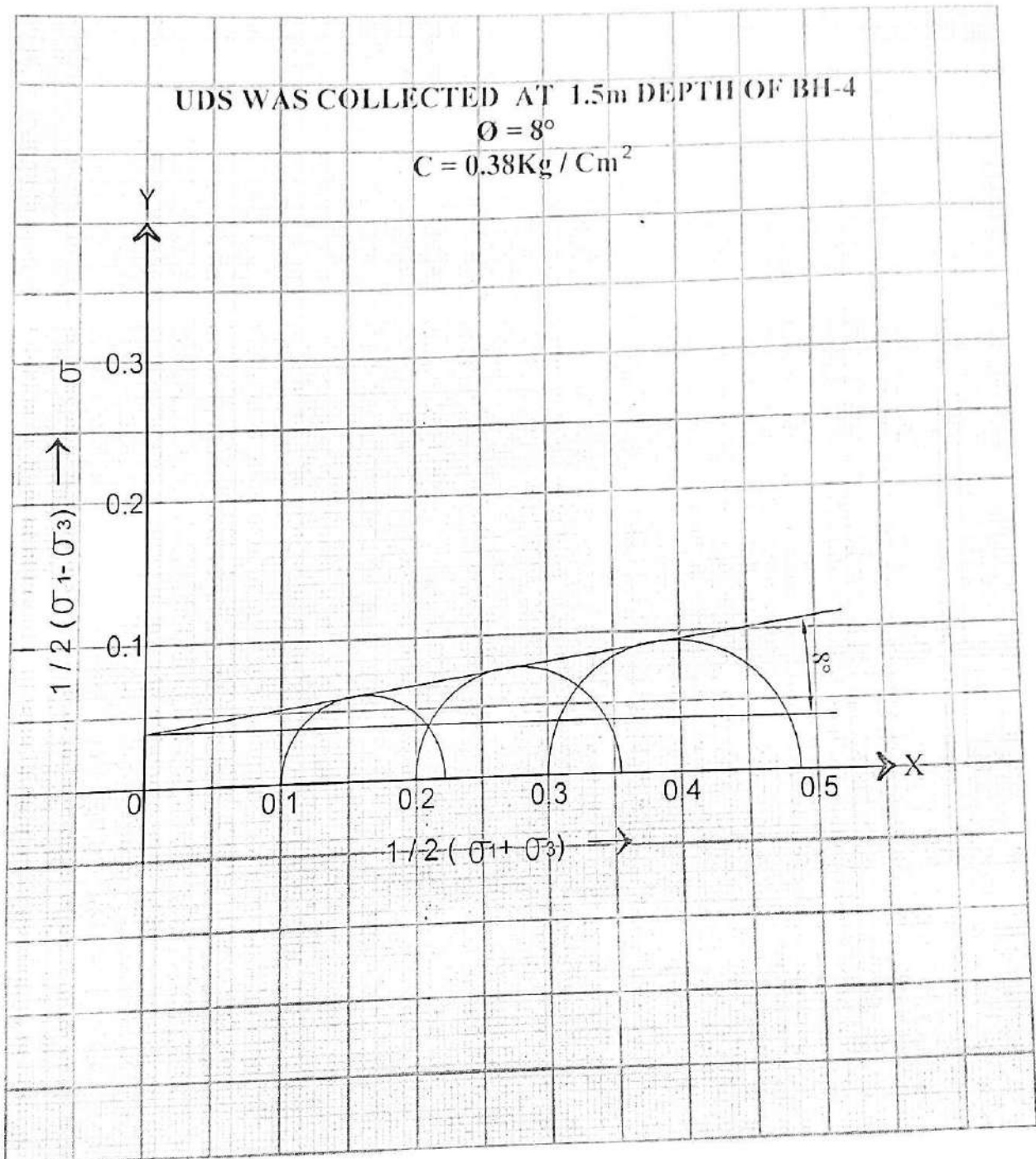
C.5 UDS GRAPH



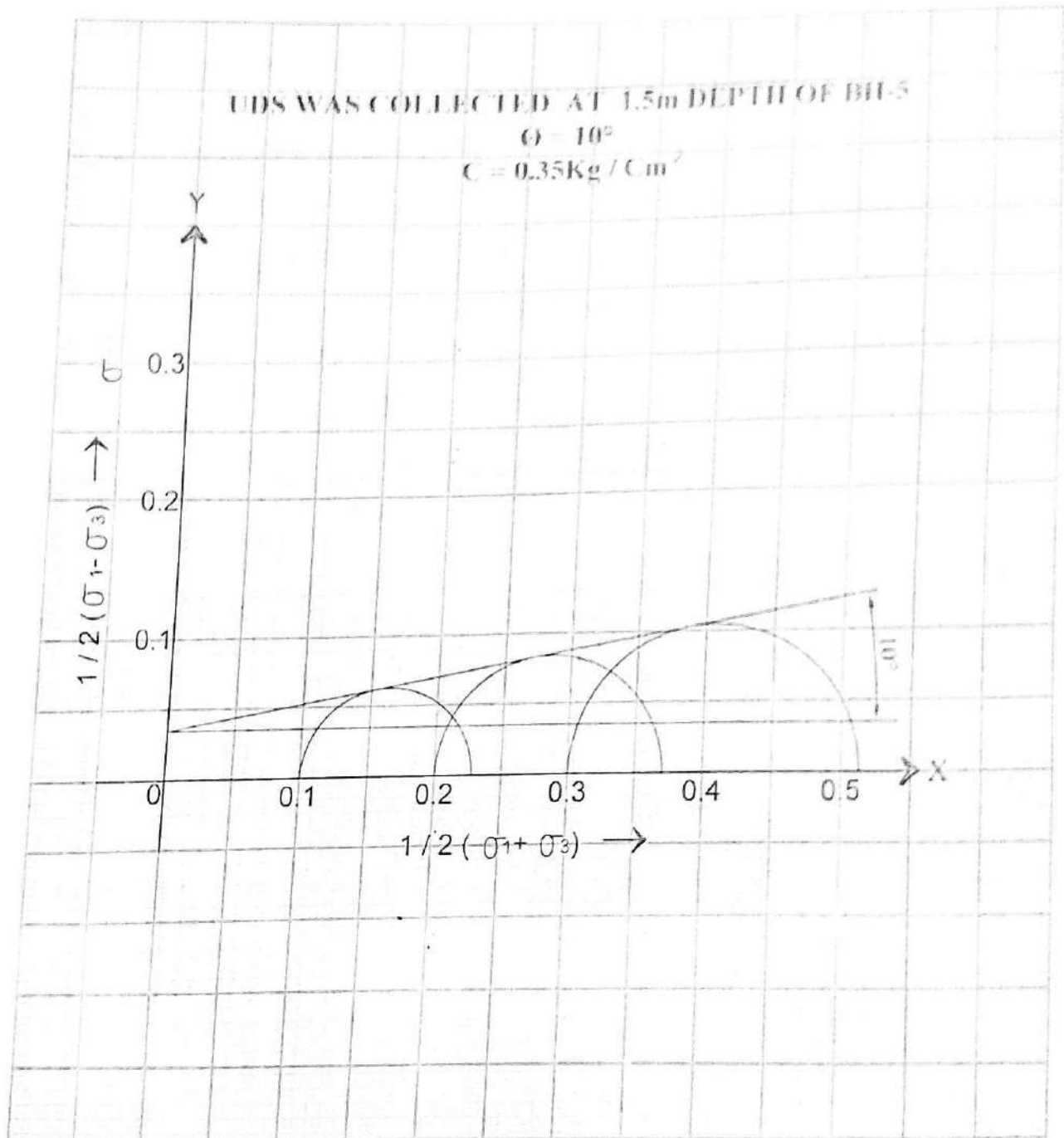
C.6 UDS GRAPH



C.07 UDS GRAPH



C.08 UDS GRAPH



D.1. CHEMICAL TEST ON WATER SAMPLE:

Location	Water sample collected at depth in m	pH	Chloride in mg/ltr	Sulphate in mg/ltr
BH-1	1.1	7.21	98.14	58.5
BH-2	1.2	7.18	92.84	57.2
BH-3	1.5	7.24	93.62	51.5
BH-4	1.5	7.14	90.58	52.0
BH-5	2.1	7.02	97.84	59.5

