ENQUIRY DOCUMENT - MR

(Document No : B889-000-EX-MR-6070-73-RFQ)

इंजीनियर्स इंडिया लिमिटेड
(भारत सरकार का उपक्रम)
ENGINEERS INDIA LIMITED
(A Govt. of India Undertaking)

हर एक काम देश के नाम

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BIDDING DOCUMENT NO. JP/ B889-000-EX-MR-6070/73

BIDDING DOCUMENT

FOR

HEAT EXCHANGER-(Un-engineered)

FOR

TRINITROTOLUENE (TNT) PLANT AT HIGH EXPLOSIVES FACTORY (HEF) KHADKI OF MUNITIONS INDIA LIMITED (MIL) AT KHADKI, PUNE, MAHARASHTRA

Prepared & Issued by:

इंजीनियर्स इंडिया लिमिटेड
(भारत सरकार का उपक्रम)

ENGINEERS INDIA LIMITED
(A Govt. of India Undertaking)

MASTER INDEX

NAME OF ITEM/ WORK : **HEAT EXCHANGER (Un-engineered)**

BIDDING DOCUMENT NO. : **JP/ B889-000-EX-MR-6070/73**

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इंजीनियर्स इंडिया लिमिटेड
(भारत सरकार का उपक्रम)
एक नवरत्न कम्पनी
ENGINEERS INDIA LIMITED
(A Govt. of India Undertaking)
A Navratna Company
इंजीनियर्स इंडिया लिमिटेड, ईआईएल कार्यालय परिसर, सैक्टर-16, गुरुग्राम - 122 001 (हरियाणा) भारत
Engineers India Limited, EIL Office Complex, Sector-16, Gurugram - 122 001 (Haryana) INDIA
Tel. No.: 0124- 289 1200

REQUEST FOR QUOTATION (RFQ) - OEM PROCUREMENT
(e-Bidding)

To,

M/s Alfa Laval India Pvt. Ltd.

Date: 09.05.2026

SL NO.			DETAILS
a)	**Client**	:	**EIL (OBE JOB OF Munitions India Limited (MIL))**
b)	**Project**	:	**TRINITROTOLUENE (TNT) PLANT AT HIGH EXPLOSIVES FACTORY (HEF) KHADKI OF MUNITIONS INDIA LIMITED (MIL) AT KHADKI, PUNE, MAHARASHTRA**
c)	**Item**	:	**HEAT EXCHANGER (Un-engineered)**
d)	**EIL RFQ No.**	:	**JP/B889-000-EX-MR-6070/73**
e)	**MR Category**	:	**II**
			1400 Hrs. (IST) on 14.05.2026
g)	**Pre-Bid Meeting Details and Venue**	:	**Through Microsoft Teams:** **Join: Join:** https://teams.microsoft.com/meet/4336965569637?p=20qKY7YL1ru9Q9HHW6 Meeting ID: 433 696 556 963 7 Passcode: Go3W6pL2
h)	**Last date of receipt for pre-bid queries**	:	Bidder may submit their queries, if any, through NIC Portal (https://eprocure.gov.in/eprocure/app within 4 Calender days from the date of publish of this enquiry, with an intimation to the Contact Personnel(s) as stated in the Sl. No. (m). EIL reserves the right not to consider such query/ies received late, if any, i.e. after the stipulated date/ period as mentioned above.
i)	**Earnest Money Deposit (EMD)**	:	Not Applicable
j)	**BID DUE DATE (Last date and time of submission of e-Bids)**	:	**22.05.2026,12.00 hrs**
k)	**Unpriced Bid Opening Opening date of Techno commercial e-Bids**	:	**25.05.2026,14.00 hrs**
l)	**PRICED BID OPENING**		**The date & time to be intimated later.**
m)	**Bidding/RFQ Document and subsequent**		From 09.05.2026 to 22.05.2026 [12:00 Hrs. (IST)] The Detailed RFQ document (with Technical Part) can be viewed /

SL NO.	SALIENT FEATURES		DETAILS
	Addendum/ Corrigendum (if any) available on Web site for viewing and downloading		downloaded from the following website: (https://eprocure.gov.in/eprocure/app). A link will be available on EIL tender website http://tenders.eil.co.in/
n)	**Contact Person for any query/ clarification**	**:**	Ms. Anwesha Sahoo, Sr.Mgr (SCM), anwesha@eil.co.in;Tel.No.: +91-124- 289 1338 Mr. Bapi Baidya, AGM (SCM), bapi.baidya@eil.co.in;Tel.No.: +91-124- 289 1307/ +91 9401708411 Mr. Jaydip Purkayastha, GM (SCM-C&P), Phone no. 0124 289 1287 E-mail ID: jaydip@eil.co.in
o)	**e-Tendering portal for submission of e-bids**	**:**	GeM CPPP website: (https://eprocure.gov.in/eprocure/app).
p)	**Delivery Period/ Completion Period**	**:**	**Within 7 Months** on FOT Project Site on freight pre-paid & door delivery basis from the date of issue of LOA. The date of receipt of material at site shall be considered as the date of delivery.
q)	**DEVIATIONS NOT PERMITTED** Bids are invited on **"Zero Deviation Basis".** Accordingly offer is to be submitted in complete compliance to RFQ Terms & Conditions without any deviation. Hence, Bidder shall ensure submission of complete bid without any deviation as per requirement of Enquiry document in first instance itself.		
r)	This enquiry is issued on **Original Equipment Manufacturer (OEM) basis to M/s Alfa Laval India Pvt. Ltd. for "captioned items mentioned at Sl. No. c above" only.** A separate intimation to the EIL suppliers eligible for this enquiry shall be sent through mail subsequent to issue of enquiry in NIC Portal.		
s)	**IMPORTANT INSTRUCTIONS** Deleted		
t)	**PROVISIONS OF NON DISCLOSURE AGREEMENT (NDA)** Due to confidential information contained in the Technical part/ MR of enquiry, NDA/Confidentiality Agreement needs to be executed by all vendors prior to downloading the Technical part/ MR on e procurement Portal. However, initially bidder will be able to download only the commercial section of the bidding document. The bidder shall be required to upload following documents on the e-procurement portal under the subject bidding document/tender ID. : 1. Duly signed NDA format 2. Power of Attorney in favour of person authorized to sign the NDA 3. Power of Attorney in favour of person whose DSC will be used to submit NDA on the e-procurement portal. 4. Self-declaration by bidder confirming that content of the NDA has not been altered/ modified. (on bidder's letterhead) The acceptance/re-submission or rejection of NDA can be checked from e-procurement Portal and vendor whose NDA is accepted can further download the Technical part of Bidding document. Note : The NDA submitted through e-procurement Portal (URL: https://eprocure.gov.in/cppp) shall ONLY be considered. NDA submitted through Fax/e-mail/Physical/ submitted on any other website (other than CPPP website https://eprocure.gov.in/cppp) shall be rejected.		

If any of the dates indicated at Sl. No. (k) above happens to be a declared/closed holiday in EIL-Gurugram, the next working day shall be considered.

1. INTRODUCTION

Engineers India Ltd. (EIL), a Government of India Public Sector Undertaking is a premier consultancy organization having registered office at 1, Bhikaiji Cama Place, R.K. Puram, New Delhi-10066.

M/s Munitions India Limited (Owner/Client) intends to build TNT Plant at High Explosive Factory at Khadki, Pune on Open Book Estimate (OBE) Basis.

M/s Engineers India Limited (EIL) has been engaged by the Client as the Executing Agency for this Project.

2. SUBMISSION OF BIDS & VALIDITY:

2.1. E-bids under **single stage two bid system** are requested for the captioned item based on the requirement specified in this MR and in total compliance to technical specifications, scope and terms & conditions of RFQ documents/attachments.

2.2. Bids are required to be submitted only through above mentioned Govt. of India NIC Portal on or before the Bid submission date and time. Bidders are required to enroll on NIC Portal (URL: http://eprocure.gov.in/eprocure/app)

2.3. **EIL registered bidder shall quote only for those Items for which they are registered with EIL as on the date of issuance of RFQ. Items quoted by EIL registered bidder other than the approved range with EIL shall not be considered for evaluation/award. Only the bids received from these eligible empanelled bidders shall be accepted and considered for further evaluation. Bids received from all other bidders shall be rejected.**

2.4. All amendments, time extension, clarifications etc. (corrigendum as per NIC nomenclature) will be uploaded in NIC Portal only. Bidders should regularly visit the e-tendering website of NIC Portal (http://eprocure.gov.in/eprocure/app) to keep themselves updated. No extension in the bid due date / time shall be considered on account of delay in receipt of any document by Mail/Post.

2.5. Bidders are required to submit their bids complete in all respects in accordance with Instructions to Bidders (ITB) only through e-tendering website of NIC Portal (http://eprocure.gov.in/eprocure/app) only on or before the bid-submission date & time as specified above. Bidder to carefully read and understand the instructions for e-tendering as indicated in ITB to upload their bid on e-tendering website.

2.6. Physical Bids/ Offer sent through Fax/ E-mail/ CD/ DVD/ Pen Drive/ Courier/Post or Bids through any other mode shall not be accepted. However, any specific document required to be submitted in physical form as per RFQ shall be submitted in physical form.

2.7. Bidders are required to register themselves at http://eprocure.gov.in/eprocure/app.

2.8. Bidders are requested to get acquainted with the NIC Portal in advance and obtain/seek clarifications, if any from NIC Portal Helpdesk.

2.9. Bidder is advised to download & utilize the available information/documents/ resources under https://gem.gov.in for activities like Registration, obtaining User ID & Password, uploading & submission of e-bids etc. Bidders are advised in their own interest to carefully go through Instructions for E-tendering and other related document available against various help links so as to ensure that bids are uploaded in E-tendering website well before the closing date and time of bid submission.

2.10. All those bidders who have not complied with the above registration requirements will not be eligible to bid. Request for extension in due date of submission of bids due to non-registration or delayed registration in NIC portal shall not be entertained.

2.11. The vendor registration on NIC Portal is a very user-friendly process. However, in case of any doubt, the vendor may contact the NIC Helpdesk. In the event of failure in bidder's connectivity with EIL/NIC Portal during the last few hours on account of any problem and they are likely to miss the deadline for bid submission in such a case no request for extension in bid due date shall be entertained. In view of the same, bidders are advised to upload their bid in advance.

2.12. RFQ Document is non-transferrable.

2.13. Please submit your Acknowledgement against the RFQ on EIL's website http://tenders.eil.co.in within the due date & time, with reason(s) of not participating in the bidding process in case of regret/negative acknowledgment. In case there is no response, the bidder shall be liable for suitable action including review of their enlistment with EIL for the subject item.

2.14. Submission of authentic documents is the prime responsibility of the bidder. Wherever EIL has concern or apprehension regarding the authenticity/ correctness of any document, EIL reserves a right of getting the document cross verified from the document issuing authority.

2.15. Subsequent to the submission of bid, bidders are not allowed to change the price or substance of the bid i.e. scope of work, specifications, delivery schedule, completion period etc.

2.16. ~~Bids received after the due date and time (refer late bids clause of ITB) shall be rejected and representative of such bidders shall not be allowed to attend the bid opening.~~

2.17. Consortium / Unincorporated Joint Venture Bids are **not acceptable.**

2.18. ~~EIL reserves the right to assess Bidder's capabilities and capacity to execute the work using in-house information and past performance that also includes the performance of the Bidder in any of the contract awarded in the present Project.~~

~~Further in case Purchase Order awarded for the tendered work have to be terminated due to supplier's default and separate enquiry have to be floated to get the remaining / complete work executed, such defaulting supplier will not be considered for enquiries issued for the refloated works of the same project. EIL/Owner shall reject the bidders' offer if the performance in the awarded contract in this project is found to be unsatisfactory.~~

2.19. ~~Based on documents submitted by Bidder(s) in the bid if a suspicion of cartel formation is observed, bid(s) will not be considered for evaluation/placement of order. Such bidder will also be debarred from bidding in future and EMD shall be forfeited.~~

2.20. Canvassing in any form by the Bidder or by any other Bidder on their behalf may lead to disqualification of their Bid.

2.21. EIL reserves the right to reject ~~any or all~~ Bids received and to annul the Bidding Process at its discretion without assigning any reason, whatsoever.

2.22. Wherever the term – "Black-listing / Holiday Listing" is appearing anywhere in the RFQ/Bidding Document including formats, declaration etc, the same stands replaced by – "Black-listing/ Holiday Listing/Suspension / Banning List".

2.23. ~~Purchase preference to central Public Sector Enterprises (PSUs) or any other government guidelines as applicable from time to time shall be considered applicable.~~

2.24. ~~Owner/EIL shall follow the prevailing Public Procurement Policy on Procurement of Goods and services from Micro and Small Enterprises (MSEs) Order 2012 as mentioned elsewhere in the Bidding Document. The details are enclosed as Appendices to ITB.~~

2.25 Owner/EIL shall follow the prevailing Public Procurement (Preference to Make in India) guidelines as mentioned elsewhere in the Bidding Document. The details are enclosed as Appendices to ITB. - NOT APPLICABLE

2.26 EIL shall follow the prevailing purchase preference to domestically manufactured Electronic Products (DMEP Policy) issued in furtherance to Public Procurement (Preference to Make in India) order by Meity as mentioned elsewhere in the Bidding Document. The details are enclosed as Appendices to ITB- NOT APPLICABLE

2.27 Owner/EIL shall follow the prevailing guidelines for restriction on procurement from Bidders from countries sharing border with India as mentioned elsewhere in the Bidding Document. The details are enclosed as Appendices to ITB.

2.28 Reverse Auction is NOT APPLICABLE for this RFQ.

2.29 Engineers India Ltd. including its officers and representatives, shall under no circumstances solicit or request any payment, monetary consideration from bidders other than those specifically stipulated in the published tender/ enquiry document and its amendments (if any).

Bidders are cautioned that, should they receive any phone calls, messages, emails, or personal approaches requesting payments other than specified in Tender Document, such communications are fraudulent and do not originate from Engineers India Ltd.

Engineers India Ltd. shall not be responsible for any financial loss, penalty, or damage caused due to actions taken by Bidders/Contractors on the basis of such communications.

2.30 For detailed specifications, terms and conditions and other details, refer complete RFQ Document.

***Please specify NIC Bid ID & RFQ No. in all correspondence**

This limited invitation for e-bid is open only to suppliers to whom this RFQ is issued.

THIS IS NOT AN ORDER

Very truly yours,
(Jaydip Purkayastha)
GM (SCM-C&P)
Engineers India Limited

INSTRUCTIONS TO BIDDERS (ITB)

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A. GENERAL

1.0 SCOPE OF BID

1.1 In connection with the Request for Quotation (RFQ), Engineers India Limited (EIL) invites e-Bid(s), under single stage two bid system, for the scope of supply and services covered under the RFQ Document.

1.2 Throughout the Bidding Document:

(a) The **PURCHASER** means Engineers India Limited **(EIL)**, a company incorporated in India having its registered office at Engineers India Bhawan, 1, Bhikaiji Cama Place, RK Puram, New Delhi-110066 and shall include its successors and assignees.

(b) **CLIENT/ OWNER:** Client/ Owner means Project Owner i.e., "Munitions India Limited (MIL), 2nd Floor Nyati Unitree, Nagar Road, Yerwada, Pune, Maharashtra, India. Pin- 411006, India" as mentioned in RFQ.

(c) except where the context requires otherwise, words indicating the singular also include the plural and words indicating the plural also include the singular; and word written in capital or small letter or where the first letter capital have the same meaning; and

(d) "Day" means calendar day.

(e) The term 'Bid Due Date' shall mean the 'Final Bid Due Date'.

(f) the term "bid"/ "tender"/"offer"/ "proposal" and their derivatives ("RFQ/IFB/Bidding/Enquiry" documents, "bidder/tenderer", "Vendor/Supplier/Seller", "Bid/tender", "bidding/tendering", "Contract/Purchase Order" etc.) are synonymous, and day means calendar day. Singular also means plural and vice versa.

(g) **INCOTERM 2020:** INCOTERM 2020 means the terms which shall be applicable for procurement of equipment/material under the subject RFQ / Enquiry document.

(h) Material Requisition (MR) means the Technical Part of RFQ Document.

(i) E-Tendering/ e- procurement website means Government e Marketplace (GeM) Portal (https://gem.gov.in) / Government of India Central Public Procurement (CPP) Portal (https://eprocure.gov.in/eprocure/app) **[Refer BDS for applicability]**

1.3 The successful bidder / "supplier" shall complete the Scope of RFQ within the Time Period / Completion Period stated in RFQ document.

2.0 ELIGIBLE BIDDERS

2.1 An Eligible bidder may be a firm or a company, who, have been issued the RFQ Document on Limited Competitive Basis or a bidder meeting the BQC criteria as per Invitation for Bids (IFB)/ Notice Inviting Tender (NIT) on Open Competitive basis.

2.2 In case of limited competitive basis, the bidding is open only to the bidders to whom Bidding Document has been issued. (Refer BDS for type of bidding)

In case of limited enquiries, bidder to note that this notice is being published for information only and is not an open invitation to quote in this limited tender. Participation in this tender is by invitation only and is limited to the selected suppliers/contractors to whom this enquiry is issued. Unsolicited offers are liable to be ignored. However, suppliers/contractors who desire to participate in such tenders in future may apply for enlistment with Owner/EIL as per procedure.

2.3 In case of open competitive basis, the bidding is open to the bidder who intends to submit the Bid, in response to IFB/NIT.

2.4 A bidder who is on **Black-listing / Holiday Listing /Suspension / Banning List/ Negative List** of EIL/Owner or **debarred and/ or disqualified by GeM (if RFQ published through GeM Portal)** on due date of submission of bid / during the process of evaluation of the bids, the offers of such bidders shall not be considered for bid opening/evaluation/award, as the case may be. Further, in case of a consortium, if any of the member(s) of consortium is on **Black-listing / Holiday Listing /Suspension / Banning List/ Negative List** of EIL/ Owner **or debarred and/ or disqualified by GeM (if RFQ published through GeM Portal)** on due date of submission of bid / during the process of evaluation of the bids, the offers of such consortium shall not be considered for bid opening/evaluation/Award.

If the RFQ Document is/was issued inadvertently to such Bidder/downloaded from website by such Bidder, then Bid submitted by such Bidder shall not be considered for opening/ evaluation/ award.

2.5 Similarly, if a bidder is seeking qualification based on engaging a sub-contractor / sub-vendor who meets stipulated qualification criteria (in case allowed as per IFB/NIT) and such a sub-contractor / sub-vendor is on **Black-listing / Holiday Listing /Suspension / Banning List/ Negative List** of EIL / MIL **or debarred and/ or disqualified by GeM** (if RFQ published through GeM Portal) on due date of submission of bid / during the process of evaluation of the bids, the offer of such bidder shall not be considered for bid opening/evaluation /award , as the case may be.

2.6 If a Bidder / member of the consortium (as per Clause No. **2.4** above) / proposed sub-contractor or sub-vendor (as per Clause No. 2.5 above), is placed on **Black-listing / Holiday Listing /Suspension / Banning List/ Negative List** of EIL/Client after opening of price bid and such Bidder / Consortium happens to be the lowest bidder, the next lowest bidder shall be considered as L1. Further, in case a Bidder / Consortium happens to be the lowest bidder but is Suspended / debarred on GeM portal, evaluation and awarding shall be as per GeM Incident Management Policy (if RFQ published through GeM Portal).

2.7 Suspension / Banning in GeM portal:

GeM has a policy of banning / suspending sellers / service providers in case of incidents being raised against them. The status of such bidders is displayed against their name on GeM portal. Such bidders suspended by GeM shall be considered for further evaluation and order may be placed provided they are not on Black-listing/Holiday Listing/ suspension/ Banning List / Negative List of EIL/OWNER/Client and GeM doesn't disqualify such bidders on Portal and allows further processing on their platform. In case, GeM disqualify such bidders and doesn't allow further processing, they shall be rejected due to disqualification by GeM and shall not be recommended for PBO/Award.

Clause No. 2.4, 2.5 & 2.6 of ITB shall be read in conjunction with Clause No. 2.7 of ITB.

2.8 The Bidder shall not be under a declaration of ineligibility by Purchaser for Corrupt/Fraudulent/Collusive/Coercive practices, as defined in SPC.

2.9 **CONFLICT OF INTEREST (FOR LIMITED ENQUIRIES ONLY):**

The bidder found to have a conflict of interest shall be disqualified.

2.9.1 **Bidder's conflict of interest as Consultant of Owner :**

Consultants or any of their Affiliates will not be considered for any assignment, which by its nature may be in conflict with another assignment of the consultants.

2.9.2 **Bidder's conflict of interest with other bidders:**

A bidder shall not have conflict of interest with other bidders. Such conflict of interest can lead to anti-competitive practices to the detriment of Owner's interests. The bidder found to have a conflict of interest shall be disqualified.

A bidder may be considered to have a conflict of interest with one or more parties in this bidding process, if:-

a. they have controlling partner (s) in common; or

b. they receive or have received any direct or indirect subsidy/ financial stake from any of them; or

c. they have the same legal representative/agent for purposes of this bid; or

d. they have relationship with each other, directly or through common third parties, that puts them in a position to have access to information about or influence on the bid of another Bidder; or.

e. In cases of agents, quoting on behalf of their principal manufacturers, one agent cannot represent two manufacturers or quote on their behalf in a particular tender enquiry. One manufacturer can also authorise only one agent/dealer. There can be only one bid from the following:

   1. The principal manufacturer directly or through one agent on his behalf; and

   2. Agent on behalf of only one principal.

f. Bidder or any of its affiliates participated as a consultant in the preparation of the design or technical specifications of the contract that is the subject of the Bid;

g. In case of a holding company having more than one independently manufacturing units, or more than one unit having common business ownership/management, only one unit should quote. Similar restrictions would apply to closely related sister companies. Bidders must proactively declare such sister/ common business/ management units in same/ similar line of business.

2.10 In addition to above, Bidder has to comply with the policies issued by Government including Purchase Preference policies or any other government guidelines as applicable from time to time. For details refer clause no. 38 below and for applicability refer Bid Data Sheet (BDS).

3.0 FRAUDULENT PRACTICES

Fraudulent Practices clause as per Special Purchase Conditions(SPC) shall be applicable.

B. CONTENTS OF BIDDING DOCUMENT

4.0 BIDDING DOCUMENT

4.1 The RFQ document consisting of Commercial & Technical Section has been hosted on e-procurement website. However, a link shall be provided in EIL website http://tenders.eil.co.in..

4.2 The Bidding Document shall in general consist of the following and should be read in conjunction with any amendment issued in accordance with Clause No. **7.0** of ITB.

i. Request for Quotation (RFQ) / Invitation For Bids (IFB)
ii. Bid Data Sheet (BDS)
iii. Instructions to Bidders and its Appendices
iv. Bidding Forms
v. Special Purchase Conditions (SPC) and its Annexure
vi. General Purchase Conditions (GPC)
vii. Format for Performance Bank Guarantee and Bank Guarantee for Advance
viii. Packing, Marking, Shipping and Documentation Specification
ix. Additional Documents Mentioned in RFQ

x. Price Schedule

xi. Material Requisition (MR)

4.3 Although all the details presented in this Bidding Document have been compiled with reasonable care, the bidder is expected to examine the Bidding Document, including all instructions, forms, terms, specifications and drawings in the Bidding Document and it includes all the documents as per Table of Contents. In case of any ambiguity or incompleteness, the bidder must bring it to the attention of EIL immediately and prior to submission of Bid.

4.4 The bidder is expected to examine the RFQ document downloaded from the e-Procurement Portal, bidding guidelines receipt from EIL or available on EIL website, all instructions, formats, terms, specifications and drawings etc., enclosed in the RFQ documents. The invitation for bid (bidding) together with all its attachment thereto, shall be considered to be read, understood and accepted by the bidder in co-ordination to each other. Failure to furnish all information required by the RFQ documents or submission of a bid not substantially responsive to the RFQ documents in every respect will be at bidder's risk and may result in the rejection of the Bid.

4.5 RFQ document once issued in case of limited competitive bidding is non-transferable. However, in case of Open Competitive Bidding, since the RFQ Document is available for free downloading on the portal, any bidder may submit the Bid and the same shall be evaluated in line with the provisions of the Bidding Document.

4.6 **Order of precedence**

The documents forming the Purchase Order (i.e. LOA/PO/GeM Contracts, as applicable and its Addendums) are to be taken as mutually explanatory of one another. If there is an ambiguity or discrepancy in the Term & Conditions defined in the various documents, the order of Precedence shall be as follows:

i. Purchase Order and its enclosures along with Purchase Requisition
ii. Amendment to Bidding Document, if any
iii. Bid Data Sheet
iv. Job Specifications
v. Drawings
vi. Technical specifications
vii. Special Purchase Conditions (SPC)
viii. General Purchase Conditions (GPC) & Packing, Marking, Shipping and Documentation Specification
ix. Request for Quotation (RFQ) / Invitation For Bids (IFB)
x. Instructions to Bidders (ITB)
xi. Other Documents

A variation or amendment issued after the execution of the formal contract shall take precedence over respective clauses of the formal contract and it's Annexures.

4.7 Additional requirements for Category-I MRs (Refer BDS for MR Category):

4.7.1 Bidder to note that no correspondence shall be entertained after the due date for bid submission.

4.7.2 Bidder shall quote prices for only those items which the bidder can supply material as per specifications and for which bidder is approved by EIL.

4.7.3 No technical details of any nature shall be specified in the bid unless otherwise specifically sought as per the Bidding Document. If the bid stipulates any technical deviations, it shall be summarily rejected.

4.7.4 Bidder shall note that enquiry is issued on zero deviation basis. Bidder shall comply with all technical specifications & commercial terms and other conditions of the enquiry document without any deviations/ clarifications. Any deviation stipulated by bidder shall result in summary rejection of the bid.

4.7.5 The submission of prices by the bidder shall be construed that bidder has confirmed compliance with all technical specifications of the quoted items as well as commercial terms & conditions of enquiry document.

4.7.6 Other than the details & documents specifically required in the bid as per enquiry document, bidder shall not submit any other detail / document in the bid.

4.7.7 Bidders in their own interest should ensure submission of complete information/ documentation in the first instance itself. Buyer reserves the right to evaluate the bids based on the details/ documents so furnished in bids without seeking any subsequent additional information/ clarification/ documents.

4.7.8 Bidders to refer the requisite format provided in MR (if sought in MR) for providing the Technical information which are essential for PR preparation.

- Bidder is requested to fill the above format and submit the same without fail in their Un-priced Bid. Further, Bidder to note that post opening of Unpriced bid, no query will be raised either due to non-submission or incomplete submission.
- Therefore, if is requested for Bidder to ensure submission of the above Technical information complete in all respects in the Unpriced Bid so that the Purchase Requisition (PR) can be issued to the successful Vendor without any delay past issuance of LOA/PO/GeM Contract.

5.0 SITE VISIT

5.1 For Scope involving Site Work, bidder, if required, may visit and examine the Project Site and its surroundings and obtain for itself on its own responsibility all information that may be necessary for preparing the bid.

5.2 Bidder is advised to visit and examine the site (at his own cost), its surroundings and familiarise themselves of the existing facilities & environment, and collect all other information which he may require for preparing and submitting the bid and entering into the Contract. Claims and objections due to ignorance of existing conditions or inadequacy of information will not be considered after submission of the bid and during implementation. Bidder shall provide at least two days in advance the details of their representatives along with details of laptop, mobile or any other electronic device or any equipment if any, being carried so as to make arrangement for gate passes. Owner's decision on this regard shall be final and binding upon the bidder.

5.3 Bidder and any of its personnel will be granted permission by EIL/Client to enter upon its premises and lands/ Project Site for the purpose of such visit, but only upon the express condition that the bidder and its personnel will relieve and indemnify EIL/Client and its personnel from and against all liability in respect thereof, and will be responsible for death or personal injury, loss of or damage to property, and any other loss, damage, costs, and expenses incurred as a result of the inspection.

5.4 For site visit, Bidder may contact the persons in EIL/MIL as per details provided in Bid Data Sheet (BDS).

6.0 CLARIFICATION OF BIDDING DOCUMENT& PRE-BID MEETING

6.1 The enquiry is issued on "***Zero Deviation Bidding***" basis wherein no post bid correspondence of any nature may be entertained. Bidders in their own interest are advised to take part in the pre-bid meeting seriously by issuing their genuine queries and also by attending the pre-bid meeting by their competent personnel. This will help bidder not only to cut short of the evaluation time leading to requirement of shorter bid validity but also enable them to submit their best prices based on the clear techno-commercial scope.

6.2 To make the pre-bid meeting effective and result-oriented, the bidders are requested to send their queries/clarifications, if any, as per format included in the Bidding Document through e-procurement

portal, strictly within the cut-off date as mentioned after which EIL shall reserve the right not to entertain any queries. Further, any query received outside of the e-procurement portal may not be entertained.

6.3.1 Pre-bid Meeting shall be held on the scheduled date and time intimated alongwith the RFQ.

6.3.2 Bidders or their competent authorized representatives are requested to attend the Pre-Bid Meeting so that their queries, if any, related to the Bidding document and Scope of Work etc. can be addressed during the pre-bid meeting to enable the bidder to submit Zero Deviation Bid.

6.3.3 Bidders shall treat the pre-bid meeting as of utmost importance in their own interest and depute competent persons to understand the requirement and capable of taking spot decision to sort out all the technical, commercial and legal issues. Bidders are also advised to attend the pre-bid meeting along with their technical, commercial and legal representative, if so desired, to get all issues clarified for submission of "Zero- Deviation bid" to meet the project time schedule.

6.3.4 The bidders may carry their qualification documents in case they desire them to be reviewed by EIL officials during the pre-bid meeting.

6.3.5 Replies to the pre-bid queries by EIL will be uploaded on e-procurement portal.

Any modification to the RFQ document, which may become necessary as a result of the pre-bid queries / pre bid discussion, shall be intimated to all bidders through the issue of an Addendum/Amendment. Record notes of pre-bid meeting/reply to pre-bid queries shall not be considered as part of RFQ.

Note : In case of group wise/basket evaluation (Bidder to refer Award Methodology for the Type of Evaluation), Bidders may submit the details of the equipment/ items out of a group for which they can meet MR/ Technical specifications along with the pre-bid queries. The final group/basket to be quoted by the bidders, if revised, post pre-bid meetings shall be part of the Amendment(s).

7.0 AMENDMENT OF BIDDING DOCUMENT

7.1 At any time prior to the deadline for submission of bids, EIL may, for any reason whether at his own initiative or in response to the clarification requested by the prospective bidder(s), issue amendment in the form of Amendment/ Addendum.

7.2 All Amendments, Clarifications (if any) etc. will be uploaded in e-procurement portal Generally, intimation of uploading of documents in website is sent to the bidders (all bidders in case of Limited bidding and to bidders who have submitted acknowledgement on tender portal in case of NIT) in their email id. It is the responsibility of the bidder to regularly check the website and provide current and authenticated email id. Any amendment thus issued shall become part of Bidding Document. Bidder shall submit a copy of the Addendum duly signed and stamped in token of his acceptance. Any revision, clarification, addendum, corrigendum, time extension, etc. will be hosted on these websites only. Bidders are requested to visit the websites regularly to keep themselves updated. Bidders have to take into consideration of all the addendum(s) / corrigendum (s) / clarifications issued/ web hosted, before submitting the bid.

7.3 To give bidders reasonable time in which to take an addendum into account in preparing their bids, EIL may extend the deadline for the submission of bids, pursuant to Clause No. **24.3** of ITB.

7.4 In case Addendum is issued during the bidding period, Bidder shall consider its impact in his bid. In case Addendum is issued subsequent to receipt of bids, Bidder shall follow the instructions issued along with Addendum with regard to submission of impact on quoted price / revised price, if any.

8.0 ACKNOWLEDGEMENT & CONFIRMATION

8.1 Within 10 days of downloading of Bidding Document, bidder shall acknowledge and confirm his intention to bid for the requested item/work on EIL website http://tenders.eil.co.in.

8.2 In case of limited competitive bidding, Bidders should respond to this enquiry either by submitting their bids or by explaining the reason for non-submission of the offer. In case there is no response either way continuously, the bidder shall be liable for suitable action including review of their enlistment with EIL for that particular item.

C. PREPARATION OF BIDS

9.0 COST OF BIDDING

9.1 Bidder shall bear all direct and indirect costs associated with the preparation and submission of its Bid (including clarification meetings, and site visit, if any), and EIL shall not be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

10.0 LANGUAGE OF BID

10.1 The Bid prepared by the bidder, all correspondence/drawings and documents relating to the bid exchanged by the bidder with the Owner/Consultant shall be in English Language only. In case, any printed literature furnished by bidder written in another language so long as accompanied by an English translation, in which case, for the purpose of evaluation and interpretation of the bid, the English translation shall govern.

In the event of submission of any document/ certificate by the Bidder in a language other than English, then copies of the English translation of the same shall also be furnished duly certified, stamped and signed, as per the convention followed by the concerned authority in the respective country, by any one of the following authorities:

a) Local chamber of commerce
b) Indian embassy in bidder's country
c) Bidder's Country's Embassy in India
d) Any translator in India recognized/ authorized by Bidder's Country's Embassy.

11.0 DOCUMENTS COMPRISING THE BID

No Physical Bids / Offers shall be permitted (other than the documents which are specifically mentioned to be submitted in physical form for which scanned copy already uploaded along with the bid). The offers/bids submitted online through e-procurement portal as mentioned in clause 1.2 (i) above along with the respective originals as specified under **clause no. 11.3** shall only be considered as bid for evaluation and ordering. Bidders are required to upload the Bid/offer along with all supporting documents including Priced bid on the **E-Tendering website only.** Electronic Bids (e-bid) shall be submitted on e- procurement website as per available functionalities.

Bidders to upload the unpriced bid (comprising of bid security, technical bid, other documents, etc.) and priced bid (offer prices) strictly at designated place on e- procurement website. Offer prices shall not be mentioned at any place other than the designated field(s) provided on e- procurement website.

11.1 **TECHNO-COMMERCIAL/ UNPRICED BID (through e- procurement website)**

a. List of Document required in the UNPRICED BID is as per BDS.

Bidder shall upload above documents at designated field(s) available on e- procurement website.

11.2 **Priced Bid (through e-tender portal)**

Bidder shall fill-in the prices at designated field(s) available on e- procurement website.

Note:

a) Deviation to terms & conditions, presumptions etc. shall not be stipulated in **"FINANCE"** folder in e-tendering portal. In case of any conditions stipulated in price bid, the bids of such bidders shall be summarily rejected and shall not be considered for further evaluation. Evaluation shall be carried out excluding such bidder(s).

b) Bidder to note that if they submit prices in un-priced part of their bid, such prices shall not be considered. The prices as submitted in the priced part in e-tendering portal only shall be considered for evaluation and award. If prices are not found in the priced part and even if mentioned elsewhere, the bid shall be rejected.

11.3 **EMD/Bid Security (to be submitted in original and scanned copy is required to be uploaded on e-tendering portal)[only in case of open competitive bidding (NIT / IFB)]**

11.3.1 In case of open competitive bidding, the following documents shall be submitted in ORIGINAL within the Bid due date and time of e-bid submission in the E-procurement portal & in a sealed envelope, with proper index and covering letter in bidder's letter head. The envelope shall be titled "EMD (IN ORIGINAL)" with the Name of the Work, Bidding Document No., Name of the Project etc. along with the Bidder's name and address with contact no., email Id etc. and shall be submitted to the address as mentioned below:

i) Original Earnest Money Deposit/ Bid Security or exemption certificate in accordance with Clause No. 16.0 of ITB.

ii) In case of limited competitive bidding, bid security shall not be applicable.

Bidder shall be required to submit the copy of the bid security (or authenticated exemption certificate, wherever applicable) within the final extended bid due date and time on the e-tendering portal. In case of bid security in the form of BG/DD/FDR, bidders shall also be required to submit the original BG/DD/FDR to EIL, before the final bid due date and time. If the Bidder fails to submit Bid Security (BG/DD/FDR) physically in original within the above cut-off date, his bid shall be rejected and not considered for further evaluation, irrespective of their status/ ranking in tender and notwithstanding the fact that a copy of Bid Security was earlier uploaded by the bidder on the e-tendering portal.

11.3.2 The address for submission of original documents **is as follow:**

DAK RECEIPT SECTION, ENGINEERS INDIA LIMITED
R&D COMPLEX, SECTOR-16 (On N.H.-8) TOWER-2 (GROUND FLOOR), GURUGRAM - 122 001
HARYANA (INDIA)
Attn.: Mr. Jaydip Purkayastha, GM (SCM-C&P)
Phone No.: +91-124- 289 1304
e-mail: jaydip@eil.co.in

11.3.3 Each envelope shall indicate name and complete address of the bidder with contact details to enable the bid to be returned unopened, if required.

11.3.4 If the envelope is not sealed and marked as above, the Owner / EIL will assume no responsibility for the misplacement or premature opening of the bid.

Document submitted in physical form shall be the exact copy of the documents uploaded on e-procurement portal.

12.0 INTEGRITY PACT

12.1 Bidder shall submit, the scanned copy of the Integrity Pact duly signed and stamped in token of compliance in Part-I of the Bid (**enclosed with RFQ/IFB**), wherever required as per Bid Data Sheet. The bidder shall be required to furnish an undertaking (**Form-D** of Bidding Forms) confirming that he is not involved in any case of transgression in terms of integrity pact. **Non-submission of "Integrity Pact" including "Undertaking w.r.t. Section-5 of Integrity Pact" in the bid shall be a ground of disqualification. However, in case of non-submission of Integrity Pact including Undertaking in the bid, an opportunity shall be given in the CQ to submit the Integrity Pact including Undertaking, provided bidder has declared Integrity Pact submission confirmation in their bid.** Hence, only those bidders shall be given opportunity to submit Integrity Pact who have confirmed to submit the same in their original bid. Copy of the Integrity Pact is provided in Bidding

Forms. Further, if the Integrity Pact submitted in the bid is carrying certain shortcomings / deviations, the bidder shall be asked to clarify or make simple corrections through CQs.

12.2 The detail of Independent External Monitors (IEMs), appointed by EIL, in terms of Integrity Pact (IP) are mentioned in BDS.

12.3 No deviations / modifications in IP shall be acceptable. Bidder shall submit the same format of signed integrity pact (as provided in the bidding document duly signed by the buyer), duly filled-in, signed & stamped by the authorised signatory of bidder.

12.4 Integrity Pact shall be signed by the authorised signatory of the bid subject to following:

a) In case of Proprietorship firm IP may be signed by the Proprietor

b) In case of Partnership firm, IP shall be signed by at least two authorized Partners of the firm unless otherwise specified in the IP format.

c) In case of consortium bids, IP shall be submitted by all consortium members.

d) In case of Sub-contracting, the Principal contractor shall be solely responsible for adherence to the provisions of the Integrity Pact. The Integrity Pact and Affidavit of transgression shall be submitted by the principal contractor only.

13.0 MULTIPLE/ALTERNATIVE BIDS

13.1 A bidder (i.e., the bidding entity) shall, on no account submit more than one bid either directly (as a single bidder or as a member of consortium) or indirectly (as a sub-contractor) failing which following actions shall be initiated:

i) All bids submitted by such bidder (say 'A') as a single bidder or as a consortium, shall stand rejected and Bid Security, if any, in case of all such bids submitted by bidder 'A' shall be forfeited.

ii) If another bidder (say 'B') has proposed bidder 'A' as a sub-contractor then bidder 'B''s bid shall also be rejected. However, in case the bidder 'B' has also proposed an alternative sub-contractor who is other than the bidder 'A', then bidder 'B''s bid shall be evaluated with the proposed alternative sub-contractor only. Hence, every bidder shall ensure in his own interest that his proposed sub-contractor is not submitting alternative/ multiple bids.

Note: However, in case EIL has proposed a list of sub-contractors/ sub-vendors in the enquiry document itself which shall be common for all the Bidders, the provisions at Clause No. **13.1**ii) above shall not be applicable. It is further clarified that:

- A sub-contractor / sub-vendors can be common to more than one Bidder, provided the sub-contractor / sub-vendors themselves are neither a Bidder nor a consortium member.
- Where an Enquiry has multiple Parts, the above condition shall be applicable individually for each Part, as if it is a separate Enquiry.

14.0 BID PRICES AND DISCOUNTS

14.1 Prices shall be furnished strictly in the appropriate field(s) available on E-procurement website. Bidder shall not quote any discount separately for any item or on overall price. Conditional discounts, if offered by a bidder, shall not be considered for evaluation.

14.2 If the bidder has quoted prices in typed/excel sheets, .pdf format (other than prices/rates sought separately as per 'Preamble to Submission of Prices on E-procurement website') then same shall not considered for evaluation purpose.

14.3 Rates/ prices quoted by the bidder shall remain **FIRM, FIXED AND VALID** till the completion of the scope of supply/Works (as applicable) and will not be subject to variation on any account except as otherwise specifically provided in the Bidding Documents.

14.4 The bidder shall quote the prices after careful analysis of cost involved for the performance of complete work considering all parts of the RFQ documents. In case, any activity though specifically not covered but is required to complete the work as per scope of work, scope of supply, specifications, standards, drawings, GPC, SPC or any other part of RFQ Document, the prices quoted shall be deemed to be inclusive of full and final cost incurred for such activity(ies).

14.5 It shall be the responsibility of the Bidder to duly enquire of their own and comply with all applicable laws, rules, regulations, orders and formalities applicable to Goods and Services Tax (GST), Custom Duty etc. on the manufacture, sale and/or supply of any material / services to Owner / EIL. It is clearly understood that Owner/ EIL will not have any additional liability towards payment of applicable Taxes & Duties as a result of Bidder's wrong assessment / interpretation of applicable taxes & duties.

14.6 **Price basis w.r.t inclusion/exclusion of taxes and duties**

Refer Clause No. 8.0 of SPC (Special Purchase Conditions).

14.7 All duties, taxes, and other levies payable shall be as per Special Purchase Conditions (SPC).

14.8 It shall be the responsibility of the Bidder to duly enquire on their own and comply with all applicable laws, rules, regulations, orders and formalities applicable to Goods and Services Tax (GST), Customs Duty etc. on the manufacture, sale and/or supply of any material / services to Owner / EIL.

14.9 **The Bidder shall keep the Owner / EIL indemnified from and against any and all claims, demands, prosecutions, penalties, damages, demurrages and/or other levies whatsoever** made or levied by any Court, Tribunal or the Customs or other Authorities with respect to any alleged breach, evasion or infraction of such duties, taxes, charges or levies or any breach or infraction of such laws, rules, regulations, orders or formalities concerning the same and from the consequence thereof.

14.10 Foreign Exchange rate variation shall not be provided.

15.0 CURRENCIES OF BID AND PAYMENT

15.1 Currency of bid and Payment shall be as specified in Special Purchase Conditions/ Price Schedule. Payment shall be made in respective currency of quote only. Change in currency once quoted will not be allowed.

16.0 BID SECURITY [APPLICABLE IN CASE OF OPEN COMPETITIVE BIDDING (NIT/IFB)]

16.1 Details of EMD / Bid Security are specified in the NIT/ IFB. Bidder is required to submit the bid security / EMD accordingly.

16.2 The Bidder shall be required to furnish Bid security in the form of **Bank Guarantee (including e-BG)** OR **bank demand draft** OR **Fixed Deposit Receipts (FDRs)** OR **Insurance Surety bond** or **through Net-Banking (RTGS/NEFT)**.

Bidders (Indian or Foreign) shall submit Bank Guarantee or DD or FDR through an Indian Scheduled Public Sector or Scheduled Private Sector or Indian branch of Scheduled Foreign Banks as per RBI's List of Scheduled Commercial Banks (SCBs).

Bids must be accompanied with Earnest Money Deposit / Bid Security. Bids not accompanied with requisite Earnest Money deposit /Bid Security (or authenticated exemption certificate, wherever applicable) shall be considered as non-responsive and such Bids shall be summarily rejected.

EMD/ Bid Security shall be in favour of **Engineers India Limited** in the form of **bank demand draft** payable at **New Delhi** or **non-revocable Bank Guarantee (including e-BG)** on non-judicial stamp paper of value not less than INR 100/- and in the prescribed proforma enclosed with bidding document and valid for 2 (Two) Months beyond the original bid validity or **through Net banking** or

Fixed Deposit Receipts (FDRs) along with a confirmation in the prescribed proforma enclosed with bidding document valid for 2 (Two) Months beyond the original bid validity or **Insurance Surety bond** in the prescribed proforma enclosed with bidding document valid for 2 (Two) Months beyond the original bid validity.

Swift message/Cheque/Cash shall not be acceptable.

In case Bid security submitted in the form of Insurance surety bond or on-line payment or DD or FDR, same shall be in Indian Rupees only.

16.3 Bidder's name and RFQ details shall be written on the back side of bid security submitted in the form of DD.

16.4 **Validity of Bid Security** : EMD/ Bid Security shall be valid for a period of **02 months** over and above validity of bid. It shall be ensured that the validity of Bid Security submitted by all the bidder is inline with the provisions in the bidding document.
In case of seeking any extension in bid validity by more than 15 days, corresponding extension in validity of bid security shall also be ensured by the Bidder.

16.5 Bidder shall be required to submit the original bid security (or documentary proof claiming exemption, wherever applicable) and also upload copy of the same within the final bid due date and time on the e-tendering portal/ GeM Portal, as the case may be. If the Bidder fails to submit Bid Security physically in original to EIL office (as mentioned in BDS) or upload copy of the same on the e-tendering portal within the above cut-off date, his bid shall be rejected and not considered for further evaluation. Uploading as well as submitting original Bid Security within the cut-off date, as specified in the Bidding Document is mandatory.

In case EMD/ Bid Security is submitted through net-banking, submission of Original physical form of EMD/ Bid Security within the bid due date shall not be required. However, transaction details/ proof of submission of EMD/ Bid Security through net-banking shall be uploaded in designated place in the above mentioned GeM Portal.

16.6 Bank details for the purpose of submitting **EMD/Bid Security through Net banking is as below**:

Name	**: Engineers India Limited**
Current Account No.	**: 35776275270**
Bank	**: State Bank of India**
Branch	**: Mehrauli Road, M.G. Road, Gurugram, Haryana-122001**
IFSC/RTGS Code	**: SBIN0001565**
MICR CODE	**: 110002190**

16.7 Against submission of Earnest Money Deposit (Bid Security) Electronic Bank Guarantee shall also be acceptable in place of SFMS based bank Guarantee. If a Supplier chooses to submit e-BG, physical copy is not required. For issuance of Electronic Bank Guarantee through National E-Governance Services Limited (NeSL) platform, details of Engineers India Limited (Beneficiary) are as under:

(i)	*PAN*	*AAACE5318C*
(ii)	*Name*	*Engineers India Limited*
(iii)	*Date of Incorporation*	*15.06.1965*
(iv)	*Email ID*	*eil.ebg@eil.co.in*
(v)	*Contact No.*	*9999119550*
(vi)	*Legal Constitution*	*Entity*
(vii)	*Registered office address*	*Engineers India Bhawan, 1, Bhikaji Cama Place, New Delhi-110066, India*
(viii)	*Registered office address Pin code*	*110066*
(ix)	*Communication address*	*Engineers India Bhawan, 1, Bhikaji Cama Place, New Delhi-110066, India*
(x)	*Communication Address Pin code*	*110066*

EIL's Format of BG for Bid security is enclosed in the bidding document. However, in case the RFQ is issued through GeM Portal, Bank Guarantee Format as per GeM shall also be acceptable.

BG submitted in e-BG should be verified from NeSL portal through departmental nodal officer.

16.8 Apart from hard copy submission of BGs, bank guarantee issued towards EMD/CPBG/ABG etc., it shall be preferred that same is also routed through SFMS (Structured Financial Messaging System) platform for Bank Guarantee issuance and Verification. The information/message (as per SFMS platform) shall be sent by BG issuing bank branch to EIL's Banker as per details below:

Name	Engineers India Limited
Address of EIL	1, Bhikaji Cama Place, RK Puram, New Delhi- 110066
e-Mail Address	billing@eil.co.in
PAN	AAACE5318C
Name of Bank	State Bank of India CAG Branch-II, 4th and 5th Floor, Redfort Capital Parsvanath Towers, Bhai Veer Singh Marg, Gole Market, New Delhi-110001 Tel: 011-23475562/5569 Fax: 011-23475580
Branch Code	17313
Current Account Number	10813604212
IFSC Code	SBIN0017313
MICR Code	110002562

Bidders to note that routing BG's through SFMS (Structured Financial Messaging System) platform for Bank Guarantee issuance and Verification shall be mandatory w.e.f. 1st January, 2021. Therefore, bidders are advised to switchover their banking following above platform for issuance of Bank Guarantee.

16.9 EIL shall not pay any interest on Bid Security furnished. Bidder shall be required to submit genuine & valid Bid Security with the bid meeting the requirements for the same specified in the bidding document in the first instance itself. Bids submitted without Bid Security or Bids submitted with Bid Security for an amount less than the specified amount or Bid Security submitted in favour of beneficiary other than as specified in Enquiry Document or from other than the required bank shall be rejected outright and shall not be considered even for unpriced opening. Further, in case Bid security submitted by the bidder is found to be fake, the bid will be rejected and a suitable action as per provision of Fraudulent Practice shall be initiated.

However, minor typographical deficiencies in the BG(including e-BG), Insurance security bond, etc, may be allowed to be corrected.

16.10 In case of a Foreign Bidder, Bid Security may be submitted by their subsidiary or associate Company or their Indian Counter Part/ Agent, on behalf of the Foreign Bidder. In such a case, following conditions must be complied:

(i) Bid Security, if issued in the form of a bank guarantee shall clearly state that it is issued by the Indian Counter Part for & on behalf of the Foreign Bidder.

(ii) The bank guarantee shall contain specific declaration from the Indian Counter Part that the Bank Guarantee shall be liable for invocation in case of any default by the foreign bidder in terms of the bidding document.

(iii) The Indian Counter Part shall be duly authorised by the foreign bidder to issue the bank guarantee on their behalf. This authorisation shall be on the foreign bidder's letterhead and appended with the bid security.

16.11 The bid security of a bidder shall be forfeited in any of the following situations:

a. If the bidder submits alternative bids; or

b. If the bidder suo moto modifies his bid; or

c. Withdraws his bid during the period of bid validity; or
d. In case, during evaluation of bid, it is found that any forged/fake document has been furnished.
e. In the case of a successful bidder, if the bidder fails or refuses:
   i) to accept the Purchase Order/signing of the Contract
   ii) to furnish Contract Performance Bank Guarantee.
   iii) to accept arithmetical corrections of its bid, as per the terms of the Bidding Document.

In case, any of the above events happens, the bidder shall be given a notice of 7 days to take corrective action and in case corrective action is not taken, the bid security shall be encashed without any further notice.

16.12 In case of a JV/Consortium bid (if permitted in IFB), the Bid Security shall be submitted by Consortium, or the Leader or any of the members of the Consortium on behalf of consortium in original form as follows :

a) Foreign consortium (i.e., consortium formed by foreign companies only) - US$
b) Indian Consortium (i.e, consortium formed by Indian companies only) - Indian Rupees
c) Consortium bid involving at least one Indian entity and one Foreign entity - Indian rupees or US$.

In case of Consortium bids, EMD exemption shall only be allowed wherein;

i. both the Consortium members are MSE; and / or
ii. both the Consortium members are Indian Central PSUs / PSEs; and / or
iii. one member being MSE and the other member being Indian Central PSU / PSE.

The amount of EMD / Bid Security is specified in the **IFB.**

16.13 **Exemption of Bid Security :**

16.13.1 Indian CPSUs (state PSUs are not exempted) and Micro or Small Enterprises (MSEs) registered on UDYAM registration portal having valid "UDYAM Registration Certificate", shall be exempted from submission of bid security. Irrespective of the product category, exemption from payment of EMD shall be given to all eligible MSEs, except for Traders and in Works contracts.
CPSUs shall submit declaration to this effect that being CPSU they are exempted from submitting Bid Security. MSEs shall provide the necessary valid documentary evidence, i.e. UDYAM Registration Certificate. MSE Bidders shall be eligible for exemption only if the URC Certificate / URC detail as submitted in the Bid. The Udyam registration certificate shall be verified from GoI Udyam registration portal (present web address is https://udyamregistration.gov.in). The status of the MSE Bidder as on the date of Unpriced Bid opening shall be considered.

In case of an upward change in terms of investment in Plant and Machinery or Equipment or Turnover or both, and consequent re-classification, an enterprise shall continue to avail of all non-tax benefits of the category (Micro or Small or Medium) it was in before the re-classification, for a period of three years from the date of such upward change.

In case of upward change in status, Bidder is required to submit the previous certificate also to establish consequent re-classification for claiming exemption of EMD.

In case an MSE bidder has submitted Udyam Registration but authenticated scanned document is not uploaded along with Bid on GeM Portal, the same can be accepted provided a valid MSE Certification is available on Government Udyam Registration portal.

16.13.2 If the enquiry is issued through the GeM Portal, exemption from submission of Earnest Money Deposit shall be as per the latest GeM GTC as on the date of issuance of RFQ/ Tender.

16.14 EMD / Bid securities shall be returned as follows:

a) To bidders whose bids received late or of those unpriced bids which have not been opened/whose price bids are not opened, shall be returned within 30 days after publishing the result of unpriced bid evaluation.

b) To unsuccessful bidders, i.e., whose priced bid has been opened, will be returned upon placement of order/ award.

c) To successful bidders, the same will be returned after the order / contract is effective and Contract Performance Bank Guarantee/ Security Deposit is submitted.

d) In case EIL / Owner decides to cancel / annul the Enquiry / bidding document at any stage during the bidding process but before the award of works / items (as applicable), EMD of the bidders shall be returned at the earliest from the date of such decision.

16.15 Owner/ EIL shall not pay any interest on Bid Security furnished. Further, in case Bid security submitted is found to be fake, bid of such bidder shall be rejected and may initiate action as deemed necessary as per EIL Policy.

17.0 CERTIFICATION OF DOCUMENTS / SPECIAL DOCUMENTATION REQUIREMENT

17.1 DOCUMENTS ESTABLISHING QUALIFICATION OF THE BIDDER [APPLICABLE IN CASE OF OPEN COMPETITIVE BIDDING (NIT/IFB)] / AUTHENTICATION

i. Submission of genuine and authentic documents is the prime responsibility of the bidder. No amount of checking or verification by EIL/Owner shall absolve bidder from his responsibility.

ii. The mechanism for bidder's certification regarding authenticity of BQC documents shall be as under:

(a) Bidder shall furnish an undertaking in the format as per **Annexure-IV to IFB/NIT**(Undertaking towards the authenticity of submitted BQC documents**)** towards the authenticity of submitted BQC Documents, duly signed by the authorized signatory of Bidder holding Power of Attorney for signing of Bid.

(b) Proprietorship/ Partnership firms shall submit the undertaking as per **Annexure-IV to IFB/NIT**, duly signed, respectively by the Proprietor/ any two Partners.

iii. Bidders shall be required to upload the authenticated copies of documents for meeting BQC on the e-tendering portal only. Bidders are not required to submit the original authenticated documents in physical form to EIL.

iv. Under the EIL suspension/ banning rules (available on EIL portal www.engineersindia.com), the punishment for submission of FORGED/FALSE documents is clearly mentioned. Moreover, the bidding document additionally indicates other actions against the bidder like encashment of EMD or PBG depending upon the stage of discovery of the fraud/false documentation. Moreover, the bidder's organisation is responsible for any and all actions of their employees and any claims seeking to pin point the blame on some employee of bidder and attempting to absolve the bidder's organisation will not be entertained.

v. Bidder to note that the EIL/Owner reserves the right to proceed based on acceptable offers (who have submitted authenticated documents in line with the mechanism mentioned above and also in the NIT/IFB) and reject outright the other bids which have some shortcoming including non-submission of authenticated documents. The bidder shall therefore submit the authenticated documents along with the offer itself and in case of rejection of his bid shall not have any right to seek another opportunity for submission of authenticated documents.

17.2 In addition to authentication of BQC document, the document(s) submitted by the bidder towards meeting the Bidder Qualification Criteria (BQC) as per NIT/IFB shall be subject to verification as per mechanism detailed below:

i. Documents submitted by the bidder for meeting the BQC shall be verified from the document issuing authority.

ii. Verification of documents shall be carried out through e-mail/letter or visit by EIL Officials. Bidder shall provide complete assistance towards the same. It shall also be the responsibility of the bidder to assist EIL in carrying out this exercise.

Accordingly, bidder shall ensure that they submit only those executed & completed works (PO/Contracts) meeting the qualification criteria for which they can arrange such verification from respective Clients.

iii. Payment shall not be released till verification is complete.

iv. Failure of cross verification shall entitle EIL to reject the bid or terminate the Purchase Order/Contract, if issued.

v. In case, the BQC documents have already been verified by EIL for any other enquiry/tender, the same may also be considered verified on the strength of previous verification and acceptance by EIL. However, in such case, bidder shall indicate in **Appendix-XI to ITB** that BQC/PTR documents submitted in this bid has already been verified by bidder's client.

vi. In case bidder's supporting documents are not in English language and, bidder also submits duly certified translated documents, verification from document issuing authority shall be carried out only for the original documents issued by the client.

It shall be the responsibility of the Bidder to provide complete assistance to EIL for carrying out the verification exercise. Accordingly, Accordingly, bidder shall ensure that they submit those executed and completed Work(s)/Contract(s) meeting the BQC for which they can arrange such verification from their respective Clients.

18.0 PERIOD OF VALIDITY OF BIDS

18.1 Bids shall remain valid for the period specified in the GeM Bid/BDS after the bid submission deadline date prescribed by EIL in accordance with ITB. A bid with shorter validity period shall be rejected by EIL as non-responsive. Bidders shall not be entitled during the above period, without the consent of EIL in writing, to revoke or cancel their Bid or to vary the Bid given or any term thereof. In case of bidders revoking or cancelling their Bid or varying any terms in regard thereof without the consent of EIL in writing, EIL shall forfeit Bid security, submitted along with the bid and shall reject their bids. Such Bidder may also be put on **Black-listing / Holiday Listing /Suspension / Banning List/ Negative List**.

18.2 In exceptional circumstances, prior to the expiration of the bid validity period, EIL may request bidders to extend the period of validity of their bids. The request and the responses shall be made in writing. If a bid security is requested in accordance with Clause No. **16.1 of ITB**, it shall also be extended for 2 (Two) months beyond the deadline of the extended validity period [for extension in required original bid validity by more than 15 days]. A bidder may refuse the request without forfeiting its bid security. A bidder granting the request shall not be permitted to modify its bid.

A bidder may refuse the request after which their offer will not be considered for further evaluation. Bid security shall not be forfeited in case a bidder refuses validity extension.

19.0 SPECIAL INSTRUCTIONS TO FOREIGN BIDDERS – Not Applicable

20.0 POWER OF ATTORNEY

20.1 Bids shall be signed by the authorized signatory of the bidder.

20.2 In all press enquiries, bidder shall submit a Power of Attorney in the name of such authorized signatory(ies). Requirements for submitting the POA shall be as follows:

i) Company: Bidder shall submit a specific Power of Attorney for the tender in the name of authorized person.

Alternatively, in case Bid signatory has General Power of Attorney or has the power as per their Board resolution, the same shall be submitted duly certified by Notary Public or CEO/CFO/Company Secretary (CS)/Member of Board of Directors.

In case, Bid is signed by CEO/CFO/CS/any member of board of Directors, no separate POA is required, provided the documentary evidence of their being CEO/CFO/CS/any member of board of Directors is reflected in the MOA/AOA/Financial Statements, else submitted separately in the Bid.

ii) Partnership Firm: In such case,

- Bid can be signed by all the partners of the Firm and in such case no separate POA is required. OR
- Bid can be signed by any of the Partner(s) holding Power of Attorney as specified in the Partnership deed, OR
- Bid can be signed by an authorized person and shall submit a specific POA for the tenderduly signed by all the Partners.

Bidder shall submit the copy of Partnership Deed.

iii) Limited Liability Partnership (LLP) Entity: Bid shall be signed by the person holding Power of Attorney as per the registered LLP Agreement for the Firm, OR, has the power as per their Board resolution, OR, a specific POA for the tender duly signed by all the LLP Partners.

Bidder shall submit (i) a copy of LLP Agreement, and (ii) a copy of Certificate of Incorporation.

iv) Proprietorship: Proprietor shall sign the Bid.

Bidder shall also submit a copy of (i) PAN card and (ii) Bank Mandate Form, duly certified bythe Bidder's Banker.

v) Unincorporated Joint Venture/Consortium: Both members of the consortium shall authorize the Lead Member of the consortium with the authority to bind the consortium, through a Power of Attorney given jointly by all the members to the Lead Member.

Leader as well as Member(s) of the Consortium/JV shall also submit a separate POA from their respective Company/ Firm in the name of the signatory signing the Consortium/JV Agreement. Depending on the formation/ registration/ constitution (Company/ Firm, etc.) ofthe Leader/Member of the Consortium/JV, POA shall be submitted in a manner, as applicable, as per the above clauses.

20.3 For Indian Bidder, POA shall be on non-judicial stamp paper of minimum value of INR 100/- and duly Notarized by a Notary Public in India.

For Foreign Bidders, POA shall be:

- on the Stamp Paper of appropriate value or engraving/embossing, in lieu of non-judicial stamp paper, as per applicable laws in Bidder's Country; or
- as per any other system prevailing in the bidder's country for the purpose of issuing POA.

20.4 Specific POA issued for the tender shall confirm that the authorized signatory have been authorized to do in the name and on behalf of the Company/Firm all or any of the acts, deeds or things necessary in connection with or incidental to the Bid submitted by the bidder for the subject Enquiry Document, including but not limited to the signing and submission of bid, participating in the meetings, responding to queries, submission of information /documents and generally to represent us in all the dealings with EIL or any person, in connection with the works, without any prejudice, limitations and exceptions till the completion of the bidding process.

21.0 DIGITAL SIGNATORY

In case of e-tendering, login and submission of bids by the bidder on the e-tendering portal is through requisite & valid digital signature certificate.

e-Bid Signatory who is using his digital signature for uploading / signing the e-bid, shall also carry the Power of Attorney.

However, in case foreign bidder does not have digital signature issued by an Indian certifying authority, he can authorize his Indian representative to use the representative's digital signature to upload the bid on behalf of foreign bidder. In such a case, the authorization letter shall be submitted alongwith the bid.

All documents as submitted in the e-Procurement Portal using digital signature at any time during the Bidding process shall be deemed considered signed by the POA holder only, irrespective of POA holder's signature on all pages or not.

22.0 FORMAT AND SIGNING OF BID

22.1 The e-bid shall be uploaded duly digitally signed (e-signed) using the digital signature of a person duly authorized to sign on behalf of the bidder. The digital signature used for signing the bid shall be issued in the name of such authorized person and the certificate details, available from the signed documents, should indicate the details of the signatories.

22.2 Bids shall be submitted by the bidder through e-tendering portal using their digital signature. However, in case foreign bidder does not have digital signature issued by an Indian certifying authority, he can authorise his representative to use the representative's digital signature to upload the bid on behalf of foreign bidder. In such a case, the authorisation letter shall be submitted along with the bid.

22.3 Bidder shall be required to upload the digitally signed copies of documents for meeting BQC, Power of Attorney and other authenticated documents (like proof of being MSEs for availing preference under Public Procurement Policy-2012) on the e-tendering portal only. In that case, bidder shall not be required to submit the original authenticated documents in physical form to EIL.

22.4 In case of a JV/Consortium bid (If permitted in the bidding document), the Bid shall be digitally signed (e-signed) using the digital signature of a authorized representative of the JV /Consortium, and so as to be legally binding on all the members as evidenced by a power of attorney signed by their legally authorized representatives.

22.5 Offer shall be checked for submission of authenticated document as per the requirement as per of bidding document. In case of e-tendering, bidders shall be required to upload the digitally signed authenticated copies of documents for meeting BQC on the e-tendering portal only.

22.6 Bidders to upload the Un-price and Price part of their e-bids strictly in the Un-price & Priced folders respectively at the designated place in the e-tendering portal. Non-Compliance to the same may lead to rejection of their Bids.

23.0 SEALING AND MARKING OF BIDS [APPLICABLE IN CASE OF OPEN COMPETITIVE BIDDING (NIT/IFB)]

23.1 The bidder shall submit the, original Bid Security as per the requirement of clause no**. 11.3 & 16.0** of ITB, in separately sealed envelopes, duly marking the envelopes as per following:

Bid Security (Originals)

Name of Item/Work: _____

Bidding Document No.:_____

Due date & Time of Submission: _____

From: [Name & Address of Bidder including contact details] _____

23.2 The envelope shall bear the name and address of the bidder and bear a warning "Do not open before the time and date of bid opening".

23.3 If envelopes are not sealed and marked as required, EIL will assume no responsibility for the misplacement or premature opening of this envelope.

D. SUBMISSION AND OPENING OF BIDS

24.0 DEADLINE FOR SUBMISSION OF BIDS

24.1 Bidders shall submit their bids electronically in the e-tendering portal, within the date and time **specified in the RFQ Covering Letter** or any extension thereof. Bidders submitting bids electronically shall follow the electronic bid submission procedures **specified in the RFQ**.

No Physical bid shall be permitted other than submission of the documents categorically asked for in hard copies as part of e-bids submitted online through the e-tendering Portal. **Original Bid Security must be received by EIL at the address specified in IFB/ Bid Data Sheet within the date and time for submission as specified in the IFB or any extension thereof.**

24.2 EIL may, at its discretion, extend the deadline for the submission of bids by amending the Bidding Documents in accordance with Clause No.**7.0** of ITB, in which case all rights and obligations of EIL and bidders previously subject to the deadline shall thereafter be subject to the deadline as extended.

24.3 Bidders in their own interest are requested to upload/submit their bid well in time. Bidder should avoid the last hour rush to the website wherein bidder is likely to miss the deadline for bid submission. Due date extension request due to above reason shall not be entertained.

24.4 Wherever bids are sought through GeM portal, bidders to get acquainted with the GeM Portal in advance and obtain/seek clarifications, if any, from GeM Portal Helpdesk.

25.0 LATE BIDS

25.1 E-tendering system shall close immediately after the deadline for submission of bid. Any bids being submitted in physical form (**other than Bid Security or documents specifically sought in physical form**) shall not be considered for opening / evaluation / award and will be returned to such bidders.

25.2 ***In the event the Bid Security in original, in accordance with Clause No.0 of ITB & IFB, are not submitted within the deadline as per IFB, the bids shall be declared late and shall not be considered for opening/evaluation/award, notwithstanding the fact that the bid has been submitted in electronic form within the deadline.*** However, in case of exemption from submitting Bid Security under MSE/CPSE/Startup, then bidder shall submit the documentary evidence of the same.

25.3 Unsolicited bids or bids being submitted to place/website other than one specifically stipulated in the RFQ documents shall not be considered for opening/ evaluation / award.

26.0 WITHDRAWAL, SUBSTITUTION, AND MODIFICATION OF BIDS

26.1 The bidder may modify, re-submit or withdraw its e-bid after the bid submission, but, before the due date and time for submission of Bid following the electronic bid submission procedures.

26.2 There are two specific features in NIC- Central Public Procurement Portal (CPPP) viz, "Withdraw" and "Re-Submission". Bidders should not use the feature "withdraw" unless they have decided to withdraw their bids. It is to be noted that once "withdraw" feature is used they will not be allowed to re-submit their bid against this Bidding Document. In case a Bidder desires to change his bid for any reason before bid due date, Bidder shall use "Re-Submission" feature.

26.3 No bid shall be withdrawn, substituted, or modified in the interval between the deadline for submission of bids and the expiration of the period of bid validity or any extension thereof. Such withdrawal shall be dealt as per provision of tender documents and prevailing policy(ies) of EIL.

26.4 In case bidder fail to accept the order or withdraw the bid after bid submission, punitive action shall be taken against them as per the EIL Policy.

27.0 BID OPENING

27.1 The un-priced Bids shall be opened online through e-tender portal, at the specified date and time given in the RFQ/ IFB document or on the extended due date, as applicable. Bidders can view the stages of evaluation on E-procurement website.

27.2 The order of opening of bids shall be as follows;

(i) On scheduled date and time of Technical (UNPRICED) bid opening, Opening of **documents, submitted in electronic form shall be processed on the e-Procurement module of the e-tendering portal.**

(ii) Financial (Price) bid of only those bidders whose bids is determined to be technically and commercially acceptable by EIL shall be opened. Bidders selected for opening of their priced bids shall be informed about the date and time of price bid opening and shall not be called for physical participation during bid opening.

NOTE: Online opening as above, will be deemed as opened in public and there will be no separate public opening. Hence, bidders will not be called during opening of the bids.

27.3 If a supplier / an agency is placed on **Black-listing / Holiday Listing /Suspension / Banning List/ Negative List** of EIL or Client after issue of enquiry but before unpriced bid opening, their bid will not be opened. If a supplier / an agency is placed on **Black-listing / Holiday Listing /Suspension / Banning List/ Negative List** of EIL/Client after opening of unpriced bids but before opening of priced bids, further evaluation shall be stopped and the corresponding priced bid will not be opened.

If a supplier / an agency is placed on **Black-listing / Holiday Listing /Suspension / Banning List/ Negative List of EIL** or **debarred and/ or disqualified by GeM (if Tender published through GeM Portal)** after issue of enquiry but before unpriced bid opening, their bid will not be considered for further evaluation.

If a supplier/ an agency is placed on **Black-listing / Holiday Listing /Suspension / Banning List/ Negative List** of EIL or Client after opening of priced bids and such a supplier/ agency happens to be the lowest bidder, the next lowest bidder shall be considered as L1 for the items/ parts for which the bidder is lowest. Further, in case L1 bidder is Suspended / debarred on GeM portal, incase enquiry/ tender has been published in the GeM Portal, evaluation and awarding shall be as per GeM Incident Management Policy.

Also, bidder shall submit the declaration that they are not on **Black-listing / Holiday Listing /Suspension / Banning List/ Negative List** of or black listed by any Central Government Department/ Central Public Sector on due date of submission of bid. However, this shall be for information only and shall not be rejection criteria. In case, this information is not provided or provided falsely, the bid shall be rejected.

Also, refer provisions of Clause No. 2.7 of ITB regarding Suspension/Banning in GeM portal.

E. EVALUATION AND COMPARISON OF BIDS

28.0 CONFIDENTIALITY

28.1 A bidder may seek clarification regarding the Bidding Document provisions, bidding process and / or rejection of his bid. EIL shall respond to such requests within a reasonable time. However, such

information relating to the evaluation of bids and recommendation of award shall not be disclosed to any other persons not officially concerned with the bidding process.

28.2 Any attempt by a bidder to influence EIL in the evaluation of the bids or award decisions shall render their Bid liable for rejection.

28.3 Notwithstanding Clause No.**28.2** of ITB, from the time of bid opening to the time of placement of Order, if a bidder wishes to contact EIL on any matter related to the bidding process, it shall done so in writing only.

29.0 ZERO DEVIATION

29.1 Bidders to note that enquiry is issued on Zero deviation basis. Bids shall be submitted as "**Zero deviation Basis**". Accordingly offer is to be submitted in complete compliance to Terms & Conditions of Bidding Document without any deviation. Offer with deviation may be liable for rejection without any further correspondence.

In view of this Bidder shall ensure submission of complete bid without any deviation as per requirement of Bidding Document in first instance itself.

30.0 DETERMINATION OF RESPONSIVENESS

30.1 EIL's determination of a bid's responsiveness is to be based on the contents of the bid itself, as defined in Clause 11.0 of ITB.

30.2 A substantially responsive bid is one that meets the requirements of the Bidding Documents without deviation.

30.3 A substantially responsive Bid is one which conforms to all the terms & conditions, specifications etc. of the Tender Document without any material deviation or reservation or omission, for this purpose Purchaser defines the foregoing terms below:-

a) 'Deviation' is departure from the requirement specified in the Tender Documents.

b) 'Reservation' is the setting of limiting condition(s) or withholding from complete acceptance of the requirement in the Bidding Document.

c) 'Omission' is the failure to submit part or all of the information or documentation required in the Tender Document.

d) A material deviation, reservation or omission is one that, If accepted would,

i) Affect in any substantial way the scope, quality or performance of the job as specified in the Tender Document.

ii) Limit, in any substantial way, inconsistent with the Tender Document, the Owner/EIL's rights or the Bidder's obligation under the proposed Contract.

iii) If rectified, would unfairly affect the competitive position of other bidders presenting substantially responsive bids.

30.4 The Owner/EIL shall examine all aspects of the Bid to confirm that all requirements have been met without any material deviation, reservation or omission.

30.5 **Bidder should not be under liquidation, court receivership or similar proceedings. Bidder shall submit self-Declaration Form-A in this regard on bidder's letterhead.**

30.6 **In case Bidder(s) affirms that present litigations/arbitrations have impact on their obligations to perform the Contract or doesn't provide the affirmations as above, their bids shall be rejected. Bidder shall submit self-Declaration Form-A in this regard on bidder's letterhead.**

30.7 Bidder shall not be allowed to submit any Price Implication or Revised Price after submission of e-Bid. In case Exceptions and Deviations submitted by Bidder along with Bid are not considered acceptable and no Amendment is issued incorporating such changes, then in such a case the Bidders would be required to withdraw such Exceptions/Deviations unconditionally in favour of stipulations of the RFQ document without any price implication, failing which such Bid(s) shall be considered as non-responsive and liable for rejection.

30.8 No stipulation, deviation, terms & conditions, presumption, basis etc. shall be stipulated in the bid. Any conditions, if stipulated, shall be treated as null and void and shall render the bid liable for rejection.

31.0 CLARIFICATION OF BIDS

31.1 Bidders should ensure that the Bid submitted is substantially responsive Bid in the first instance itself. Evaluation may be completed based on the content of the Bid itself without seeking any subsequent additional information, which may result in rejection of Bid. However, EIL may, at its discretion, may request bidder to submit the necessary information or documentation, within a reasonable period of time, to withdraw deviation, reservation, or rectify omission in the bid related to documentation requirements. Requesting information or documentation on such account shall not be related to any aspect of the price of the Bid. EIL's request for clarification and the response shall be in writing.

31.2 No change, including any voluntary increase or decrease, in the prices or substance of the bid shall be sought, offered, or permitted. Bidder shall not be allowed to submit any price implication or revised price after submission of Bid unless the same is called for by EIL in writing.

31.3 If a bidder does not provide clarifications of its bid by the date and time set in EIL's request for clarification, its bid shall be evaluated with available information which may result in rejection of their bid.

32.0 EVALUATION OF TECHNO-COMMERCIAL BIDS

32.1 Prior to price opening of bids, EIL will determine whether each bid is accompanied with requisite documents;

i) Fulfils the technical, financial and other requirements as specified in the Bidding Document;

ii) Bid's responsiveness in accordance with Clause No. 30.0 of ITB and clarifications thereafter, if any;

iii) Any other relevant factor, if any that EIL deemed necessary or prudent to be taken into consideration.

iv) Authentication of qualification documents (open competitive bidding)

v) EMD / Bid Security as per the requirement specified in clause no. 16.0 of ITB (open competitive bidding)

32.2 EIL reserves the right to use in-house information for assessment of capability of bidder and their performance on jobs completed/ in progress for evaluation purpose.

32.3 Bidders who are enlisted with EIL are required to quote as per their capabilities registered with EIL (applicable in case of limited enquiries)

32.4 In case, any unsolicited reduction in price offered by a bidder within the bid validity by way of discount or revised prices, subsequent to the bid due date provisions of Clause no. 36.3 shall apply.

32.5 In the event of any unsolicited price increase sought by any bidder, subsequent to the bid due date, provisions of Clause no. 36.4 shall apply.

32.6 In view of the enquiries being issued on zero deviation basis, Technical or commercial queries shall not be raised. However, EIL reserves the right to raise queries in exception situations. CQ/ TQs, if any, shall be issued through E-tendering portal and Bidder shall submit their replies through E-tendering portal only. Accordingly, CQ/ TQ replies through any other mode (e-mail, physical form) shall not be accepted. Offers shall be evaluated based on the information available upto cut-off date for CQ/ TQ replies. Bidder shall not submit any Price against TQ/ CQ raised unless specifically sought in writing.

32.7 In view of zero deviation bidding, in case of MRs (group/ basket/ block/ itemwise) / Lumpsum Enquiry, during unpriced evaluation if a bidder has not quoted any part/component/ freight etc, the bid of such a bidder for the corresponding group/ basket/ block/ item (or the entire MR/ lumpsum Enquiry, in case there is only one group/ block) shall stand rejected. However, EIL reserve the right to ask the bidder to absorb the same (except in case of an item not being quoted in an itemwise MR). Non-compliance shall result in rejection of corresponding item/group/block.

It is clarified here that for grouped/ basket/ block, if any item not quoted, the offer shall be rejected for that group/ basket/ block without any CQ/ TQ.

In case, the above is discovered post priced bid opening, such bidder's bid shall not be considered for evaluation for the corresponding group/ block or entire MR/ tender, if there is only one single group/ block. In such an event, the lowest bidder shall be determined out of the remaining bidders.

33.0 OPENING OF FINANCIAL(PRICE) BID

33.1 Priced Bid of only those bidders whose bids is determined to be technically and commercially acceptable by EIL shall be opened. Bidders selected for opening of their priced bids shall be informed about the date, time and place of price bid opening.

33.2 Bidders who qualify pursuant to unpriced bid evaluation shall be notified through e-mail the time and date for online price bid opening in e-procurement portal

33.3 The Price Bids of those Bidders who were not found to be Techno-commercially acceptable shall not be opened in e-tendering.

34.0 CORRECTION OF ARITHMETICAL ERRORS

The prices quoted by bidders shall be checked for arithmetic correction, if any, based on rate and amount filled by the bidder in the SOR/price schedule formats. Based on the format of price schedule/SOR, suitable provisions shall be incorporated in enquiry document as follows:

34.1 RATE AND AMOUNT IN FIGURES AND WORDS

a. When there is a discrepancy between the rate in figures and in words for an item, the rate which corresponds to the amount shall be taken as correct.

b. When the rate quoted by the bidder in figures and words tallies but the amount is incorrect, the rate quoted by the tenderer shall be taken as correct.

c. When it is not possible to ascertain the correct rate as detailed above, the rate quoted for the item in words shall be adopted as the quoted rate. If there is an error in total corresponding to the sub-totals, the totals shall prevail and sub-totals shall be corrected;

34.2 RATE AND AMOUNT IN FIGURES ONLY

When rate and amount are in figures only, in case of discrepancy, the rate quoted by bidder shall be taken as correct.

34.3 LUMPSUM AMOUNT ONLY IN FIGURES AND WORDS

When a lumpsum amount is quoted in figure and words but unit rates are not required to be quoted, amount quoted in words shall be taken as correct.

Bidders shall be requested to accept correction of arithmetical errors. Failure to accept the correction in accordance with Clause above, shall result in the rejection of the Bid and Bid Security shall be forfeited.

34.4 Provisions of Clause No**. 34.1 through 34.3** shall not be applicable for tenders issued on GeM Portal. The evaluation done on GeM portal as per GeM guidelines shall be final and binding.

35.0 CONVERSION TO SINGLE CURRENCY

NOT APPLICABLE

36.0 EVALUATION AND COMPARISON OF PRICE BIDS

36.1 EIL shall compare the price bids based on the evaluation methodology and loading criteria, if any, provided in SPC to determine the lowest evaluated bid.

36.2 Conditional discount, if offered, shall not be considered for evaluation.

36.3 Any unsolicited reduction in price offered by a bidder within the bid validity by way of discount or revised prices, subsequent to the bid due date, shall not be taken into account for comparison. However, such reduction in price shall be taken into account for ordering if such bidder happens to be recommended as per the originally quoted prices.

In view of above, bidders shall be required to regularise such reduction in prices on GeM Portal prior to placement of order (applicable for tenders issued on GeM Portal.) .

In case, such unsolicited reduction is submitted by bidder in their offer or against CQ/TQ response and the bidder does not agree to such regularisation through GeM Portal [discounted price] (applicable for tenders issued on GeM Portal.), their bid shall be rejected. Further, if such reduction is submitted by bidder subsequent to price bid opening or in documents submitted by bidder in the Finance Folder of GeM Portal and the bidder does not agree to such regularisation on GeM Portal then the bid of shall be rejected and EMD, if submitted, by the Bidder, shall also be forfeited and appropriate action will be taken against the bidder as per company guidelines.

36.4 In the event of any unsolicited price increase sought by any bidder, subsequent to the bid due date, the bid of such a bidder shall be rejected, in case the bidder does not agree to withdraw the price increase. In case, price increase is sought by the L1 bidder after priced bid opening and the bidder does not agree to withdraw the price increase, the order shall not be placed with price increase and the enquiry shall be re-floated.

Wherever, decision is taken to reject a bid, EMD, if submitted, by the Bidder, shall also be forfeited and appropriate action will be taken against the bidder as per company guidelines.

36.5 Any implication on account of wrong quotation of taxes and duties shall be to Bidder's account. However, the payment towards such taxes and duties quoted by the bidder shall be restricted to lower of taxes and duties quoted by the bidder or the documentary evidence provided by the bidder.

36.6 If a bidder submits prices in un-priced part of bid, such prices shall not be considered. The prices as submitted in the price part only shall be considered for evaluation and ordering, if any. If prices are not found in the price part and even if mentioned elsewhere, the bid shall be rejected. Wherever e-procurement is followed, prices uploaded at the designated priced folder of the e-tendering website shall only be considered.

36.7 In an extreme situation, when there is a 'TIE' based on the evaluated price (after loadings, if any) recourse shall be taken on the basis of bidder's maximum average annual turnover during the last 3 years. For this purpose, average annual turnover of the bidders having tie, shall be tabulated for the past 3 years and maximum average annual turnover during the last 3 years shall be determined for

each bidder. The bidder whose average annual turnover is highest shall be the recommended bidder.

36.8 However when the tender is issued through GeM Portal, in an extreme situation, when there is a 'TIE' based on the evaluated price, recourse shall be taken on as per GeM guidelines. **Input Tax Credit (ITC) for RFQs issued through GeM:**

Bidder are hereby instructed that relevant details/ documents pertaining to GST registration shall be updated / uploaded in the designated field on GeM portal, failing which, evaluation shall be carried out as per functionality / methodology of GeM Portal and same shall be final and binding on the Bidder.

36.9 **SHIFTING OF ORDER**

NOT APPLICABLE

36.10 Preference to MSEs, if applicable as per BDS, shall be carried out to distribute the item / quantity as per clause no**. 38** below.

36.11 Public Procurement (Preference to Make in India) (PPP-MII), if applicable as per BDS, shall be carried out to distribute the item / quantity as per clause no.**38.0** below.

36.12 **REVERSE AUCTION – NOT APPLICABLE**

37.0 EIL'S RIGHT TO ACCEPT ANY BID, AND TO REJECT ANY OR ALL BIDS

37.1 The EIL reserves the right to accept or reject any bid, and to annul the bidding process and reject all bids at any time prior to award of the order without thereby incurring any liability to the affected bidder or bidders or any obligations to inform the affected bidder or bidders on the ground of such action by EIL.

38.0 POLICIES ISSUED BY GOVERNMENT INCLUDING PURCHASE PREFERENCE POLICIES

38.1 **Preference to Central PSUs**

Purchase preference to central PSUs or any other government guidelines as applicable from time to time shall be considered.

38.2 **Preference to Micro and Small Enterprises (MSEs) (Applicable for Procurement of Goods & Services only): For applicability Refer Bid Data Sheet (BDS)**

Ministry of Micro, Small & Medium Enterprises notified the Public Procurement Policy (PPP), 2012 for facilitating the promotion and development of micro and small enterprises in Government Procurement. Subsequently, Micro, Small & Medium Enterprises vide circular no. 21(8)/2018-MA dated 09.11.2018 has issued an amendment to the said policy.

Further, Ministry of MSMEs (MoMSME) vide Gazette notification No. S.O. 4926(E) dated 18.10.2022 have issued amendment in sub-paragraph (5) of paragraph 8 of MoMSME S.O. No. 2119 (E) dated 26.06.2020.

Under this policy, buyer reserves the right to allow Micro & Small enterprises as well as MSEs Owned by SC/ST entrepreneur and MSEs Owned by Women, purchase preference as admissible under the prevailing procurement policy for MSEs.

Refer Appendix – III to ITB for details.

38.3 **Public Procurement (Preference to Make in India), Order 2017: For applicability Refer Bid Data Sheet (BDS)**

Ministry of Petroleum & Natural Gas (MoPNG) vide File no. FP-20013/24/2017-FP-PNG-(E-17013) dated 21.08.2024, have issued revised Public Procurement (Preference to Make in India) (PPP-MII)

Order, 2017 issued by DPIIT and as amended from time to time shall be applicable to all the Public Sector Undertakings and their wholly owned subsidiaries under MoP&NG, Joint Ventures that have 51% of more equity by one or more Public Sector Undertakings under MoP&NG. Copy of the notifications is available on MoPNG website.

Under this policy, buyer reserves the right to allow Suppliers or Service providers in a tender and purchase preference as admissible under the prevailing policy, subject to complying with the requirements/ conditions defined herein and submitting documents required to support the same.

Refer Appendix-IV to ITB for details. For Concurrent Applicability of PPP-MII & MSE Policy refer Appendix-V to ITB.

Important Instruction for Purchase Preferences (PPP-MSE,2012 / PPP-MII, 2017) for Tenders issued at GeM portal.

Bidder is hereby instructed that relevant documents and information pertaining to MSE and PPP-MII (as applicable; refer BDS), which are necessary for availing the relevant benefits during evaluation, must be updated/ uploaded in the designated folder on GeM portal.

Bidders to note that in spite of submission of such relevant documents in the ATC folder in GeM, in case they fail to adhere to the above instructions, i.e., does not properly select/update for the option of availing such preferences on the GeM portal itself, they shall not be considered as a MSE and/or Class-I local supplier, as applicable, even though bidder is natural L1.

Also, the evaluation as done by GeM portal shall be final and binding.

38.4 **Policy for providing Preference to Domestically Manufactured Iron & Steel Products (DMI&SP) inGovernment Procurement: For applicability Refer Bid Data Sheet (BDS)**

i. In order to give preference to domestically manufactured iron and steel products (DMI&SP) in Government procurement, Ministry of Steel, **vide "The Gazette of India, extraordinary part II no. 298,G.S.R. 341(E) dated 26.05.2025"** notified the revised policy for providing preference to domestically manufactured iron & steel products in government procurement promulgated a Policy, Copy of this policy is available at https://steel.gov.in/policies.

Refer Appendix-VI to ITB for details.

ii. In case Bidder's Quoted Price (Item wise basis) is more than INR 5 lakhs, Bidder should comply with the Domestically Manufactured Iron & Steel Policy (DMI&SP) for the Iron & Steel products involved in execution of the contract. Bidder shall submit affidavit of such Iron & Steel products as per the Format enclosed as **Form-1 (enclosed with Appendix-VI to ITB).**

iii. If Bidder's Quoted Price (Item wise basis) is lower than the threshold value of INR 5 Lakhs, Bidder shall submit a "Declaration of Non-Applicability of DMISP Policy" as per **Form-2 (enclosed with Appendix-VI to ITB)**. In case, at any stage before or after award, if Price of any of the quoted item is found more than INR 5 Lakhs, it shall be construed as the false/wrong declaration and Penal action shall be initiated against the Bidder as per provision of Bidding Document. If such a supplier/ agency happens to be the lowest bidder during price evaluation, the next lowest bidder shall be considered as L1.

iv. For the purpose of this Policy, the threshold value INR 5 lakhs shall be considered on Item wise basis excluding GST & freight. In all cases where evaluation is on bottom line basis for each individual group, threshold value shall be considered on the basis of individual item of the respective group.

v. Domestic manufacturers of Iron and Steel products under Appendix-A and Appendix-B shall submit duly filled / certified **Form-1 (enclosed with Appendix-VI to ITB)**, at the time of bidding.

vi. Bidders who are selling agents/authorized distributors/authorized dealers/authorized supply houses of the domestic manufacturers of iron & steel products, covered by Appendix-A, are eligible to bid with self-certification on behalf of the domestic manufacturers under the policy, subject to the bidder furnishing an authorisation certificate issued by the domestic manufacturer at the time of delivery.

vii. For products covered under Appendix B of thelow DMI&SP policy, the bidder shall furnish certification issued by the statutory auditor or cost auditor of the company (in the case of companies) or from a practicing cost accountant or practicing chartered accountant (in respect of suppliers other than companies) declaring that the capital goods to be used in iron & steel industry are domestically manufactured in terms of the domestic value addition prescribed.

viii. If a bidder does not submit above affidavit or undertaking as per format, the offer of bidder shall be rejected.

ix. In case of detection of mis-declaration by the bidder of the prescribed declaration, in the tender document, at any stage before or after award, the following actions shall be taken by the procuring company (Client/EIL):

a. Rejection of bid and Forfeiture of EMD or Forfeiture of CPBG depending upon the stage of detection.

b. Banning of business dealings in line with the EIL extant policy.

x. A supplier debarred by any procuring entity for violation of this Order shall not be eligible for preference under this Order for procurement by any other procuring entity for the duration of the debarment. The debarment for such other procuring entities shall take effect prospectively from the date on which it comes to the notice of other procurement entities.

A declaration shall be submitted by the bidder in the bid for the above.

38.5 **Policy for Purchase Preference to Domestically Manufactured Electronic and Telecom Products: For applicability Refer Bid Data Sheet (BDS)**

I. MEiTY on the preference to domestically manufactured Electronic Products have issued the following notifications (copies available on website https://meity.gov.in/esdm/ppo):

a) Notification no. 33(1)/2017-IPHW dated 26.10.2017 on purchase preference in domestically manufactured Electronic Products

b) Notification no. 1(10)2017-CLES dated 02.07.2018 on purchase preference in domestically manufactured / produced Cyber Security Products

c) Notification no. 33(5)/20174-IPHW dated 14.08.2018 on purchase preference in Cellular mobiles Phones

List & Definition of the Products, percentage of Procurement for which preference to domestically manufactured products is to be provided, percentage of local content or domestic value addition in terms of Bill of Material (BOM) required for the products to qualify as domestically manufactured and Criteria for BOM to be classified as domestic for each of the notified Electronic Products are defined in above notifications.

II. Ministry of Communications (Department of Telecommunications) on the preference to domestically manufactured Telecom Products have issued Notifications no. 18-10/2017-IP dated29.08.2018 issued by Ministry of Communications (Department of Telecommunications) (copy available on website https://dot.gov.in/dot-pmapmi-policy).

List & definitions of Telecom products, services & works, Percentage of Procurement for which preference to domestically manufactured Telecom Products is to be provided and Percentage of local content in terms of Bill of Material (BOM) required for the products to qualify as domestically manufactured Telecom Products and conditions for inputs to be qualified as Local Content &Maximum ceiling for Design as local content out of the total Local content are defined in above notification.

Refer **Appendix-VII & VIII** to **ITB** for details.

38.6 **Startup India Policy: For applicability Refer Bid Data Sheet (BDS)**

Startup India is a flagship initiative of the Government of India, intended to build a strong ecosystem that is conducive for the growth of startup businesses, to drive sustainable economic growth and generate large scale employment opportunities. The Government through this initiative aims to empower startups to grow through innovation and design.

Refer **Appendix-IX** to **ITB** for details.

38.7 **Restrictions on Procurement from Bidders from Country(ies) sharing Border with India: For applicability Refer Bid Data Sheet (BDS)**

Department of Expenditure (Ministry of Finance) of Government of India through OM No. 7/10/2021-PPD(1) dated 23.02.2023 has issued the revised guidelines for Restrictions on Procurement from Bidders from Country(ies) sharing Border with India. These guidelines are available on the website of DoE (https://doe.gov.in).

Refer **Appendix-X** to **ITB** for details.

F. AWARD OF CONTRACT

39.0 AWARD CRITERIA

39.1 Pursuant to clause no. 36.0 and Clause no. 37.1 of ITB, the EIL shall place Purchase Order to the bidder(s) who has (have) been determined to be the lowest successful bidder(s) for item(s) / Group(s) of MR as per the Itemwise / GroupWise ordering philosophy defined in MR / Price Schedule. However, if in the opinion of EIL, the total price or certain **item rates quoted by the lowest evaluated bidder are considered high OR where there is a suspicion of cartel formation OR in case of proprietary / OEM items OR where limited source of supply are available for the item**, EIL may invite such bidder for price negotiation. Lowest quoted bidder shall attend such negotiation meetings and if requested by EIL shall provide the analysis of rates/break-up of amount quoted by him for any or all items of Price Schedule Format to demonstrate the reasonability. As a result of negotiation, bidder may offer rebate on his earlier quoted Price(s).

39.2 In case of MRs containing supplies as well site work/ services, a single order, covering the supply part as well site work/ services, shall be placed. ***Split ordering is not permitted.***

40.0 NOTIFICATION OF AWARD

40.1 Prior to the expiration of the period of bid validity, EIL shall notify the successful bidder, in writing, that its bid has been accepted. The notification letter [hereinafter and in the General Purchase Conditions called the "**Letter of Acceptance (LOA)/ Purchase Order (PO)**" and in GeM called the "Contract" shall specify the sum that the EIL will pay the Supplier in consideration of the execution and completion of the Supply/Works. The notification letter will constitute the formation of the contract.

40.2 The Delivery Schedule shall commence from the date of issue of GeM "Contract"/ **Letter of Acceptance (LOA)/ Purchase Order (PO) (whichever issued earlier)**.

40.3 GeM "Contract"/ **Letter of Acceptance (LOA)/ Purchase Order (PO)** shall contain price, delivery and other salient terms of bid and RFQ Document.

40.4 Bidder will be required to acknowledge receipt of the same by returning "Copy of the Contract" duly signed and stamped by the bidder as a token of acknowledgement to Owner and EIL.

41.0 CONTRACT CUM PERFORMANCE BANK GUARANTEE

41.1 Within **30 (Thirty) days** from the date of GeM Contract /Purchase order/ Letter of Acceptance, whichever issued earlier, the supplier shall furnish the Contract cum Performance Bank Guarantee for the required value, period and in the proforma, inline with bidding document.In place of Contract cum Performance Bank Guarantee, bidder can furnish Demand Draft also within the time period specified above.

41.2 Failure of the successful bidder to submit the above-mentioned Contract Performance Bank Guarantee / Demand Draft shall constitute sufficient grounds for the annulment / termination / cancelation of the award.

42.0 WAIVER OR TRANSFER OF THE AGREEMENT

42.1 The successful bidder shall not waive the Agreement or transfer it to third parties, whether in part or in whole, nor waive any interest that is included in the Agreement without the prior written permission of the Purchaser.

43.0 CARTEL FORMATION

43.1 Based on the documents submitted by the Bidder(s) in the unpriced bid if a suspicion of Cartel formation is observed, bid(s) will not be considered for evaluation/placement of order. Such bidder will also be debarred from bidding in future and EMD shall be forfeited

44.0 UNIQUE DOCUMENT IDENTIFICATION NUMBER

The Institute of Chartered Accountant of India at its 379th council meeting dated 17-18th December, 2018 made generation of Unique Document Identification Number (UDIN) mandatory for every signature of full time practicing chartered accountant in phased manner for following services:

a) All certificates with effect from 1st February, 2019.

b) GST and Income Tax Audit with effect from 1st April, 2019.

c) All Audit and Assurance Functions with effect from 1st July, 2019.

In view of the above, bidder shall ensure that any certificate/ reports issued/ attested by an practicing chartered accountant in India and submitted in the bid shall mandatorily include the UDIN number. Certificate / reports issued/ attested without UDIN number of practicing chartered accountant in India shall not be considered for evaluation. The requirement of including UDIN shall not be applicable for certificate/ reports issued/ attested by a chartered accountant practising in Foreign Country.

45.0 UPLOADING OF INVOICE ON INVOICE PORTAL

Suppliers and Service Providers shall upload the scan copy of invoices and other documents as required in the Purchase Order/Work Order on the EIL Invoice Portal to enable EIL to speed up and cut down on the processing and payment cycle. Post uploading, all correspondence between EIL and Suppliers/Service Providers will be through the portal. Suppliers/Service providers can track the status of the uploaded invoices through the portal.

A user guide on the operation of the portal is available on log in.

URL of the portal is http://www6.eil.co.in/invoiceportal

Registered Supplier/Contractor can Login with existing Supplier/Contractor code using the radio button.

◉ Registered Supplier/Contractor in EIL

Non-Registered Supplier/Contractor can Login with PAN No. and generate the password using the radio button.

○ Non-Registered Supplier/Contractor

46.0 ABNORMALLY LOW BIDS

"The Bidder(s) are expected to quote rates for each item (as applicable) after careful analysis of costs involved for the performance to complete item/Work considering all specifications and conditions of Enquiry/bidding document including its Amendments (if any). Bidder to expressly note that, even in case of any review or analysis of Bidder's quoted price by EIL, EIL shall not be responsible for the workability of the prices quoted by the Bidder and any assessment by EIL shall not absolve the Bidder to execute the contract in case contract is awarded to the Bidder. The Bidder shall be solely liable for any and all loses, whether direct or consequential, in this regard, and EIL disclaims any and all liabilities in this regard.

Further, in cases where the quoted prices are below/lower than the threshold levels as per EIL's assessment, the Bidder shall be required to submit the following if specifically sought by EIL after price bid opening:

A. Confirmation that the bidder,

(i) have read all terms and conditions of Enquiry/Bidding Document including its Amendments and understood the scope of work completely; and
(ii) shall execute the job at their offered rate/prices without any deviation to the tendered specification; and
(iii) shall be able to complete the job within the scheduled time;

AND/OR

B. Detailed price analysis with justification how the quoted price covers scope, schedule, resource mobilisation, risk allocation and all other tender requirements.

Following situation shall be treated as withdrawal of bid and action will be taken as per provision of bidding document including suspension/banning and/or forfeiture of EMD –

i. In case of non-submission of any response; Or
ii. Non-confirmation of clause A(i) to (iii) above
iii. Unable to justify the quoted price as per B above

Further, bidders are hereby informed that EIL reserves the right, in its sole discretion, not to proceed with the award of the contract, in whole or in part, if circumstances arise which, in its judgment, warrant such a decision."

APPENDIX-I TO ITB

INSTRUCTIONS TO BIDDERS FOR E-TENDERING THROUGH CPPP PORTAL

1.0 INSTRUCTIONS TO BIDDERS FOR E-TENDERING

The bidders are required to submit soft copies of their bids electronically on the CPP Portal (URL: http://eprocure.gov.in) only, using valid Digital Signature Certificates. The instructions given below are meant to assist the bidders in registering on the CPP Portal, prepare their bids in accordance with the requirements and submitting their bids online on the CPP Portal.

Various links such as “Help for Contractor”, “Information about DSC”, “FAQ”, “Resources Required”, “Bidders Manual Kit” etc. are available on home page of http://eprocure.gov.in/eprocure/app facilitating vendors to participate in the bidding process. Bidder are advised to download & utilize the available information/documents under these links for activities like Registration in CPPP, obtaining User ID & Password, uploading & submission of e-bids etc. Bidders are advised in their own interest to carefully go through Instructions for E-tendering and other related document available against various help links so as to ensure that bids are uploaded in E-tendering website well before the closing date and time of bid submission.

More detailed information useful for submitting online bids on the CPP Portal may be obtained at: https://eprocure.gov.in/eprocure/app**.**

2.0 REGISTRATION

2.1 Bidders are required to enroll on the e-Procurement module of the Central Public Procurement Portal (URL: https://eprocure.gov.in/eprocure/app) by clicking on the link “Click **here to Enroll**” on the CPP Portal is free of charge.

2.2 As part of the enrolment process, the bidders will be required to choose a unique username and assign a password for their accounts.

2.3 Bidders are advised to register their valid email address and mobile numbers as part of the registration process and submit in EIL tender portal for updation of records (http://tenders.eil.co.in) . These details would be used for any communication from the CPP Portal.

2.4 Upon enrolment, the bidders will be required to register their valid Digital Signature Certificate (DSC) (Class II or Class III Certificates with signing key usage) issued by any Certifying Authority recognized by CCA India (e.g. Sify / TCS / nCode / eMudhra etc.), with their profile.

2.5 Foreign Bidders have to refer “DSC details for foreign Bidders” for Digital signature Certificates requirements which comes under Download Tab at https://eprocure.gov.in/eprocure/app and the remaining part is same as above and below.

2.6 Only one valid DSC should be registered by a bidder. Please note that the bidders are responsible to ensure that they do not lend their DSC’s to others which may lead to misuse.

2.7 Bidder then logs in to the site through the secured log-in by entering their user ID / password and the password of the DSC / e-Token.

3.0 SEARCHING FOR TENDER DOCUMENTS

3.1 There are various search options built in the CPP Portal, to facilitate bidders to search active tenders by several parameters. These parameters could include Tender ID, organization name, location, date, value, etc. There is also an option of advanced search for tenders, wherein the bidders may combine a number of search parameters such as organization name, form of contract, location, date, other keywords etc. to search for a tender published on the CPP Portal.

3.2 Once the bidders have selected the tenders they are interested in, the same can be moved to the respective 'My Tenders' folder. This would enable the CPP Portal to intimate the bidders through SMS / e-mail in case there is any corrigendum issued to the tender document.

3.3 The bidder should make a note of the unique Tender ID assigned to each tender, in case they want to obtain any clarification / help from the Helpdesk.

4.0 PREPARATION OF BIDS

4.1 Bidder should take into account any corrigendum published on the tender document before submitting their bids.

4.2 Please go through the tender advertisement and the tender document carefully to understand the documents required to be submitted as part of the bid. Please note the number of covers in which the bid documents have to be submitted, the number of documents - including the names and content of each of the document that need to be submitted. Any deviations from these may lead to rejection of the bid.

4.3 To avoid Network congestion, Bidder is recommended to upload file size of up to Maximum 35 MB per part. However, in case file size exceeds 35 MB, bidder may compress the files by scanning with 75 dpi setting as per s.no 4 below and can use additional 25 MB space ("My Documents") provided to the bidder as per s.no 5 below.

4.4 Bidder, in advance, should get ready the bid documents to be submitted as indicated in the tender document and generally, they can be in PDF / XLS / RAR / DWF formats. Bid documents may be scanned with 100 dpi with black and white option. However, Price Schedule / SOR shall be strictly in RAR format without altering any contents of the formats uploaded by EIL in their Bidding Document.

4.5 To avoid the time and effort required in uploading the same set of standard documents which are required to be submitted as a part of every bid, a provision of uploading such standard documents (e.g. PAN card copy, annual reports, auditor certificates etc.) has been provided to the bidders. Bidders can use "My Space" area available to them to upload such documents. These documents may be directly submitted from the "My Space" area while submitting a bid, and need not be uploaded again and again. This will lead to a reduction in the time required for bid submission process.

5.0 SUBMISSION OF BIDS

5.1 Bidder should log into the site well in advance for bid submission so that he/she upload the bid in time i.e. on or before the bid submission time. Bidder will be responsible for any delay due to other issues.

5.2 The bidder has to digitally sign and upload the required bid documents one by one as indicated in the tender document.

5.3 Bidder has to select the payment option as “offline” to pay the tender fee / EMD as applicable and enter details of the instrument.

5.4 Bidder should prepare the EMD as per the instructions specified in the tender document. The original should be posted/couriered/given in person to the Tender Processing Section, within the final bid due date & time. The details of the DD/any other accepted instrument, physically sent, should tally with the details available in the scanned copy and the data entered during bid submission time. Otherwise the uploaded bid will be rejected.

5.5 A Price Bid format has been provided with the tender document to be filled by all the bidders. Bidders are requested to note that they should necessarily submit their financial bids in the format provided and no other format is acceptable. Bidders are required to download the Price Bid file, open it and complete the cells with their respective financial quotes and other details (such as name of the bidder). No other cells should be changed. Once the details have been completed, the bidder should save it and submit it online, without changing the filename. If the Price Bid file is found to be modified by the bidder, the bid will be rejected.

5.6 The server time (which is displayed on the bidders’ dashboard) will be considered as the standard time for referencing the deadlines for submission of the bids by the bidders, opening of bids etc. The bidders should follow this time during bid submission.

5.7 All the documents being submitted by the bidders would be encrypted using PKI encryption techniques to ensure the secrecy of the data. The data entered cannot be viewed by unauthorized persons until the time of bid opening. The confidentiality of the bids is maintained using the secured Socket Layer 128 bit encryption technology. Data storage encryption of sensitive fields is done.

5.8 The uploaded tender documents become readable only after the tender opening by the authorized bid openers.

5.9 Upon the successful and timely submission of bids, the portal will give a successful bid submission message & a bid summary will be displayed with the bid no. and the date & time of submission of the bid with all other relevant details.

5.10 The bid summary has to be printed and kept as an acknowledgement of the submission of the bid. This acknowledgement may be used as an entry pass for any bid opening meetings.

6.0 RETENDER

6.1 Please note that if Tender has been retendered, than it is mandatory for the bidder to submit their offer again on CPP Portal.

7.0 WITHDRAWAL OF BID

7.1 It may please be noted that bidders now have an additional feature of withdrawing their bids before due date and time. After submitting the bid on the CPP Portal, if the bidder wishes to withdraw his bid, he can do so. However, if the bidder withdraws his bid, he will be exempted from further participation in the tender and won’t be able to submit his bid again for that particular tender.

8.0 ASSISTANCE TO BIDDERS

8.1 Any queries relating to the tender document and the terms and conditions contained therein should be addressed to the Tender Inviting Authority for a tender or the

relevant contact person indicated in the tender.

8.2 Any queries relating to the process of online bid submission or queries relating to CPP Portal in general may be directed to the 24x7 CPP Portal Helpdesk. The contact number for the helpdesk is 1800 233 7315.

APPENDIX-II TO ITB

TERMS & CONDITIONS FOR REVERSE AUCTION

NOT APPLICABLE

APPENDIX-III TO ITB

PREFERENCE TO MICRO AND SMALL ENTERPRISES (MSEs)

PREFERENCE TO MICRO AND SMALL ENTERPRISES (MSES)
(APPLICABLE FOR PROCUREMENT OF GOODS & SERVICES ONLY)

1. Ministry of Micro, Small & Medium Enterprises notified the Public Procurement Policy (PPP), 2012 for facilitating the promotion and development of micro and small enterprises in Government Procurement. Subsequently, Micro, Small & Medium Enterprises vide circular no. 21(8)/2018-MA dated 09.11.2018 has issued an amendment to the said policy.

   Further, Ministry of MSMEs (MoMSME) vide **Gazette notification No. S.O. 4926(E) dated 18.10.2022**
   have issued the following amendment in sub-paragraph (5) of paragraph 8 of MoMSME S.O. No. 2119 (E) dated 26.06.2020:

   "In case of an upward change in terms of investment in Plant and Machinery or Equipment or Turnover or both, and consequent re-classification, an enterprise shall continue to avail of all non- tax benefits of the category (Micro or Small or Medium) it was in before the re-classification, for a period of three years from the date of such upward change".

   As per the press notification dated 19.10.2022 issued by Press Information Bureau, **Non-tax benefits include benefits of various schemes of the Government, including Public Procurement Policy, Delayed Payments, etc.**

2. For claiming price preference against enquiries in which provision of price preference is to be extended to the MSE Bidders, the MSE certificate should be valid as on date of un-priced bid opening.

3. The owner reserves the right to allow Micro & Small enterprises as well as MSEs Owned by SC/ST entrepreneur and MSEs Owned by Women, purchase preference as admissible under the prevailing procurement policy for MSEs.

4. The quantity against the item(s) of MR may be split to enable ordering of 25% quantity against the item(s) of MR to MSEs bidder within the price range of L1 bidder's evaluated price + 15% subject to their matching L1 bidder's price, in line with purchase preference as admissible under the prevailing procurement policy for MSEs. Accordingly, the quoted prices against various items of MR shall remain valid in case of splitting of quantities of the items in view of the same.

   Out of this 25% from MSEs, 4% is to be from MSEs owned by SC/ ST entrepreneurs. However, in event of failure of MSEs owned by SC/ ST entrepreneurs to participate in the bidding process or meet the tender requirements and L1 price, this 4% will be met from other MSEs.

   Additionally, out of this 25% from MSEs, 3% is to be from MSEs owned by Women. However, in event of failure of MSEs owned by Women to participate in the bidding process or meet the tender requirements and L1 price, this 3% will be met from other MSEs.

   While granting purchase preference as above, procurement of goods through MRs may include certain small work, or some services, which are incidental or consequential to supply of such goods such as transportation, insurance, installation, commissioning, training & maintenance.

   Clarification:

   - In case where quantity against a line item cannot be split (i.e., minimum 25% to MSEs) or items with single quantity or in grouped item, the complete line item/ group shall be awarded on MSE bidder within the price range of L1 bidder's evaluated price + 15% subject to their matching L1 bidder's price.
   - In case, quantity(ies) against an item/ group cannot be split among MSEs owned by SC/ ST entrepreneurs, MSEs owned by Women and non- SC/ ST or non-women MSE entrepreneurs, first opportunity shall be given to MSEs owned by Women than to MSEs owned by SC/ ST entrepreneurs and lastly to other MSEs, within the price range of L1 non-MSE bidder's evaluated price + 15%.

5. MSEs MSE bidders shall submit the following:

i) Bidder claiming to be a Micro or Small Enterprises (MSEs) must be registered on Udyam Registration portal having valid “Udyam Registration Certificate”.

ii) The Udyam registration certificate shall be verified from GoI Udyam registration portal (present web address is https://udyamregistration.gov.in). The status of the MSE Bidder as on the date of Unpriced Bid opening shall be considered for benefits defined in the Bidding Document under the Purchase Preference Policy for MSEs, 2012.

iii) In order for MSE owned by SC/ST Entrepreneurs to qualify for benefits available under Public Procurement Policy for MSEs order 2012, the MSE shall additionally submit a relevant SC/ ST certificate in the name of SC/ ST proprietor or partner(s) holding minimum 51% shares in case of partnership or person(s) holding minimum 51% shares in limited companies, issued by any of the following:

- District Magistrate/ Additional District Magistrate/ Collector/ Deputy Commissioner/ Deputy Collector/ 1st Class Stipendiary Magistrate/ City Magistrate/ Sub-Divisional Magistrate/ Taluka Magistrate/ Executive Magistrate/ Extra Assistant Commissioner (not below the rank of 1st Class Stipendiary Magistrate).
- Chief Presidency Magistrate/ Additional Chief Presidency Magistrate/ Presidency Magistrate.
- Revenue Officers not below the rank of Tehsildar
- Sub-Divisional Officer of the area where the candidate and/ or his family normally resides.
- Administrator/ Secretary to Administrator/ Development Officer (Lakshadweep Islands).

Definition of MSEs owned by SC/ST Entrepreneurs, is as follows:

- In case of proprietary MSE, proprietor should be SC/ST.
- In case of partnership MSE, the SC/ST partner(s) should be holding at least 51% shares in the unit.
- In case of Limited companies, at least 51% share should be held by SC/ST shareholder(s).
- In case of Public Limited Companies, at least 51% share should be held by SC/ST entrepreneurs at any given point of time.

iv) Micro & Small Enterprises shall be considered as owned by Women Entrepreneurs as per the below definition:

- In case of proprietary MSE, Women should be SC/ST.
- In case of partnership MSE, the Women partner(s) should be holding at least 51%
- shares in the unit.
- In case of Limited companies, at least 51% share should be held by Women shareholder(s).

In order for MSE owned by Women Entrepreneurs to qualify for benefits available under Public Procurement Policy for MSEs order 2012 to Women Entrepreneurs, the MSE shall additionally submit the following:

- In case of a proprietorship firm, the name and address of proprietor, and certified copy of Bank Account Details.
- In case bidder is a partnership firm, certified copy of the partnership deed.
- In case of company (whether private or public), certified copy of the `Certificate of
- Incorporation' together with certified copy of Memorandum/Articles of Association.

v) To avail the benefits available to MSEs under the bidding document, MSEs shall provide the necessary valid documentary evidence, i.e. Udyam Registration Certificate. MSE bidders shall submit MSE documents, as above.

vi) No verification of bidder's status as Micro or Small Enterprises from the financial statementof bidders shall be required.

vii) In case a MSE bidder has submitted Udyam Registration Certificate, the same shall be accepted provided the details of the same could be verified from the Government Udyam Registration portal, as applicable.

viii) In case, a MSE bidder doesn't submit the MSE document or submits invalid document or, such bidders shall not be considered for providing the benefits under MSE Policy.

6. In case at any stage, if it is found the bidder has claimed / availed the benefits by providing false/forged details, their bid shall be rejected and bidder shall be placed on suspension/ banning. However, if this is found after order placement, bidder shall also be liable for encashment of PBG. Bidder's organization is responsible for any and all actions of their employees. Any claims seeking to pin point/shift the blame on any employee and consequently attempting to absolve the bidder's organization will not be entertained.

7. EIL is committed to promotion and development of micro and small enterprises Accordingly; bidders are also encouraged to promote the same by considering MSE sub-suppliers/ sub- contractors to the extent possible under the Orders/ Contracts awarded on them EIL. All efforts shall be made by bidder to encourage procurement thru MSEs (holding valid certificate) through their Sub orders/ Sub contract procurement. The successful bidder shall provide the following only for the purpose of reporting.

i) Monthly Reports for purchase of material/services/ sub-contracts (from MSE vendors) shall be submitted by bidder to .....(Name of CPSU).

i) The report shall be signed by authorised person of contractor (Successful Bidder).

ii) Report shall be submitted in the following format.

Sl. No.	Sub-Supplier/ Subcontractor	Work Order no.& date	Item Description	Amount (In Rs)	Category of MSE Gen/ SC/ ST	MSME Status Micro/ Small with code	Remarks

8. Government of India has implemented the Trade Receivables Discounting System (TReDS). TReDS is an institutional mechanism set up in order to facilitate the financing of trade receivables of MSMEs from corporate buyers through invoice financing by multiple financiers. EIL is already registered on the following TReDS Platform:

Name of the Company	Name of The Platform	Web Address	Address	Contact person
A.TREDS Limited	Invoicemart	https://www.invoicemart.com/	11th Floor, Office No A-3, Ashar IT Park, Road No 16Z, Wagle Industrial Estate, Thane, Maharashtra, 400604	Mr. Ankur – 8447308425
Receivables Exchange of India Limited	Trade Receivables Discounting System (TReDS)	http://www.rxil.in/	Trade Centre (Vatika Business Centre), First Floor (Unit No.2), Office No.14, Bandra Kurla Comp ex, Bandra (East), Mumbai – 400051. Maharashtra	Ms. Ruchi Agarwal 9560793437
Mynd Solutions Private Limited	M1xchange	https://www.m1xchange.com/	280, Udyog Vihar, phase-IV, Gurgaon, Haryana, 122001	Mr. Dipanshu 9711008042

In addition to above EIL is also registered with the following TreDs platform:

Name of the Company & Address:

Kredx Platform Private Limited
Unit No. 106, 107,108 & 109, 1st Floor,
Sakti Statesman, Wing B, S. NO. 34,
Iblur, Begur Hobli, Bangalore -560103

Contact Person Details:

Mr. Jason C, Sales-Head
Mobile No.: +91- 96000 63327
Email - jason@kredx.com

Mr. Sandeep Kumar Das, Manager (Business Sourcing)
Mobil No.: +91- 78276 22830
Email- Sandeep.das@kredx.com

MSME bidders are requested to register on the TReDS platform.

APPENDIX-X TO ITB

PROCUREMENT FROM BIDDERS FROM A COUNTRY OR COUNTRIES SHARING LAND BORDER WITH INDIA

1.0 Department of Expenditure (DoE) vide **O.M. No. 7/10/2021-PPD(1) dated 23.02.2023** has issued the revised guidelines for Restrictions on Procurement from Bidders from Country(ies) sharing Border with India. These guidelines are available on the website of DoE (https://doe.gov.in).

2.0 **Requirement of registration from Competent Authority:**

i). Any Bidder from a country which shares a land border with India will be eligible to bid in any procurement whether of goods, services (including consultancy services and non-consultancy services) or works (including turnkey projects) only if the Bidder is registered with the Competent Authority, specified in **Annexure-I of DoE O.M. No. 7/10/2021-PPD(1) dated 23.02.2023.**.

ii). Any Bidder (including an Indian bidder) who has a Specified Transfer of Technology (ToT) arrangement with an entity from a country which shares a land border with India will be eligible to bid in any procurement whether of goods, services (including consultancy services and non-consultancy services) or works (including turnkey projects) only if the Bidder is registered with the Competent Authority, specified in **Annexure-I of DoE O.M. No. 7/10/2021-PPD(1) dated 23.02.2023.**

3.0 **This Order shall not apply to the following special cases:**

i). In projects which receive international funding with the approval of the Department of Economic Affairs (DEA), Ministry of Finance, the procurement guidelines applicable to the project shall normally be followed, notwithstanding anything contained in this order and without reference to the Competent Authority. Exceptions to this shall be decided in consultation with DEA.

ii). This order shall not apply to procurement by Indian missions and by offices of Government agencies/ undertakings located outside India.

iii). This order will not apply to Bidders (or Entities) from those countries (even if sharing a land border with India) to which the Government of India has extended lines of credit or in which the Government of India is engaged in development projects. Updated lists of countries to which lines of credit have been extended or in which development projects are undertaken are given on the website of the Ministry of External Affairs.

iv). Procurement of spare parts and other essential service support like Annual Maintenance Contract (AMC)/ Comprehensive Maintenance Contract (CMC), including consumables for closed systems, from Original Equipment Manufacturers (OEMs) or their authorized agents, shall be exempted from the requirement of registration.

4.0 **Definitions**:

i). **"Bidder"** (including the term 'Tenderer', 'Consultant' 'Vendor' or 'Service Provider' in certain contexts) means any person or firm or company, including any member of a Consortium or Joint Venture (that is an association of several Persons, or Firms or Companies), every artificial juridical person not falling in any of the descriptions of Bidders stated hereinbefore, including any Agency, Branch or Office controlled by such person, participating in a procurement process.

ii). **"Tender"** will include other forms of procurement, except where the context requires otherwise.

iii). **"Transfer of Technology"** means dissemination and transfer of all forms of commercially usable knowledge such as transfer of know-how, skills, technical expertise, designs, processes and procedures, trade secrets, which enables the acquirer of such technology to perform activities using the transferred technology independently. (Matters of interpretation of this term shall be

referred to the Registration Committee constituted by the Department for Promotion of Industry and Internal Trade, and the interpretation of the Committee shall be final.)

iv). **"Specified Transfer of Technology"** means a transfer of technology in the sectors and/ or technologies, specified in **paragraph 5.0**, occurring on or after 23.07.2020.

v). **"Bidder (or entity) from a country which shares a land border with India"** means

(a) An entity incorporated, established or registered in such a country; or

(b) A subsidiary of an entity incorporated, established or registered in such a country; or

(c) An entity substantially controlled through entities incorporated, established or registered in such a country; or

(d) An entity whose beneficial owner is situated in such a country; or

(e) An Indian (or other) agent of such an entity; or

(f) A natural person who is a citizen of such a country; or

(g) A Consortium or Joint Venture where any member of the Consortium or Joint Venture falls under any of the above.

vi). **Beneficial Owner** for the purposes of **paragraph 4.0 v) (d)** will be as under:

a) **In case of a Company or Limited Liability Partnership**, the beneficial Owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person(s), has a controlling ownership interest or who exercises control through other means.
Explanation: -

1. "Controlling ownership interest" means ownership of, or entitlement to, more than twenty-five per cent of shares or capital or profits of the company;

2. "Control" shall include the right to appoint the majority of the Directors or to control the management or policy decisions, including by virtue of their shareholding or management rights or shareholders agreements or voting agreements;

b) **In case of a Partnership Firm**, the beneficial Owner is the natural person(s) who, whether acting alone or together, or through one or more juridical person, has ownership of entitlement to more than fifteen percent of capital or profits of the partnership;

c) **In case of an Unincorporated Association or body of Individuals**, the beneficial Owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has ownership of or entitlement to more than fifteen percent of the property or capital or profits of such association or body of individuals;

d) Where no natural person is identified under a) or b) or c) above, the beneficial Owner is the relevant natural person who holds the position of senior managing official;

e) **In case of a Trust**, the identification of beneficial Owner(s) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen percent or more interest in the trust and any other natural person exercising ultimate effective control over the trust through a chain of control or ownership.

vii). **"Agent'** is a person employed to do any act for another, or to represent another in dealings with third persons.

[Note:

i). A person who procures and supplies finished goods from an entity from a country which shares a land border with India will, regardless of the nature of his legal or commercial relationship with the producer of the goods, be deemed to be an Agent for the purpose of this Order.

ii). However, a Bidder who only procures raw material, components etc. from an entity from a country which shares a land border with India and then manufactures or converts them into other goods will not be treated as an Agent.]

5.0 **Sensitive Sectors/ Technologies (relevant only for the provisions on ToT arrangements):**

i). Certain sectors and technologies have been identified as sensitive from the national security point of view. **The sectors listed in Schedule I (copy attached) are considered Category-I sensitive sectors**. **The sectors listed in Schedule II (copy attached) are considered Category-II sensitive sectors**. The technologies listed in **Schedule III** (copy attached) are considered sensitive technologies.

ii). For **Category-I sensitive sectors**, Bidders with ToT arrangement in any technology with an entity from a country which shares a land border with India shall require registration.

iii). For **Category-II sensitive sectors**, Bidders with ToT arrangement in the sensitive technologies listed in **Schedule III**, with an entity from a country which shares a land border with India shall require registration.

iv). In **Category-II sensitive sectors**, the Secretary (or an officer not below the rank of Joint Secretary to Government of India, so authorized by the Secretary) of the Ministry/ Department of the Government of India is empowered, after due consideration, to waive the requirement of registration for a particular item/ application or a class of items/ applications from the requirement of registration, even if included in Schedule-III. The Ministry/ Department concerned shall intimate the Department for Promotion of Industry and Internal Trade (DPIIT) and National Security Council Secretariat (NSCS) of their decision to waive the requirement of registration.

Ministries/ Departments of the Government of India are not required to consult the DPIIT/ NSCS before deciding and are only required to intimate the decision to DPIIT/ NSCS. If any point is raised by DPIIT/ NSCS, it should be considered in future procurements; ongoing procurement for which the waiver was granted need not be interrupted or altered.

Based on security considerations, a Ministry/ Department in a **Category-II sensitive sector** or other Ministries/ Departments may recommend to DPIIT inclusion of any other technology in the list of sensitive technologies, either generally or for their Ministry/ Department.

6.0 **Sub-contracting in works contracts**

In works contracts, including turnkey contracts, Contractors shall not be allowed to sub-contract works to any Contractor from a country which shares a land border with India unless such contractor is registered with the Competent Authority. The definition of **"Contractor from a country which shares a land border with India"** shall be as given in above **paragraph 4.0 v)**.

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

7.0 **Certificate regarding compliance**

Bidder shall submit a certificate of Compliance in the enclosed **Form-I A/ Form-I B/ Form - II** (as applicable).

This certificate shall be on the Bidder's Letter head and shall be duly signed & stamped by the authorised signatory of the Bidder.

In case at any stage, it is found that the certification given by the Bidder is false, their Bid shall be rejected and shall be liable for other penal actions like placement on Suspension/ Banning or forfeiture of EMD (if applicable). However, if this is found after order placement, this would be ground for immediate termination and further legal actions in accordance with law/provisions of Bidding Document including Suspension/Banning and forfeiture of CPBG/ Security Deposit.

Form- I A

BIDDER'S UNDERTAKING

(On Company's Letter Head)

To,

M/s Engineers India Limited/ _____ (Name of the client)

Tender Name : _____

Tender No. : _____

"I have read the clause regarding restrictions on procurement from a Bidder of a country which shares a land border with India; I hereby certify that, Bidder M/s_____ (Name of the Bidder) is:

i).	Not from such a country	[ ]
ii).	If from such a country, has been registered with the Competent Authority	[ ]

Notes:

a) Bidder to tick appropriate option ($\surd$) in either i) or ii) above)

b) In case of sl. no. ii) above, Bidder to attach evidence of valid registration by the Competent Authority.

I hereby certify that the Bidder fulfills all requirements in this regard and eligible to be considered.

Place :
Date :

Signature (#):
Name :
Designation :
Seal :

(#) Undertaking shall be signed by the authorized signatory of the Bidder.

Form- I B

BIDDER'S UNDERTAKING IN CASE OF SUB-CONTRACTING IN WORK CONTRACTS

(On Company's Letter Head)

To,

M/s Engineers India Limited/ _____ (Name of the client)

Tender Name : _____

Tender No. : _____

"I have read the clause regarding restrictions on procurement from a Bidder of a country which shares a land border with India and on sub-Contracting to Contractors from such countries; I hereby certify that, Bidder M/s_____ (Name of the Bidder) is:

i).	Not from such a country and will not sub-Contract work to a Contractor from such countries unless such Contractor is registered with the Competent authority	[ ]
ii).	If from such a country, has been registered with the Competent Authority and will not sub-Contract work to a Contractor from such countries unless such Contractor is registered with the Competent authority	[ ]
Notes: a) Bidder to tick appropriate option ($\surd$) in either i) or ii) above) b) In case of sl. no. ii) above, Bidder to attach evidence of valid registration by the Competent Authority.		

I hereby certify that the Bidder fulfills all requirements in this regard and eligible to be considered.

Place :
Date :

Signature (#):
Name :
Designation :
Seal :

(#) Undertaking shall be signed by the authorized signatory of the Bidder.

FORM-II

BIDDER'S UNDERTAKING IN CASE OF TRANSFER OF TECHNOLOGY (ToT) ARRANGEMENT

(On Company's Letter Head)

To,

M/s Engineers India Limited/ _____ (Name of the client)

Tender Name : _____

Tender No. : _____

"I have read the clause regarding restrictions on procurement from a Bidder having Transfer of Technology (ToT) arrangement. Bidder M/s_____ (Name of the Bidder), hereby certify that,

i).	Bidder does not have any ToT arrangement requiring registration with the competent authority	[ ]
ii).	Bidder has valid registration to participate in this procurement	[ ]

Notes:

a) Bidder to tick appropriate option ($\surd$) in either i) or ii) above)

b) In case of sl. no. ii) above, Bidder to attach evidence of valid registration by the Competent Authority.

I hereby certify that the Bidder fulfills all requirements in this regard and eligible to be considered.

Place :
Date :

Signature (#):
Name :
Designation :
Seal :

(#) Undertaking shall be signed by the authorized signatory of the Bidder

No.F.7/10/2021-PPD (1)
Government of India
Ministry of Finance
Department of Expenditure
Procurement Policy Division
264-C, North Block, New Delhi.
23.02.2023.

Order (Public Procurement No. 4)

Subject: Restrictions under Rule 144(xi) of the General Financial Rules (GFRs), 2017.

Attention is invited to Order (Public Procurement No. 1) issued vide F.6/18/2019-PPD dated 23.07.2020, Order (Public Procurement No. 2) issued vide F.6/18/2019-PPD dated 23.07.2020, Order (Public Procurement No. 3) issued vide F.6/18/2019-PPD dated 24.07.2020, Office Memorandum (OM) No. F.18/37/2020-PPD dated 08.02.2021, OM No. F.12/1/2021-PPD(Pt.) dated 02.03.2021 and OM No. F.7/10/2021-PPD dated 08.06.2021. In this regard, the following is hereby ordered under Rule 144(xi) (as amended vide OM No. F.7/10/2021-PPD dated 23.02.2023) on the grounds stated therein, in supersession to all of the above mentioned Orders/ clarifications:

Requirement of registration:

2. Any bidder from a country which shares a land border with India will be eligible to bid in any procurement whether of goods, services (including consultancy services and non-consultancy services) or works (including turnkey projects) only if the bidder is registered with the Competent Authority, specified in **Annexure I**.

3. Any bidder (including an Indian bidder) who has a Specified Transfer of Technology (ToT) arrangement with an entity from a country which shares a land border with India will be eligible to bid in any procurement whether of goods, services (including consultancy services and non-consultancy services) or works (including turnkey projects) only if the bidder is registered with the Competent Authority, specified in **Annexure I**.

4. The requirement of registration for cases covered by paragraph 2 above has been applicable since 23.07.2020. The requirement of registration for bidders covered by paragraph 3 above will be applicable for all procurements where tenders are issued/ published after 01.04.2023.

5. In tenders issued after 23.07.2020 or 01.04.2023, as the case may be, the provisions of requirement of registration of bidders and of other relevant provisions of this Order shall be incorporated in the tender conditions.

Applicability:

6. Apart from Ministries/ Departments, attached and subordinate bodies, notwithstanding anything contained in Rule 1 of the GFRs 2017, the Order shall also be applicable

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a) to all Autonomous Bodies;

b) to all public sector banks and public sector financial institutions;

c) to all Central Public Sector Enterprises;

d) to all procurement in Public Private Partnership projects receiving financial support from the Government or public sector enterprises/ undertakings; and

e) Union Territories, National Capital Territory of Delhi and all agencies/ undertakings thereof.

7. This order will not be applicable for cases falling under **Annexure II**.

Definitions:

8. "*Bidder*" for the purpose of the Order (including the term 'tenderer', 'consultant' 'vendor' or 'service provider' in certain contexts) means any person or firm or company, including any member of a consortium or joint venture (that is an association of several persons, or firms or companies), every artificial juridical person not falling in any of the descriptions of bidders stated hereinbefore, including any agency, branch or office controlled by such person, participating in a procurement process.

9. "*Tender*" for the purpose of the Order will include other forms of procurement, except where the context requires otherwise.

10. *"Transfer of Technology"* means dissemination and transfer of all forms of commercially usable knowledge such as transfer of know-how, skills, technical expertise, designs, processes and procedures, trade secrets, which enables the acquirer of such technology to perform activities using the transferred technology independently. (Matters of interpretation of this term shall be referred to the Registration Committee constituted by the Department for Promotion of Industry and Internal Trade, and the interpretation of the Committee shall be final.)

11. *"Specified Transfer of Technology"* means a transfer of technology in the sectors and/ or technologies, specified in paragraph 15, occurring on or after 23.07.2020.

12. *"Bidder (or entity) from a country which shares a land border with India"* for the purpose of the Order means

(a) An entity incorporated, established or registered in such a country; or

(b) A subsidiary of an entity incorporated, established or registered in such a country; or

(c) An entity substantially controlled through entities incorporated, established or registered in such a country; or

(d) An entity whose beneficial owner is situated in such a country; or

(e) An Indian (or other) agent of such an entity; or

(f) A natural person who is a citizen of such a country; or

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(g) A consortium or joint venture where any member of the consortium or joint venture falls under any of the above

13. *Beneficial owner* for the purposes of Para 12 (d) will be as under:

(i) In case of a company or Limited Liability Partnership, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person(s), has a controlling ownership interest or who exercises control through other means.

Explanation:-

a. "Controlling ownership interest" means ownership of, or entitlement to, more than twenty-five per cent of shares or capital or profits of the company;

b. "Control" shall include the right to appoint the majority of the directors or to control the management or policy decisions, including by virtue of their shareholding or management rights or shareholders agreements or voting agreements;

(ii) In case of a partnership firm, the beneficial owner is the natural person(s) who, whether acting alone or together, or through one or more juridical person, has ownership of entitlement to more than fifteen percent of capital or profits of the partnership;

(iii) In case of an unincorporated association or body of individuals, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has ownership of or entitlement to more than fifteen percent of the property or capital or profits of such association or body of individuals;

(iv) Where no natural person is identified under (i) or (ii) or (iii) above, the beneficial owner is the relevant natural person who holds the position of senior managing official;

(v) In case of a trust, the identification of beneficial owner(s) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen percent or more interest in the trust and any other natural person exercising ultimate effective control over the trust through a chain of control or ownership.

14. "*Agent*" for the purpose of the Order is a person employed to do any act for another, or to represent another in dealings with third persons.

[Note:

i. A person who procures and supplies finished goods from an entity from a country which shares a land border with India will, regardless of the nature of his legal or commercial relationship with the producer of the goods, be deemed to be an Agent for the purpose of this Order.

ii. However, a bidder who only procures raw material, components etc. from an entity from a country which shares a land border with India and then manufactures or converts them into other goods will not be treated as an Agent.]

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Sensitive Sectors/ Technologies (relevant only for the provisions on ToT arrangements):

15. (i) Certain sectors and technologies have been identified as sensitive from the national security point of view. The sectors listed in Schedule I to this Order are considered Category-I sensitive sectors. The sectors listed in Schedule II to this Order are considered Category-II sensitive sectors. The technologies listed in Schedule III are considered sensitive technologies.

(ii) For Category-I sensitive sectors, bidders with ToT arrangement in any technology with an entity from a country which shares a land border with India shall require registration.

(iii) For Category-II sensitive sectors, bidders with ToT arrangement in the sensitive technologies listed in Schedule III, with an entity from a country which shares a land border with India shall require registration.

(iv) In Category-II sensitive sectors, the Secretary (or an officer not below the rank of Joint Secretary to Government of India, so authorized by the Secretary) of the Ministry/ Department of the Government of India is empowered, after due consideration, to waive the requirement of registration for a particular item/ application or a class of items/ applications from the requirement of registration, even if included in Schedule III. The Ministry/ Department concerned shall intimate the Department for Promotion of Industry and Internal Trade (DPIIT) and National Security Council Secretariat (NSCS) of their decision to waive the requirement of registration. Ministries/ Departments of the Government of India are not required to consult the DPIIT/ NSCS before deciding and are only required to intimate the decision to DPIIT/ NSCS. If any point is raised by DPIIT/ NSCS, it should be considered in future procurements; ongoing procurement for which the waiver was granted need not be interrupted or altered.

16. Based on security considerations, a Ministry/ Department in a Category II sensitive sector or other Ministries/ Departments may recommend to DPIIT inclusion of any other technology in the list of sensitive technologies, either generally or for their Ministry/ Department.

Sub-contracting in works contracts

17. In works contracts, including turnkey contracts, contractors shall not be allowed to sub-contract works to any contractor from a country which shares a land border with India unless such contractor is registered with the Competent Authority. The definition of "contractor from a country which shares a land border with India" shall be as in paragraph 12 above. This shall not apply to sub-contracts already awarded on or before 23.07.2020.

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

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Certificate regarding compliance

18. An undertaking shall be taken from bidders in the tender documents **(Annexure III)** that the extant guidelines for participation in the tenders (which should include conditions for implementation of this Order) have been complied with. If such certificate given by a bidder whose bid is accepted is found to be false, this would be a ground for debarment and further legal action in accordance with law.

Validity of registration

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

Government e-Marketplace (GeM)

20. GeM shall remove non-compliant entities from GeM unless/ until they are registered in accordance with this Order.

Model Clauses/ Certificates

21. Model Clauses and Model Certificates which may be inserted in tenders/ obtained from Bidders are given at Annexure-III. While adhering to the substance of the Order, procuring entities are free to appropriately modify the wording of these clauses based on their past experience, local needs etc.

23/02/2023

(Kanwalpreet)
Director(PPD)
Tel.No. 2309 3811; email: kanwal.irss@gov.in

To

1. Secretaries of all Ministries/ Departments of Government of India for information and necessary action. They are also requested to inform these provisions to all procuring entities.
2. Secretary, Department of Public Enterprises with a request to immediately reiterate these orders in respect to public enterprises.
3. Secretary, Department of Financial Services with a request to immediately reiterate these orders in respect to public sector and public sector financial institutions.
4. Secretary DPIIT with a request to take action as provided under Annexure I.
5. Chief Secretaries/ Administrators of Union Territories/ National Capital Territory of Delhi.
6. CEO/ GeM with a request to ensure implementation of this order on GeM.

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Schedule I

List of Category-I Sensitive sectors:

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

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Schedule II

List of Category-II Sensitive sectors:

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

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Schedule-III

List of Sensitive Technologies:

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

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ANNEXURE I

Competent Authority and Procedure for Registration

A. The Competent Authority for the purpose of registration under this order shall be/ continue to be the Registration Committee constituted by the Department for Promotion of Industry and Internal Trade (DPIIT)*. [This Committee was already constituted under Order (Public Procurement) No.1].

B. The Registration Committee shall have the following members*:

   i. An officer, not below the rank of Joint Secretary, designated for this purpose by DPIIT, who shall be the Chairman;

   ii. Officers (ordinarily not below the rank of Joint Secretary) representing the Ministry of Home Affairs, Ministry of External Affairs, and of those Departments whose sectors are covered by applications under consideration;

   iii. Any other officer whose presence is deemed necessary by the Chairman of the Committee.

   iv. With effect from 01.04.2023, an officer (ordinarily not below the rank of Joint Secretary) representing the National Security Council Secretariat.

C. DPIIT shall lay down the method of application, format etc. for such bidders as covered by the Order.

D. On receipt of an application seeking registration from a bidder covered by Para 2 and 3 of this order, the Competent Authority shall first seek political and security clearances from the Ministry of External Affairs and Ministry of Home Affairs, as per guidelines issued from time to time. Registration shall not be given unless political and security clearance have both been received.

E. The Ministry of External Affairs and Ministry of Home Affairs may issue guidelines for internal use regarding the procedure for scrutiny of such applications by them.

F. The decision of the Competent Authority, to register such bidder may be for all kinds of tenders or for a specified type(s) of goods or services, and may be for a specified or unspecified duration of time, as deemed fit. The decision of the Competent Authority shall be final.

G. Registration granted by the Competent Authority of the Government of India shall be valid not only for procurement by the Central Government and its bodies specified in para 6 of this order, but also for procurement by State Governments and their agencies/ public enterprises etc. No fresh registration at the State level shall be required.

H. The Competent Authority is empowered to cancel the registration already granted if it determines that there is sufficient cause. Such cancellation by itself, however, will

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not affect the execution of contracts already awarded. Pending cancellation, it may also suspend the registration of a bidder, and the bidder shall not be eligible to bid in any further tenders during the period of suspension.

I. For national security reasons, the Competent Authority shall not be required to give reasons for rejection/cancellation of registration of a bidder.

[*Note:

(i) In respect of application of the Order to procurement by/ under State Governments, all functions assigned to DPIIT shall be carried out by the State Government concerned through a specific department or authority designated by it. The composition of the Registration Committee shall be as decided by the State Government. However, the requirement of political and security clearance as per para D shall remain and no registration shall be granted without such clearance.

(ii) Registration granted by State Governments shall be valid only for procurement by the State Government and its agencies/ public enterprises etc. and shall not be valid for procurement in other states or by the Government of India and their agencies/ public enterprises etc.]

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Special Cases

A. In projects which receive international funding with the approval of the Department of Economic Affairs (DEA), Ministry of Finance, the procurement guidelines applicable to the project shall normally be followed, notwithstanding anything contained in this order and without reference to the Competent Authority. Exceptions to this shall be decided in consultation with DEA.

B. This order shall not apply to procurement by Indian missions and by offices of government agencies/ undertakings located outside India.

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

D. Procurement of spare parts and other essential service support like Annual Maintenance Contract (AMC)/ Comprehensive Maintenance Contract (CMC), including consumables for closed systems, from Original Equipment Manufacturers (OEMs) or their authorized agents, shall be exempted from the requirement of registration.

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ANNEXURE III

Model Clause/ Certificate/ Undertaking to be inserted in tenders etc.

[While adhering to the substance of the Order, procuring entities and GeM are free to appropriately modify the wording of the clause/ certificate based on their past experience, local needs etc.

The conditions relating to specified ToT (as shown in italics) should be incorporated only in the tenders which attract the restrictions due to specified ToT.]

A. Model Clauses for Tenders (including tenders issued manually or any electronic portal including GeM):

I. Any bidder from a country which shares a land border with India will be eligible to bid in any procurement whether of goods, services (including consultancy services and non-consultancy services) or works (including turnkey projects) only if the bidder is registered with the Competent Authority. *Further, any bidder (including bidder from India) having specified Transfer of Technology (ToT) arrangement with an entity from a country which shares a land border with India, shall also require to be registered with the same competent authority.*

II. "Bidder" (including the term 'tenderer', 'consultant' or 'service provider' in certain contexts) means any person or firm or company, including any member of a consortium or joint venture (that is an association of several persons, or firms or companies), every artificial juridical person not falling in any of the descriptions of bidders stated hereinbefore, including any agency branch or office controlled by such person, participating in a procurement process.

III. "Bidder (or entity) from a country which shares a land border with India" for the purpose of this Order means: -

(a) An entity incorporated, established or registered in such a country; or
(b) A subsidiary of an entity incorporated, established or registered in such a country; or
(c) An entity substantially controlled through entities incorporated, established or registered in such a country; or
(d) An entity whose beneficial owner is situated in such a country; or
(e) An Indian (or other) agent of such an entity; or
(f) A natural person who is a citizen of such a country; or
(g) A consortium or joint venture where any member of the consortium or joint venture falls under any of the above

IV. The beneficial owner for the purpose of (iii) above will be as under:

1. In case of a company or Limited Liability Partnership, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has a controlling ownership interest or who exercises control through other means.

Explanation—

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a. "Controlling ownership interest" means ownership of or entitlement to more than twenty-five per cent. of shares or capital or profits of the company;

b. "Control" shall include the right to appoint majority of the directors or to control the management or policy decisions including by virtue of their shareholding or management rights or shareholders agreements or voting agreements;

2. In case of a partnership firm, the beneficial owner is the natural person(s) who, whether acting alone or together, or through one or more juridical person, has ownership of entitlement to more than fifteen percent of capital or profits of the partnership;

3. In case of an unincorporated association or body of individuals, the beneficial owner is the natural person(s), who, whether acting alone or together, or through one or more juridical person, has ownership of or entitlement to more than fifteen percent of the property or capital or profits of such association or body of individuals;

4. Where no natural person is identified under (1) or (2) or (3) above, the beneficial owner is the relevant natural person who holds the position of senior managing official;

5. In case of a trust, the identification of beneficial owner(s) shall include identification of the author of the trust, the trustee, the beneficiaries with fifteen percent or more interest in the trust and any other natural person exercising ultimate effective control over the trust through a chain of control or ownership.

V. An Agent is a person employed to do any act for another, or to represent another in dealings with third person.

VI. [To be inserted in tenders for Works contracts, including Turnkey contracts] The successful bidder shall not be allowed to sub-contract works to any contractor from a country which shares a land border with India unless such contractor is registered with the Competent Authority.

VII. The registration shall be valid at the time of submission of bid and at the time of acceptance of bid.

VIII. If the bidder was validly registered at the time of acceptance / placement of order, registration shall not be a relevant consideration during contract execution

Model Certificate for Tenders:

"I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India; I certify that this bidder is not from such a country or, if from such a country, has been registered with the Competent Authority. I hereby certify that this bidder fulfills all requirements in this regard and is eligible to be considered. [Where applicable, evidence of valid registration by the Competent Authority shall be attached.]"

Model Certificate for Tenders for Works involving possibility of sub-contracting:

"I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India and on sub-contracting to contractors from such countries; I certify that this bidder is not from such a country or, if from such a country, has been registered with the Competent Authority and will not sub-contract any

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work to a contractor from such countries unless such contractor is registered with the Competent Authority. I hereby certify that this bidder fulfills all requirements in this regard and is eligible to be considered. [Where applicable, evidence of valid registration by the Competent Authority shall be attached.]"

Model additional certificate by Bidders in the cases of specified ToT:

"I have read the clause regarding restrictions on procurement from a bidder having Transfer of Technology (ToT) arrangement. I certify that this bidder does not have any ToT arrangement requiring registration with the competent authority."

OR

"I have read the clause regarding restrictions on procurement from a bidder having Transfer of Technology (ToT) arrangement. I certify that this bidder has valid registration to participate in this procurement."

B. Model Certificate for GeM (to be taken by the GeM from seller during registration on GeM. GeM should also obtain this certificate from all existing bidders as soon as possible):

"I have read the clause regarding restrictions on procurement from a bidder of a country which shares a land border with India; I certify that this vendor/ bidder is not from such a country and does not have any specified Transfer of Technology (ToT) from such a country or, if from such a country or if having specified ToT from such a country has been registered with the Competent Authority. I hereby certify that this vendor/ bidder fulfills all requirements in this regard and is eligible to be considered for procurement on GeM. [Where applicable, evidence of valid registration by the Competent Authority shall be attached.]"

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BID DATA SHEET (BDS)

BID DATA SHEET		
S.NO.	**CL. NO.**	**CONTENT**
1.	**ITB 1.2 (i)** **E-Tendering/ e-procurement website**	E-Tendering/ e- procurement website means Government of India Central Public Procurement (CPP) Portal (https://eprocure.gov.in/eprocure/app)
2.	**ITB 2.0** **ELIGIBLE BIDDERS**	Enquiry Basis: **Original Equipment Manufacturer (OEM) basis.**
3.	**EIL VIS-A-VIS SUPPLIER COMMITMENTS**	Not applicable
4.	**ITB. 2.9.2** **CONFLICT OF INTEREST**	Provisions of Cl. 2.9.2 shall not be applicable as bid is being invited on OEM basis
5.	**ITB 4.7.4**	Clause No. 4.7.4 to ITB shall be read as: Bidder shall note that enquiry is issued on zero deviation basis. Bidder shall comply with all technical specifications & commercial terms and other conditions of the enquiry document without any deviations/ clarifications.
6.	**ITB 11.3, ITB 16.0 & ITB 24.1** **POSTAL ADDRESS & CONTACT DETAILS FOR SUBMISSION OF DOCUMENT (VIZ. BID SECURITY, ETC.) IN PHYSICAL FORM, IF ANY, AS PER RFQ**	**EMD/Bid Security is not Applicable for this enquiry .** **Place of submission of Document:** Jaydip Purkayastha, GM (SCM-C&P) Engineers India Limited, EIL Office Complex, Sector 16, Gurugram-122004 Telephone: 0124 – 2891370 /1371/ 1287 e-mail id: aanwesha@eil.co.in /bapi.baidya@eil.co.in/ jaydip@eil.co.in
7.	**ITB 5.1** **SITE VISIT**	**Contact Person of EIL at Khadki Pune Site:** **Mr. Nikhil Datir** **Resident Construction Manager** **EIL OBE Site- HEF, Khadki** **Mob. 9444811560** **Email.: nikhil.datir@eil.co.in**
8.	**ITB 11.1** **LIST OF DOCUMENTS**	a. Salient Feature of Offer (**Form-A of Bidding Forms**) b. Bank Certified Mandate Form as per **Form-B of Bidding Forms duly** signed and stamped with the Banker's certification or **cancelled cheque**. **c. Unpriced Details for CPP Portal:** Unpriced copy (without price) of Price Schedule duly indicating 'Q' for Quoted / 'NQ' for Not Quoted, in accordance with the instructions mentioned therein.; d. Signed and stamped copy of Form-IA/IB/II, as applicable, (on Company's Letterhead) attached with Appendix-X of ITB in line with Government guidelines regarding procurement from bidders from a country or countries sharing Land Border with India. e. Signed and stamped Prefilled unit rates for addition/deletion (ANNEXURE-II to BDS) ~~f. Self Certified FORM 2 & FORM 2A by Bidder under PPP- MII Order, 2017 towards mandatory minimum Local Content (attached with Appendix-IV of ITB).~~ ~~g. Scanned copy of Integrity Pact duly signed on each page by authorized signatory, wherever applicable along with witnesses signature (if applicable)~~ ~~h. Signed and stamped copy of **Affidavit/Undertaking**, as applicable attached with **Appendix-VI** of ITB in line with Government guidelines regarding Policy~~

BID DATA SHEET		
S.NO.	**CL. NO.**	**CONTENT**
		~~for providing Preference to Domestically Manufactured Iron & Steel Products~~ i. MSE Documents, if applicable. j. Technical Compliance/datasheets/documents, required as per Technical Specifications/MR k. Any other document as required in the bidding document. l. Addendum(s)/ Amendment(s), if any, to the Bidding Document .
9.	**ITB 11.2** **Priced Bid (through e-tender portal)**	**Priced Details for CPP Portal:** Price Schedule with prices filled in. The rates are to be filled in accordance with instructions provided in Preamble to Schedule of prices, in e-tendering portal, without making any changes in the format/names of the file/worksheet.
10.	**ITB 12.0** **INTEGRITY PACT**	Not Applicable
11.	**ITB 12.2** **INDEPENDENT EXTERNAL MONITORS (IEMS) DETAILS**	The detail of Independent External Monitors (IEMs), appointed by EIL, in terms of Integrity Pact (IP) are mentioned below: Details of IEM are mentioned as bellows: 1. **Shri Akhil Kumar Shukla, IPS (Retd.)** A-804, Aakriti Shantiniketan, Sector-143B, NOIDA – 201304, District- Gautam Buddha Nagar (UP) M. No. 9958822237 E-mail: akhilshukla60@gmail.com 2. **Dr. Hari Shankar Gupta, IFoS (Retd)** D-7, Aastha Regency, PO-Hehal, Ratu Road, Ranchi, Jharkhand-834005 M.no 9031000118 E-mail: hsguptaifs@gmail.com 3. **Shri Sunil Shreekrishna Dadhe, IA & AS (Retd.)** 403 Agasti Society, 78-79 Walvekar Nagar, Pune Satara Road, Pune-411009 M. No. 9422517982, 7894444749 E- mail: sunildadhe@gmail.com
12.	**ITB 17.0** **CERTIFICATION OF DOCUMENTS**	Not Applicable
13.	**ITB 18.0** **PERIOD OF VALIDITY OF BIDS**	Bid shall remain valid for 120 Days from the final bid due.
14.	**IFB/ NIT 4.0 and ITB 36.0** **EVALUATION AND COMPARISON OF PRICE BIDS**	The evaluation and Ordering shall be on Bottom-line Basis as per MR. 100% Input Tax Credit is available with EIL.
15.	**ITB 36.10 & 38.2** **PREFERENCE TO MICRO & SMALL ENTERPRISE**	APPLICABLE

BID DATA SHEET		
S.NO.	**CL. NO.**	**CONTENT**
16.	**ITB 38.4 POLICY FOR PROVIDING PREFERENCE TO DOMESTICALLY MANUFACTURED IRON AND STEEL PRODUCTS IN GOVERNMENT PROCUREMENT (DMI&SP)**	NOT APPLICABLE
17.	**ITB 36.11 & 38.3 PUBLIC PROCUREMENT (PREFERENCE TO MAKE IN INDIA)**	NOT APPLICABLE
18.	**ITB 38.5 PURCHASE PREFERENCE TO DOMESTICALLY MANUFACTURED ELECTRONIC AND TELECOM PRODUCTS**	NOT APPLICABLE
19.	**ITB 38.6 STARTUP INDIA POLICY**	NOT APPLICABLE
20.	**ITB 38.7 PROCUREMENT FROM BIDDERS FROM COUNTRY(IES) SHARING BORDER WITH INDIA**	APPLICABLE **Non-compliance to referenced policy shall lead to rejection of offer.**
21.	**ITB 46 ABNORMALLY LOW BIDS**	Clause No. 46 of ITB stands deleted.
22.	**SPC** **GUARANTEE/WARRANTY**	**As per Clause No. 6.0 of SPC.**
23.	**SPC 2.0 PAYMENT TERMS**	**A. For Indian Bidder**: **Supply: As per sub-clause A1.4 of Annexure-I of SPC.** **Supervision: As per sub-clause A4 of Annexure-1 to SPC** Also refer Notes to Annexure-I to SPC.
24.	**SPC 7.1 CONTRACT CUM PERFORMANCE BANK GUARANTEE (CPBG)**	**5% (Five Percent) of Total Order Value**
25.	**SPC 7.3 INTEREST RATE FOR RECOVERY OF CPBG/ADVANCES (IF ANY)**	Rate of interest for such recovery shall be **@ 10.90%** per annum [based on the present Base Rate (9.90%) plus One Percent (1%)].
26.	**SPC 9.1 VARIATION AS PER IEEMA CIRCULAR**	NOT APPLICABLE

BID DATA SHEET		
S.NO.	**CL. NO.**	**CONTENT**
27.	**SPC 10.0 PRICE REDUCTION SCHEDULE**	APPLICABLE. As per Clause No. 10.2 of Specials Purchase Conditions (SPC).
28.	**SPC 13.0 BASIS OF EVALUATION**	Following components shall considered for Price evaluation: a) BASIC SUPPLY PRICE ON FOR DESPATCH POINT b) FREIGHT UPTO SITE c) PER-DIEM SUPERVISION CHARGES AT SITE
29.	**SPC 16.0 PART ORDER**	NOT APPLICABLE.
30.	**SPC 17.0 REPEAT ORDER**	NOT APPLICABLE
31.	**SPC 24.0 TERMS & CONDITIONS FOR SUPERVISION OF ERECTION, TESTING & COMMISSIONING**	APPLICABLE
32.	**SPC 25.0 TERMS & CONDITIONS FOR INSTALLATION/ SITE WORK**	NOT APPLICABLE
33.	**SPC 26.0 TERMS & CONDITIONS FOR ANNUAL MAINTENANCE CONTRACT (AMC)**	NOT APPLICABLE.
34.	**SPC 27.0 TERMS & CONDITIONS FOR TRAINING AT VENDOR'S WORKS**	NOT APPLICABLE
35.	**Unit rates for addition/ Deletion as per sr. no. 06.001 of MR Top Sheet**	Pre-filled Unit Rates for Addition/ Deletion is enclosed as Annexure-II to Bid Data Sheet (BDS). Bidder to submit a copy of Pre-filled Unit Rates for Addition/ Deletion enclosed as Annexure-II to BDS, duly signed and stamped along with the unpriced bid, as a token of acceptance. Unit Rates for Addition / Deletion shall not be considered for commercial evaluation.
36.	**INVOICING DETAILS AND DESPATCH & INVOICING INSTRUCTIONS**	Invoicing and Dispatch instructions – As per Annexure – I to BDS. The same shall be part of order/GEM contract.
37.	**NON-DISCLOSURE AGREEMENT (NDA)**	APPLICABLE; Bidder to note corresponding guidelines w.r.t NDA as mentioned in the enquiry documents.

Invoicing Details and Dispatch & Invoicing Instructions

A **METHODOLOGY FOR PREPARATION OF TAX INVOICE:**

BUYER & CONSIGNEE

Name of the BUYER and CONSIGNEE in GST Invoice shall be shown as:

Engineers India Limited
High Explosives Factory,(A unit of Munitions India Ltd.)
Ministry of Defence,
Near Holkar Bridge, Caldicott Road,
Khadki, Pune, 411003
Maharashtra

GST No. of EIL: 27AAACE5318C1Z3 State : Maharashtra

PAN of EIL : AAACE5318C

It is mandatory to mention HSN/SAC of Supply / Services by Seller.

B **METHODOLOGY FOR PREPARATION OF L.R.**

CONSIGNEE

Name of the Consignee in LR/e-way Bill shall be shown as:

Engineers India Limited
High Explosives Factory,(A unit of Munitions India Ltd.)
Ministry of Defence,
Near Holkar Bridge, Caldicott Road,
Khadki, Pune, 411003
Maharashtra

C **PACKING/MARKING/DESPATCH/SHIPPING AND INVOICING INSTRUCTIONS**

➢ Unless otherwise specified following shall be the part of despatch documents

- Invoice
- Packing List
- Inspection Release Note along with Test Certificates and Inspection Reports
- Material Test Certificate
- Lorry Receipt

➢ In addition to the details furnished in the invoice, supplier shall generate DISPATCH NUMBER (DN) against each invoice. The DN shall be 3-digit continuous number starting from 001 suffixed to purchase Order Number and shall be unique to each invoice. Same shall also be printed on each consignment / box for easy co-relation. DN shall be quoted in all further communications viz dispatch detail to inspection, correspondence with site as well as for payment purpose. Mentioning the DN on each invoice shall be mandatory.

Invoicing Details and Dispatch & Invoicing Instructions

➢ Maximum 3 nos. of invoices are allowed. Prior approval of Project Manager of EIL shall be required in case the no. of invoices exceeds 3.

➢ Documents/Invoices shall be addressed to the following:

a) Payment through EIL:

NAME OF DOCUMENT	Original	Copy	Remarks
(1) Invoice	Gurugram-Projects	Site-RCM	2 Additional Sets of the complete set of invoice document should be submitted to HO – Projects
(2) Duplicate for Transporter (DFT) Copy	Site-RCM	Gurugram-Projects	
(3) Lorry Receipts (LR)	Site-RCM	Gurugram-Projects	
(4) IRN/ IR/ IBR	Site-RCM	Gurugram-Projects	
(5) Packing List	Site-RCM	Gurugram-Projects	
(6) Test Certificates & Inspection Reports	Site-RCM	Gurugram-Projects	
(7) PBG / ABG	Gurugram (F&A)-LSTK Head	Gurugram-Projects	In case of payment through Bank, the submission of matrix of these documents shall remain unchanged.
(8) Request for Returning Bid Security	Gurugram (SCM-C&P)	Gurugram-Projects	
(9) Request for Returning ABG/ PBG	Gurugram (F&A)-LSTK Head	Gurugram-Projects	
(10) Request for E-Way Bill (in case of FOT Despatch Point Delivery obligation of Seller)	Site-RCM	HO-Inspection & Gurugram - Projects	
(11) Final Documents Certificate & CDs **	Site-RCM	Gurugram - Projects (CD Only)	
(12) Bank Mandate Form	Gurugram (F&A)-LSTK Head	Gurugram - Projects	
(13) Final Payment – Supplementary Invoice @ 10%	Gurugram - Projects	Gurugram (F&A)-LSTK Head	

For Contact Detail: Refer Sl. I

Invoicing Details and Dispatch & Invoicing Instructions

** Original copy of the Final document ation along with _6_ number of hard copies shall be submitted to Site-RCM and 2 number of CDs shall b e submitted to EIL-Gurugram office (Projects).

b) Details of Purchaser's Bank

Name	Engineers India Limited
Address of EIL	1, Bhikaji Cama Place, RK Puram, New Delhi- 110066
e-Mail address	billing@eil.co.in
PAN	AAACE5318C
Name of Bank	State Bank of India CAG Branch-II, 4th and 5th Floor, Redfort Capital Parsvanath Towers, Bhai Veer Singh Marg, Gole Market, New Delhi-110001 Tel: 011-23475562/5569, Fax: 011-23475580
Branch Code	17313
Current Account Number	00000043027762062
IFSC Code	SBIN0017313
MICR Code	110002562

Invoicing Details and Dispatch & Invoicing Instructions

D ***POST ORDER CORRESPONDENCE:***

All Post Order Correspondence shall be addressed to the following:

Name of Concern Person	Contact Details:
1) Mr. T Vasu (Senior General Manager) (SCM-Inspection)	Engineers India Limited, 1, Bhikaji Cama Place, New Delhi-110066 Tel: 0124-264 4003 / 011–2676 2121 e-mail: t.vasu@eil.co.in
2) Mr. Inderish Kapoor, DGM (Project)	Deputy General Manager, Engineers India Limited, EIL Office Complex, Sector 16, Gurugram-122001 Tel: 0124-2892467 e-mail: inderish.kapoor@eil.co.in
Copy 3) Mr. Shyam Kiran, GM (F&A)	Engineers India Limited, EIL Office Complex, Sector 16, Gurugram-122001 Tel: 0124-2892210 e-mail: ts.kiran@eil.co.in

Invoicing Details and Dispatch & Invoicing Instructions

E ***VENDOR's DRAWING & DATA REQUIREMENT***

(a) Drawings & Documents (Transparencies & printed matter), wherever applicable, shall be forwarded to the following in requisite number of copies as per Purchase Requisition. Updated DCI should accompany each submission:

1) Vendor Print Control

Trinitrotoluene (TNT) Plant at High Explosives Factory (HEF) Khadki of Munitions India Limited (MIL) at Khadki, Pune, Maharashtra

Engineers India Limited,
EIL Office Complex,
Sector 16, Gurugram-122001

2) Mr. Inderish Kapoor, DGM (Project)---------- (Only Covering Letter)

Contact Detail: Refer Sl. D(2) above

3) Mr. T Vasu (Senior General Manager) (Inspection) ---------- (Only Covering Letter)

Contact Detail: Refer Sl. D(1) above

(b) Before forwarding the drawings and documents, Seller will ensure that the following is properly entered on each drawing / document:

(i) Job No.
(ii) Drawing / Document Title and number
(iii) Purchase Requisition No.
(iv) Equipment Number

(c) Before forwarding revised drawings, Seller must ensure that EIL's Vendor Print Number that is given in approval stamp is shown on the revised drawing.

Invoicing Details and Dispatch & Invoicing Instructions

F ***Requirements of Documents as Identity Proof from Drivers/ Vendors/ cleaners/ load men***

Drivers of supplier entering the site should also carry any one of the following document as identity Proof, in addition to their Driving License as also listed below:

1. Passport
2. Ration Card (with individual photo identity)
3. Voter identification Card
4. Driving License
5. Pan Card
6. Photo ID Card by Central or State Govt. (which are having serial number)
7. Nationalised Bank Passbook with Laminated Photograph
8. Aadhaar Card
9. ESI Pachan Card
10. ID Card issued by Post Offices.

Further, the Vendors/ Cleaners/ Load Men of supplier should also carry one Identify Proof among the above mentioned documents. Vendors/Drivers/Cleaners/Load Men will not be permitted to enter the site without the above ID proofs.

It will be supplier's responsibility that above requirements are met.

Invoicing Details and Dispatch & Invoicing Instructions

G ***Details of the Marine Cum Transit Insurance:***

a) Seller shall advise by e-mail / Fax, dispatch particulars, immediately on despatch indicating the particulars in following manner, to the underwriter at following address for covering the Transit risks against the Policy.

Sl. No.	MARINE INSURANCE	
1	Policy No.	Marine Cum Erection PolicyPolicy No: 130162422120047124/13012242423M000503 Valid: From 00:01 Hours of 15/10/2024 to Mid-Night of 14/03/2027
2	Purchase Order No.	
3	Item & Value	
4	Date of LR/Transporter's name	
5	Dispatch Point	
6	Destination	
7	GC Note (LR) & Date	
8	Invoice No & Date	
9	Invoice Value	
10	No. of Packages	
11	Gross weight of material	
12	Net weight of material	

H Insurance Company:

Policy Issuing Office: Reliance General Insurance Company Limited, 6th Floor, Oberoi Commerz, Oberoi Garden City, Off Western Express Highway, Goregaon (East) , Mumbai, 400063, India
Email ID: AKHIL.JINDAL@indusindinsurance.com
(M): +91-8976710589 / +91-9643103209 / +91-9136607458

Policy Servicing Branch Office: Reliance General Insurance Co. Ltd., Flat No. 10-15, 14th Floor, Vijaya Building, 17, Barakhamba Road, Central Delhi – 110001; Contact No. 011-39975617

Details of Insurance shall be as per Clause No. 12 of SPC and corresponding Annexure(s) to SPC. SPC and SCC as mentioned in the Enquiry Documents shall be construed as the same.

I Contact Details:

1. HO-Projects

Trinitrotoluene (TNT) Plant at High Explosives Factory (HEF) Khadki of Munitions India Limited (MIL) at Khadki, Pune, Maharashtra

To: Mr. Inderish Kapoor, DGM (Projects)

Engineers India Ltd.,
Tower-2, 2nd Floor, EIL Office Complex, Sector 16, Gurugram-122001
Email : inderish.kapoor@eil.co.in
Phone : 0124 289 2467

2. Site-RCM

Mr. Nikhil Nilkanthrao Datir, AGM (Construction)

Resident Construction Manager, Engineers India Limited,
C/o High Explosives Factory,(A unit of Munitions India Ltd.)
Ministry of Defence,
Near Holkar Bridge, Caldicott Road,
Khadki, Pune, 411003
Maharashtra
Email : nikhil.datir@eil.co.in
Mobile : +91 8904045557

3. HO (F&A)-LSTK Head

Trinitrotoluene (TNT) Plant at High Explosives Factory (HEF) Khadki of Munitions India Limited (MIL) at Khadki, Pune, Maharashtra

Mr. SHYAM KIRAN, GM (F&A)
Tower-2, Ground Floor, EIL Office Complex, Sector 16, Gurugram-122001
Phone : 0124-2892210
Email : ts.kiran@eil.co.in

Copy: Mr. Harish Kumar, AGM(F&A)
Engineers India Ltd.,
Tower-2, Ground Floor, EIL Office Complex, Sector 16, Gurugram-122001
Email : harish.chugh@eil.co.in
Phone : 0124 289 2297

4. HO – (SCM – Inspection)

Trinitrotoluene (TNT) Plant at High Explosives Factory (HEF) Khadki of Munitions India Limited (MIL) at Khadki, Pune, Maharashtra

Mr. T Vasu (Senior General Manager)

Engineers India Ltd.,
EI Bhavan, 2nd Floor,1-Bhikaiji Cama Place
New Delhi – 110 066
Email : t.vasu@eil.co.in

Invoicing Details and Dispatch & Invoicing Instructions

Phone : 0124 – 264 4003 / 011 – 2676 2121

5. Gurugram (SCM-C&P)

Trinitrotoluene (TNT) Plant at High Explosives Factory (HEF) Khadki of Munitions India Limited (MIL) at Khadki, Pune, Maharashtra

Mr. Jaydip Purkayastha, GM (SCM-C&P)

Engineers India Ltd.,

Tower-1, 1st Floor, EIL Office Complex, Sector 16, Gurugram-122001

Email : jaydip@eil.co.in

Phone : 0124 289 1287

CHECKLIST FOR ENSURING COMPLETENESS OF DOCUMENTS WHILE SUBMITTING THE INVOICES

S. No.	Description	Tick Mark
1	Compliance to PO terms	
2	Item Nos. on the invoices to match the PO item nos.	
3	Submission of IBR authorization certificates	
4	In case of multiple invoices, please identify the item no. on the IRN covered in the particular invoices	
5	Submission of IRNs with each and every invoice	
6	Timely submission of ABG / PBG	
7	No deviation from ABG/PBG formats is allowed	
8	TPI certificates for final documents	
9	Submission of supplementary invoices for 10% payment along with copy of PBG	
10	Original LR shall be submitted to RCM only	

CHECK LIST FOR PREPARATION OF INSPECTION RELEASE NOTE

S. No.	Description	Tick Mark
1	EIL PO NO. / FOA NO. / ORDER NO.	
2	PR reference	
3	QAP Reference	
4	ITP reference	
5	QTY in line with Purchase Order	
6	Code-1 drawing reference (if any)	

ANNEXURE-II to BDS

UNIT RATES FOR ADDITION/DELETION

JOB NO:	B889
PROJECT:	EXECUTION OF TNT PLANT AT HEF, KHADKI ON OPEN BOOK ESTIMATE (OBE)
CLIENT:	MUNITIONS INDIA LIMITED (MIL)
CONSULTANT:	ENGINEERS INDIA LIMITED (EIL)

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
A	06-02-2026	ISSUED FOR BIDS	AS	TSD	PSV

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UNIT RATES FOR ADDITIONS/DELETIONS

Following are the charges/rates for future addition/deletion with material as per scope of supply defined in the material requisition. The rates furnished below shall be paid on finished weight basis and it includes associated fabrication and testing.

A.) Rates shall be applicable for components / parts / attachments including the fabrication & testing.

B.) The unit rates shall be applicable for addition as well as for deletion of the items.

C.) The weights indicated on engineering drawings do not form the basis for offer, since these are approximations only.

	Description	Price List
i)	Change in size / thickness / length of shell, head / Reinforcing Pad / Insert Plate/ Plate Flange etc. per Kg. basis	
	- SA 516 GR.60	Rs. 230/kg
	- SA 516 GR.70	Rs. 230/kg
	- SA 240 GR.316 L	Rs. 590/kg
	- SA 240 GR.316	Rs. 560/kg
ii)	Change in size/thk. of welded / loose internals per Kg. basis:	
	- SA 516 GR.60	Rs. 230/kg
	- SA 516 GR.70	Rs. 230/kg
	- SA 240 GR.316 L	Rs. 590/kg
	- SA 240 GR.316	Rs. 560/kg
iii)	Change in size of Nozzle Flange, non-standard flange / per Kg. basis (Refer note-1):	
	- SA 105	Rs. 320/kg
	- SA 182 F316L	Rs. 890/kg
	- SA 182 F316	Rs. 850/kg
iv)	Change in size/thickness of Nozzle Neck & Seamless Pipes per Kg. basis:	
	- SA 106 GR B	Rs. 150/kg
	- SA 516 GR 60	Rs. 230/kg
	- SA 516 GR 70	Rs. 230/kg
	- SA 312 TP 316L	Rs. 770/kg
	- SA 240 GR.316L	Rs. 590/kg
	- SA 312 TP 316	Rs. 730/kg
	- SA 240 GR.316	Rs. 560/kg
v)	Change in size/thickness of pipe fittings per Kg. basis:	
	- SA 234 WPB	Rs. 430/kg
	- SA 403 WPS 316L	Rs. 930/kg
	- SA 403 WPS 316	Rs. 880/kg

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	Description	Price List
vi)	Change in size/thickness of Seamless Pipe Supports, Lugs Support, structural cleats, piping cleats, external supports, Davit etc. per Kg. basis:	
	- SA 106 Gr.B	Rs. 150/kg
	- SA 312 TP 316L	Rs. 770/kg
	- SA 312 TP 316	Rs. 730/kg
vii)	Change in size / thickness of Pad Nozzles per Kg. basis:	
	- SA 105	Rs. 320/kg
	- SA 182 F316L	Rs. 890/kg
	- SA 182F 316	Rs. 850/kg

Notes:

1) "Nozzle Flange, non-standard flange" when supplied with blind flange, companion flange or reducing flanges the unit rate shall be applicable for the studs, nuts and gaskets.

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ENGINEERS INDIALIMITED

SPECIAL PURCHASE CONDITIONS FOR TRINITROTOLUENE (TNT) PLANT AT HIGH EXPLOSIVES FACTORY (HEF) KHADKI OF MUNITIONS INDIA LIMITED (MIL) AT KHADKI, PUNE, MAHARASHTRA

इंजीनियर्स इंडिया लिमिटेड (भारत सरकार का उपक्रम) ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)
Regd. Office : Engineers India Bhawan, 1, Bhikaiji Cama Place, New Delhi - 110066

GLOSSARY

AMC	Annual Maintenance Contract
AOW	Award of Work
BDS	Bid Data Sheet
CPBG	Contract Performance Bank Guarantee
OWNER/ CLIENT	MUNITIONS INDIA LIMITED (MIL)
CONTRACTOR	Engineers India Ltd. (EIL)
Bidder/ Vendor	Whom RFQ/ Tender has been issued/ who have submitted offer against RFQ
SUPPLIER	Successful BIDDER on whom order has been placed
CDD	Contractual Delivery Date
DOP	Sub Delegation of Power
FOA / LOA	Fax of Acceptance / Letter of Acceptance
FOB	Free on Board
GST	Goods & Service Tax
IRS	Indian Register of Shipping
L/C	Letter of Credit
MR	Material Requisition
OBE	Open Book Estimate
PAC	Project Authority Certificate
PBG	Performance Bank Guarantee
PO	Purchase Order
PR	Purchase Requisition
PRS	Price Reduction Schedule for delayed Delivery
RCM	Resident Construction Manager
RFQ	Request for Quotations
SOR/SOP	Schedule of Rates / Price Schedule
TPI	Third Party Inspection

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ANNEXURE-I : PAYMENT TERMS

ANNEXURE-II : TERMS & CONDITIONS FOR INDIAN SOURCED COMPONENTS / SERVICES BY FOREIGN BIDDER

ANNEXURE-III : TERMS & CONDITIONS FOR SUPERVISION OF ERECTION, TESTING & COMMISSIONING/ TRAINING AT SITE

ANNEXURE-IV : TERMS & CONDITIONS FOR INSTALATION / SITE WORK (PART OF SUPPLY ITEMS)

ANNEXURE-V : TERMS & CONDITIONS FOR ANNUAL MAINTENANCE CONTRACT

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ANNEXURE-VII : E-INVOICING DECLARATION

ANNEXURE-VIII : DISPUTE RESOLUTION

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1.0 INTRODUCTION

1.1 These Special Purchase conditions (SPC) shall be read in conjunction with the General Purchase Conditions (GPC), Material Requisition and any other document forming part of this RFQ wherever the context so requires.

1.2 Where any portion of the GPC is repugnant to or at variance with any provisions of the SPC & Bid Data Sheet then unless a different intention appears, the provision(s) of the SPC & Bid Data Sheet shall be deemed to override the provision(s) of GPC only to the extent that such repugnancy of variations in the SPC & Bid Data Sheet are not possible of being reconciled with the provisions of GPC.

1.3 All headings, subtitles and marginal notes to the clauses of the GPC, SPC or to the Specifications or to any other part of Bidding Document are solely for the purpose of giving a concise indication and not a summary of the contents thereof, and they shall never be deemed to be part thereof or be used in the interpretation or construction thereof.

1.4 The terms fully capitalized and/or initial capitalized shall be interchangeable and shall have the meaning as assigned to fully capitalized term or initial capitalised term.

2.0 PAYMENT TERMS

2.1 Payment Terms for the scope of supply/ services shall be as per Bid Data Sheet (BDS) & Notes provided in **Annexure-I to SPC**.

2.2 **"Uploading of and Tracking of invoice in EIL invoice portal:**

Suppliers and Service Providers shall upload the scan copy of invoices and other documents as required in the Purchase Order/ Work Order on the EIL Invoice Portal to enable EIL to speed up and cut down on the processing and payment cycle. Post uploading, all correspondence between EIL and Suppliers/Service Providers will be through the portal. Suppliers/ Service providers can track the status of the uploaded invoices through the portal.

A user guide on the operation of the portal is available on log in. URL of the portal is (http://www.eil.co.in/invoiceportal). Registered Supplier/ Contractor can Login with existing Supplier/ Contractor code using the radio button. Non-Registered Supplier/Contractor can Login with PAN No. and generate the password using the radio button.

3.0 TRANSPORTATION

3.1 INDIGENOUS SUPPLIERS

3.1.1 Indigenous SUPPLIERs are required to dispatch the goods on door delivery basis through any registered Transporter.

3.1.2 The consignment should be handed over to transporter with E-way bill, wherever required as per law/act.

3.1.3 It shall be responsibility of the seller to send intimation immediately on dispatch of the material so that necessary arrangements can be made at site. Delays on account of the same shall solely be attributable to the Supplier.

3.2 FOREIGN SUPPLIERS

3.2.1 Orders in case of foreign suppliers shall be on CFR seaport of entry (Nhava Sheva, Mumbai) / CPT airport of entry (Pune) in India basis, wherein the Ocean / Air transportation from FOB seaport of exit / FCA airport of Exit to the designated Indian seaport / airport shall be arranged by the suppliers. All shipments of break bulk material and containerized cargo shall be made by suitable vessels certified for sea worthiness and complying to National/ International safety regulations and age of the vessel being less than 25 years. Bidder to coordinate with EIL nominated Customs House Agent for smooth discharge /delivery of the cargo at the Port of arrival.

3.2.2 Bidder shall quote for supply prices on FOB seaport / FCA airport of exit basis and Ocean / Air Freight transportation charges separately as per the Price Schedule format. The quoted ocean freight charges for Break Bulk cargo delivery shall be on FLT (Full Liner Terms), i.e., all charges at destination port shall be borne by the suppliers till the cargo is unloaded on to the wharf / vehicle

as the case may be. No Trans-shipment is permitted for Break Bulk Cargo.

3.2.3 Bidder shall inform 07 days prior to the expected date of arrival of vessel in port of entry in India. Detention & Demurrages, if any, due to early arrival of vessel and / or discrepancies in shipping documents, shall be to supplier's account.

3.2.4 Wherever, the foreign bidder does not accept the ocean transportation in his scope, offer of such bidder shall be rejected. However, in exceptional cases like single bid cases, EIL reserves the right to finalize the order on FOB basis, subject to arrangement of ocean transportation from FOB port of exit to port of entry in India by EIL, on case to case basis.

3.2.5 The delivery basis of the goods is mentioned in BDS/RFQ. Delivery terms shall be interpreted as per INCOTERMS 2020 or its latest version in case of order on a foreign Bidder and as the date of LR/GR in the case of order on an Indian Bidder.

4 CURRENCY OF QUOTE AND PAYMENT

4.1 **Domestic Bidding:**

In case of Domestic Bidding, the Currency of Quote shall be in INR and payment shall be done in INR only.

4.2 **ICB/Global Bidding:**

Indian Bidders are required to quote all Indian sourced materials/services in Indian Rupees and the foreign sourced material/services in any one of the Foreign Currency out of EURO/USD or in combination of Indian Rupees and any one of the Foreign Currency out of EURO/USD or only in Indian Rupees. Payment towards such imported materials/services shall be remitted in INR at the exchange rate charged by bank.

Foreign Bidders may quote prices for supply of materials/services from India in Indian Rupees only and Foreign supply of material/services in any one of the Foreign Currency out of EURO/USD or in combination of Indian Rupees and any one of the Foreign Currency out of EURO/USD or only in Indian Rupees. Foreign bidders will be paid in the quoted currency.

5 SINGLE POINT RESPONSIBILITY OF THE SUPPLIER

In case of MRs containing supplies as well site work/ services, a single order, covering the supply part as well site work/ services, shall be placed. Split ordering will not be permitted.
In case, a foreign SUPPLIER requests for a separate order on his Indian sub-SUPPLIER, the same shall not be accepted. However, a separate working order may be issued referring to the main PO for tax compliance purpose. However, payment to Indian sub-SUPPLIER shall be released directly in Indian Rupees against invoices duly certified by the Foreign SUPPLIER.

For this purpose, the Indian sub-SUPPLIER's name, material/ services and corresponding price in Indian Rupees, shall be clearly spelt out in the purchase order placed on foreign SUPPLIER. In case a Foreign bidder sources components / sub-supplies and services from India, if allowed as per Material Requisition, the Commercial terms & conditions shall be applicable to the extent as per Annexure-I**I** enclosed.

6 GUARANTEE/ WARRANTYPERIOD

6.1 The Clause no. 22.0 (Guarantee) of GPC(Indigenous)/ 20.0 (Guarantee) of GPC(Imports) has been modified to the following extent:

Guarantee/Warranty period shall be 15 months after the equipment/material have been put in service (commissioning) or 30 months from the date of shipment, whichever is earlier.

6.2 In case Material Requisition (MR) indicates the requirement of additional / extended Guarantee period for a specified period over and above the Guarantee period as defined in Clause No. 6.1 above, then the prices for the same shall be quoted by the bidders, in case requested in the price schedule format.

In such case, order for such additional Guarantee period/ Defect Liability Period shall be placed along with the main order with condition that separate intimation for operation of additional Guarantee period/ Defect Liability Period shall be issued by EIL, within the expiry of the original

guarantee period, if so required.

6.3 The prices for this additional Guarantee period shall be considered for price evaluation.

6.4 Bidder's quoted prices for the additional Guarantee Period shall be valid up to the expiry of the warranty/ defect liability period.

7 CONTRACT CUM PERFORMANCE BANK GUARANTEE (CPBG)

7.1 The provisions of Clause No. 21.0 of GPC (Indigenous) / Clause No. 21.0 of GPC (Imports) shall be applicable and are modified to the following extent:

"The Supplier shall within 30 days of issue of FOA/ LOA / PO/ Gem Contract whichever is issued earlier, deposit with the company an interest free Security Deposit (SD) for an amount (as percentage of order value) defined in Bid Data Sheet (BDS) in the form of Bank draft/ Pay Order/ Bank Guarantee/ Fixed Deposit receipts (FDRs)/ Electronic bank Guarantee(ePBG)/Insurance Surety Bond.

In case, bidder submit CPBG in the form of FDR then bidder to submit Confirmation Letter from the FDR issuing Bank in original strictly as per the Format enclosed as Form G under Bidding Forms.

If a Supplier chooses to submit e-BG, physical copy is not required. Contractor/Supplier intending to submit an e-BG must do so in accordance with the contractual terms by submitting the e-BG copy to the Officer in-Charge as mentioned in the FOA/ LOA / PO/ Gem Contract. For issuance of Electronic Bank Guarantee through National e- Governance Services Limited (NeSL) platform, details of Engineers India Limited (Beneficiary) are as under:

(i)	PAN	AAACE5318C
(ii)	Name.	Engineers India Limited
(iii)	Date of Incorporation	15.06.1965
(iv)	Email ID	eil.ebg@eil.co.in
(v)	Contact No.	9999119550
(vi)	Legal Constitution	Entity
(vii)	Registered office address	Engineers India Bhawan, 1, Bhikaji Cama Place, New Delhi-110066, India
(viii)	Registered office address Pin code	110066
(ix)	Communication address	Engineers India Bhawan, 1, Bhikaji Cama Place, New Delhi-110066, India
(x)	Communication Address Pin code	110066

7.2 Total Order Value shall mean supply price (FOT dispatch point price for Indian Suppliers and FOB/ FCA price for foreign suppliers) plus site work (wherever applicable) but excluding GST, transportation, other services like training, AMC, supervision etc. as per the provision of MR.

7.3 The Supplier shall submit the CPBG within the period stipulated. Owner/EIC may extend such period with applicability of recovery of accrued interest for the delayed period. In case, Supplier does not submit CPBG as above, the proportionate amount of CPBG along with interest (for rate of Interest, refer BDS) accrued for the period shall be deducted from the invoices raised by Supplier for the respective milestone payments on pro rata basis, till full recovery.

7.4 Supplier can also submit CPBG in form of Unconditional & Irrevocable Insurance Surety Bond. The Unconditional Insurance Surety Bond shall be from an Indian Insurance Company (Insurer) registered with Insurance Regulatory and Development Authority of India (IRDAI). The Insurance Surety Bond shall be valid up to Guarantee period plus two months for claim period. The BG/ Insurance Surety Bond shall be submitted as per the format attached as Annexure-XIV to SPC.

8 TAXES/DUTIES

8.1 Taxes and Duties shall be as per Annexure-XI to this SPC (Special Conditions of Purchase). Clause No. A of Annexure-XI to SPC stands modified to the following extent:

8.1.1 The quoted price shall be deemed to be inclusive of GST (i.e. IGST or CGST and SGST/UTGST applicable in case of interstate supply or intra state supply respectively and GST compensation cess, if applicable) and all other taxes and duties.

8.1.2 Transportation charges up to respective project site, if sought separately, shall be inclusive of GST.

8.1.3 Site work prices, if applicable shall be inclusive of GST and all other taxes and duties. All necessary registrations, if required, for carrying out the site activities shall be done by the bidder and costs towards the same shall be included in quoted site work prices.

8.1.4 Prices of supervision (per diem) charges, hazop study, 3D modelling, training/AMC, if applicable shall be inclusive of GST. However, GST shall not be applicable on training provided at foreign bidder's work/training facilities in their country.

8.1.5 Taxes and Duties related clauses in GPC (Indigenous) stands modified to this extent as per Clause No. 8.0 of SPC.

8.2 Further, merit rate of custom duties shall be considered for built-in import content.

8.3 All other provisions related to taxes & duties shall be as per Annexure-XI to SPC

8.4 The phrase "Form-C to qualify to concessional rate of tax" indicated in clause no. 13.1 & clause no. 14.2 of General Purchase Conditions (indigenous) are not applicable. Bidder to follow provisions of taxes and duties as per Annexure-XI to SPC in this regard.

9 FIRM PRICES

9.1 The prices shall be firm and fixed and not subject to any variation whatsoever, except Statutory variation in taxes & duties and new taxes as per Annexure-XI to SPC. In case of cables, variation in prices shall be admissible as per IEEMA Price Variation Clause

9.2 For 2 years O&M spares, prices shall be kept valid for a period of 2 years from the date of order of main equipment.

9.3 The statutory variation in Basic Custom Duty (BCD) & Social Welfare Surcharge (SWS) shall be upto 2/3rd of Contractual delivery/ completion period.

10 PRICE REDUCTION SCHEDULE (PRS)

Provisions of Delayed Delivery as per Clause No. 10.0 of GPC-Indigenous stands modified to the following extent:

10.1 **FOR BULK ITEMS:** As per GPC-Indigenous Clause No. 10.1 a) .

10.2 **FOR ITEMS OTHER THAN BULK ITEMS (WITH OR WITHOUT SITE WORK):** As per GPC-Indigenous Clause No. 10.1 b).

Also refer Bid Data Sheet (BDS) for applicability of provisions of 10.1 or 10.2 of SPC.

10.3 Wherever the supply period and site work are indicated as two separate periods and notice of site readiness is required for site work, intervening period, if any, shall be excluded, while calculating the price reduction for delay. However, in cases where site work is also involved and overall supply plus site work period is indicated, the PRS shall be applicable on total value of supply plus site work whether supply is delayed or site work is delayed.

10.4 Price reduction shall be effected in the Invoice value before presenting for payment. The Purchaser reserves the right to cancel the Purchase Order for any delay exceeding the period of maximum reduction and the Seller shall be liable for all consequences thereof.

10.5 For the purpose of application of Price Reduction Schedule (refer para. 10.1 & 10.2 above), a delay for a period less than one week shall be considered as delay for the full week.

10.6 Further, total order value shall mean supply price (FOT dispatch point price for Indian Suppliers) plus site work (wherever applicable), including any amendments/ change order, excluding GST, transportation, training, AMC and supervision services.

11 INSPECTION

Inspection as per the MR/ PR requirement shall be carried out by the TPI Agency, to be appointed by supplier, out of the below TPIA list and charges of the same shall be borne by supplier. Accordingly, bidder shall include the charges of TPI in their quoted price.

i) TÜV SÜD South Asia, Mumbai
ii) DNV GL. AS, Mumbai
iii) Certification Engineers International Ltd., Mumbai
iv) VCS Quality Services Pvt Ltd, Mumbai
v) Bureau Veritas (India) Pvt Ltd, Mumbai
vi) IRCLASS Systems & Solutions Pvt Ltd, Mumbai
vii) ABS Industrial Verification (India) Pvt Ltd, Mumbai
viii) International Certification Services Pvt Ltd, Mumbai
ix) SGS India Pvt Ltd, Gurgaon
x) TUV India Pvt.Ltd., Pune

12 COMPREHENSIVE MARINE-CUM-ERECTION INSURANCE

List of Policies to be taken by EIL:

a) Contractor's All Risk Insurance
b) Cargo Transit Insurance.
c) Third Party Liability Insurance.

Insurance Policy attached as **Annexure-XII** to SCC

Therefore, Vendor/ Manufacturer shall not carry any insurance which would duplicate any insurances provided by EL/MIL and the such insurance policies shall not be included in the quoted prices. However, any other insurance policies required to be obtained by the Vendor shall be arranged by the Vendor at their own cost.

13 BASIS OF EVALUATION

13.1 WHERE ONLY INDIAN BIDS ARE UNDER COMPARISON:

SR. No.	TERMS AS PER RFQ	LOADING FACTOR
1.	FOT Site price (FOT Dispatch Point Price, Cost of mandatory spares identified in the Material Requisition, commissioning Spares and special tools & tackles, Road Freight including GST on Supply & Freight but excluding costs of Spares for two years operation & maintenance)	As quoted by the bidder
2.	Price for Site Work/ Supervision/ Training/ 3-D Modelling/ Hazop Study/ AMC (if applicable)	
	a) Site work (as per MR) including GST and all other taxes and duties	As quoted by the bidder
	b) Supervision of Erection, Testing, Commissioning, as applicable (**for no. of days to be considered for evaluation as per Enquiry Document**) (including GST and all other taxes and duties)	As quoted by the bidder
	c) Training (as per MR) **(for no. of days to be considered/ Lump sum for evaluation as per Enquiry Document)** (including GST and all other taxes and duties)	As quoted by the bidder

SR. No.	TERMS AS PER RFQ	LOADING FACTOR
	d) 3-D Modelling/ Hazop Study/ AMC including GST and all taxes & duties.	As quoted by the bidder
3.	**Total Site Work/Supervision/Training/3-D Modeling/ Hazop Study/ AMC Price including GST**	**SUM OF SR. NOS. 2 a) +2 b)+ 2 c)+ 2 d)**
4.	**Total Landed cost at site**	**SUM OF SR. NOS. (1+3)**
5.	Less Input Tax Credit: 100% of GST (as quoted for Supply including Cost of mandatory spares, Freight, Site work, supervision, Training, 3-D Modelling, Hazop Study, AMC Price- as applicable)	As applicable
6.	**Total Evaluated Price considering Input Tax Credit**	**SR. NO. 4 MINUS (-) SR. NO. 5**

Important instruction on Input Tax Credit (ITC):

Bidder are hereby instructed that relevant details/ documents pertaining to GST registration shall be updated / uploaded in the designated field on GeM portal, failing which, evaluation shall be carried out as per functionality / methodology of GeM Portal and same shall be final and binding on the Bidder.

14 LOADING/REJECTION CRITERIA

14.1 No loading criteria will be applicable for deviation to commercial terms & conditions of RFQ.

14.2 Bids are invited on Zero Deviation bidding basis. Deviation to terms & conditions of RFQ shall lead to rejection of offer.

15 INVOICING INSTRUCTIONS

15.1 Invoicing instructions shall be provided later along with the Order.

16 PART ORDER

16.1 Bidder hereby agrees to accept part order at Purchasers option without any limitation whatsoever.

16.2 **For GeM Bidding:** Bidders shall not impose any part order condition/minimum order conditions as GeM portal will not take the same into consideration while evaluating priced bids. In case, bidder stipulates any part order condition/minimum order conditions in their bid, their offer shall not be considered for further evaluation, in case bidder refuses to withdraw such stipulations.

16.3 Bidder hereby agrees that items may be split (wherever applicable) to meet the Public Procurement Policy, 2012 for MSEs (Micro & Small Enterprise) or Public Procurement (Preference to Make in India) (PPP-MII), issued by Govt. of India.

17 REPEAT ORDER

17.1 The purchase reserves the right to place Repeat Order (RO) for additional 50% value of the original order with quantities of each ordered item not exceeding 100% of the ordered quantities within final delivery date (or extended delivery date for reasons not attributable to supplier) or 1 year from the date of placement of order whichever is higher.

17.2 Further, repeat order beyond 50% can be placed under the following conditions:

- In case of POs with 1 line item with quantity 1 no., RO value can be 100% value of PO.
- In multiple items PO cases, RO value beyond 50% shall be allowed due to rounding off RO quantities of one line item to the next whole number.

  (Illustration: - a PO with 1 item and 7 nos. quantity, RO can be placed for 4 nos. with RO value allowed more than 50% or PO with multiple line items, RO can be placed for each line item upto 100% quantities subject to 50% total value of PO and any additional value

due to rounding off of quantity of one item to next whole number.

17.3 **Non-Acceptance of Repeat Order conditions by bidder shall not be the reason for rejection of bid.**

18 ARBITRATION

18.1 Clause No. 31.0 (Arbitration) of GPC (Indigenous) stands replaced with **Annexure-VIII (Model Dispute Resolution)** and **Annexure-IX (EIL Conciliation Rules)** of SPC.

18.2 **EIL Conciliation Rules 2012**: Engineers India Limited has framed the EIL Conciliation Rules 2012 in conformity with Part – III of the Indian Arbitration and Conciliation Act 1996 for speedier, cost effective and amicable settlement of disputes through conciliation. A copy of the said rules has been made available on EIL's web site www.engineersindia.com for reference.

19 SETTLEMENT OF DISPUTE BETWEEN GOVT. DEPT. / PUBLIC SECTOR UNDERTAKING

19.1 Cl. 11 of Annexure-VIII (Model Dispute Resolution) stands replaced with the following:

"*Sub-clauses 2 to 9 of this clause shall not be applicable in contracts where both the parties to the contract come under purview of AMRCD/AMRD mechanism.*

If the Seller is a CPSU or CPSE or is a Govt. Department, any disputes or differences between the seller and EIL hereto arising out of any notified claim of the Seller in terms hereof and/or arising out of any amount claimed by EIL (whether or not the amount claimed by EIL or any part thereof shall have been deducted from the final bill of the Contractor or any amount paid by EIL to the Contractor in respect of the work), then in suppression of the provisions of clause no. 18.1 above, the following provisions shall apply,

In the event of any dispute or difference relating to the interpretation and application of the provisions of commercial contract(s) between Central Public Sector Enterprises (CPSEs)/ Port Trusts inter se and also between CPSE(s) and Government Department(s)/ Organization(s) (excluding disputes relating to Railways, Income Tax, Customs & Excise Departments), such dispute or difference shall be taken up by either party for resolution through Administrative Mechanism for Resolution of CPSEs Disputes (AMRCD) only as mentioned in DPE OM no. 05/0003/2019-FTS-10937, dated 14.12.2022 and the decision of AMRCD on the said dispute will be binding on both the parties.

Further, vide DPE OM no. DPE-05/0002/2023-AMRCD, dated 25.07.2024, it is clarified that the interpretation and application of the provisions of commercial contract(s) in case of dispute/s between the following Organizations/ Departments shall be taken up under AMRCD only:

i. CPSE and CPSE;
ii. CPSE and Ministry / Department of Central Government;
iii. CPSE and Public Authority/ Organization or University under the Central Government;
iv. CPSE and State Governments/State PSUs/· Public authority/ Organization or University under any State Government."

19.2 Notwithstanding the existence of any dispute or arbitration in terms hereof or otherwise, the Supplier shall continue and be bound to continue and perform the Works to completion in all respects according to the Contract (unless the Contract or Works be determined by EIL) and the Supplier shall remain liable and bound in all respects under the Contract.

20 TERMINATION

20.1 The methodology for processing Termination for default shall be as specified below. Other terms and conditions shall be as per GPC Clause 18.1 of GPC (Indigenous) for Indian bidders:

20.1.1 Any material breach in contractual obligations shall be dealt on mutual discussion basis, so as to correct breach. In case of failure to correct the breach, EIL/ Owner shall initiate Termination action as per the contract.

20.1.2 In case of non-submission of CPBG within one month beyond the period stipulated for it, coupled with non-mobilization / non-performance within the period stipulated for the same, the Termination

action along with other contractual penal provisions shall be initiated, as per the contract provisions.

20.1.3 Further, in case of submission of CBPG within scheduled period, but Supplier being at default in terms of Contract, 20.1.1 above shall be applicable.

20.1.4 In case of occurrence of any of the above specified events, Supplier shall be understood to have defaulted and the EIL/ Owner shall have the right to terminate the contract, at its sole and absolute discretion by issuing a Show Cause notice of 15 calendar days to the Supplier, stating the reason and the intention of EIL/ Owner to terminate the Contract and to take other penal actions in terms of the contract including extant policy for Suspension/ Banning of EIL/ Owner.

20.1.5 The Supplier may also request for a personal hearing.

20.1.6 EIL/ Owner based on the Supplier's response to the Show Cause Notice and the personal hearing, shall decide the action regarding Termination and/ or Suspension / Banning or otherwise.

20.1.7 The decision taken as above shall apply to both Termination as well as Suspension / Banning.

20.2 In case Purchase order awarded for the tendered item have to be terminated due to supplier's default and a separate enquiry have to be floated to get the remaining/ complete work executed, such defaulting supplier will not be considered for enquiries issued for the refloated works of same project.

21 REQUIREMENT OF EMPLOYMENT VISA FOR FOREIGN NATIONALS COMING TO INDIA FOR EXECUTION OF PROJECTS:

21.1 All Foreign nationals coming to India for execution of Projects / Contracts will have to apply for Employment Visa only and that grant of Employment visa would be subject to strict adherence of following norms:

21.1.1 Employment visa is granted only for the skilled and qualified professionals or to a person who is being engaged or appointed by a Company, Organization, Industry or Undertaking etc. in India on contract or employment basis at a senior level, skilled position such as technical expert, senior executive or in managerial position etc.

21.1.2 Request for employment visa for Jobs for which large number of qualified Indians are available, is not considered.

21.1.3 Under no circumstances an Employment visa is granted for routine, ordinary secretarial / clerical jobs.

21.2 Bidders are advised in their own interest to check latest Visa rules from Indian Embassy/ High Commission in their country in case foreign nationals are required to be deputed to India during execution of contract.

22 FRAUDULENT PRACTICES

22.1 The Owner requires that Sellers/ Vendors/ Sub-Contractors observe the highest standard of ethics during the award/ execution of Contract. "Fraudulent Practice" means a misrepresentation of facts in order to influence the award of a Contract to the detriment of the Owner, and includes collusive practice among Sellers (prior to or after bid submission) designed to establish bid prices at artificial non-competitive levels and to deprive the owner of the benefits of free and open competition.

22.2 The owner will reject a proposal for award if it determines that the Seller recommended for award has engaged in fraudulent practices in competing for the Contract in question.

22.3 Seller is required to furnish the complete and correct information/ documents required for evaluation of their bids. If the information/ documents forming basis of evaluation is found to be false/ forged, the same shall be considered adequate ground for rejection of bids and forfeiture of Earnest Money Deposit.

22.4 In case, the information/ document furnished by the Seller/ Vendor/ Sub-Contractor forming basis of evaluation of his bid is found to be false/ forged after the award of the contract, Owner shall have full right to terminate the contract and get the remaining job executed at the risk & cost of such Seller/ Vendor/ Sub-Contractor without any prejudice to other rights available to Owner under the contract such as forfeiture of CPBG / Security Deposit, withholding of payment etc.

22.5 In case, this issue of submission of false documents comes to the notice after execution of work, Owner shall have full right to forfeit any amount due to the Seller/ Vendor/ Sub-Contractor along with forfeiture of **CPBG** / Security Deposit furnished by the Seller/vendor/ Sub-Contractor.

22.6 Further, such Seller/ vendor/ Sub-Contractor shall be put on Suspension / Banning / Debarment list of EIL/ Owner debarring them from future business with Owner for a time period, as per the prevailing policy in EIL/Owner.

23 DISPATCH NUMBER

23.1 In addition to the details furnished in the invoice, supplier shall generate DISPATCH NUMBER (DN) against each invoice. The DN shall be 3 digit continuous number starting from 001 suffixed to purchase Order Number and shall be unique to each invoice. Same shall also be printed on each consignment / box for easy co-relation. DN shall be quoted in all further communications viz dispatch detail to inspection, correspondence with site as well as for payment purpose. Mentioning the DN on each invoice shall be mandatory."

24 TERMS & CONDITIONS FOR SUPERVISION OF ERECTION, TESTING & COMMISSIONING / TRAINING AT SITE

24.1 Terms & conditions for supervision of erection, testing & commissioning / training at site shall be as per attached Annexure-III to SPC.

25 TERMS & CONDITIONS FOR INSTALLATION/ SITE WORK

25.1 Terms & conditions for installation/ site work shall be as per attached Annexure-IV to SPC.

26 TERMS & CONDITIONS FOR ANNUAL MAINTENANCE CONTRACT (AMC)

26.1 Terms & conditions for Annual Maintenance Contract (AMC) shall be as per attached Annexure-V to SPC.

27 TERMS & CONDITIONS FOR TRAINING OF OWNER PERSONNEL AS PER MR AT VENDOR'S WORKS/ TRAINING FACILITY

27.1 Terms & conditions for training of owner personnel as per MR at vendor's works/ training facility shall be as per attached Annexure-VI to SPC.

28 CANCELLATION _Deleted

29 CONFIDENTIALITY OF BIDDING DOCUMENT

29.1 Bidding Document is and shall remain the exclusive property of EIL/ Owner without any right to Bidder to use them for any purpose except for the purpose of Bidding.

29.2 On no account will any agency to whom Bidding Documents is issued, part with possession thereof or copy or take copies or tracings of any drawing, plan etc. It should be understood that the information therein is confidential, and that the Bidding Documents are therefore being issued to bidders in the strictest confidence.

30 VULNERABILITY ATLAS OF INDIA

Provisions for Vulnerability Atlas of India (VAI) shall be as per shall be as per attached **Annexure-XIII to SPC**.

31 LIEN

Seller shall ensure that the Scope of Supply supplied under the Agreement shall be free from any claims of title/liens from any third party. In the event of such claims by any party, Seller shall at his own cost defend, indemnify and hold harmless Purchaser or its authorised representative from such disputes of title/liens, costs, consequences etc.

ANNEXURE –I
TO
SPECIAL PURCHASE CONDITIONS

STANDARD PAYMENT TERMS

A.	**FOR INDIGENOUS SUPPLIERS:**
1.	
1.1.	**Where the MR is for supply of materials and there is no Vendor Data Requirement (VDR) specified in the MR like Fasteners, Valves, Pipes, Fittings, Gasket etc:** 1. 15% against identification of raw materials at Supplier's works and against submission of ABG of equivalent amount. 2. 65% against dispatch documents (along with copy of LR/GR and IRN) directly to EIL together with full taxes, duties and transportation charges. 3. 10% against receipt and acceptance of material at site 4. 10% against receipt and acceptance of all material at site.
1.2	**Where the MR is for supply of materials and calls for Vendor Data requirement (without site work), excep– item included in 1.4 & 1.5 - like Sample cooler, Strainer, Cable, Control valve etc.:** 1. 02% against approval of drawings, wherever required (identified in PO/ PR/ Kick off Meeting / post order) at least in Code-2 / Code R and against submission of ABG of equivalent amount. 2. 03% against approval of drawings in Code-1 and against submission of ABG of equivalent amount. 3. 10% against placement of sub-orders to sub-vendors for Major raw material and submission of ABG of equivalent amount 4. 15% against receipt and identification of major specified raw materials at Supplier's works and against submission of ABG of equivalent amount 5. 45% (50% where drawing/doc approval not required) against dispatch documents along with copy of LR, IRN and packing list, Invoice with full taxes, duties and transportation charges. 6. 10% against receipt and acceptance of material at site 7. 05% on receipt of all Final/As built Drawings/ Documents/ Data/ Manual in requisite number duly certified by Inspection agency as per VDR specified in Purchase Requisition and uploading the same in EIL-portal. 8. 10% on receipt of all material & acceptance of all materials at site.
1.3	**Where the MR is for supply of materials and calls for Vendor Data requirement (With site work), except– item included in 1.4 & 1.5 - like trays and tower internals, Weighing scale etc** 1. 02% against approval of drawings, wherever required (identified in PO/ PR/ Kick off Meeting / post order) at least in Code-2 / Code R and against submission of ABG of equivalent amount. 2. 03% against approval of drawings in Code-1 and against submission of ABG of equivalent amount. 3. 10% against placement of sub-orders to sub-vendors for Major raw material and submission of ABG of equivalent amount

	4. 10% against receipt and identification of major specified raw materials at Supplier's works and against submission of ABG of equivalent amount. 5. 50% (55% where drawing/doc approval not required) against dispatch documents (Copy of LR, IRN and packing list, Invoice) with full taxes duties and transportation charges 6. 10% against receipt and acceptance of material at site 7. 05% on receipt of all Final/As built Drawings/ Documents/ Data/ Manual in requisite number duly certified by Inspection agency as per VDR specified in Purchase Requisition and uploading the same in EIL-portal. 8. 10% on completion of Site Work. **Note: Above payment terms (Sl. no. 1 to 8) is for supply value.** In case site front is not available up to 6 (Six) months (wherever site work is applicable), after receipt of all supplies at site, the payment against the site work (Sl. No. 8) shall be released on submission of additional Bank Guarantee of equivalent amount valid for 1 (One) year or such extended period as may be required. **For Site Work**: a. 90% against monthly progressive bills (based on agreed billing schedule) duly certified by Engineer-in-charge. b. 10% on successful completion of site work and handing over of goods/equipment at site.
1.4	**Where the MR is for fabricated equipment like Columns/Pressure vessels/Reactors/Heat Exchangers/Air Fin Cooler and rotary equipment like /Pumps/Compressors/Extruder/EOT Crane (with significant Bought out item) and calls for Vendor Data requirement (Without site work):** 1. 02% against approval of drawings, wherever required (identified in PO/ PR/ Kick off Meeting / post order) at least in Code-2 / Code R and against submission of ABG of equivalent amount. 2. 03% against approval of drawings in Code-1 and against submission of ABG of equivalent amount. 3. 01% against receipt of foundation Template for Column, Reactors, Coke Drums, Reactor & Regenerator (R&R) and vessels as applicable and foundation Bolt for Coke Drums, Reactors, Vessels / Columns, Reactor & Regenerator (R&R), Compressor, Extruder etc. (as applicable) 4. 10% against placement of sub-order for specified major raw material (identified during kick off meeting, if not specified in enquiry) and against submission of ABG of equivalent amount. 5. 19% (20% if foundation template, foundation bolt not required) against receipt and identification of major specified raw materials at Supplier's works and against submission of ABG of equivalent amount. **6.A: 45% Payment for fabricated equipment like Columns/ Pressure vessels/ Reactors/ Heat Exchangers/ Air Fin Cooler and rotary equipment like / Pumps/ Compressors/ Extruder etc.**

6.A.1.a1 05 % of the total PO value

i. For fabricated equipment like Reactor & Regenerator/ Columns/ Pressure vessels/ Reactors against Receipt and satisfactory final inspection of all dished ends at shop and against submission of ABG of equivalent amount.

ii. For Heat exchangers and Air fin coolers against receipt and satisfactory final inspection of Tube sheet after drilling / Header boxes before PWHT respectively and against submission of ABG of equivalent amount.

6.A.1.a2 10% of the total PO value

i. For fabricated equipment like Reactor & Regenerator/Coke Drums/Columns/Pressure vessels/ Reactors against satisfactory completion of all long seam and circ seam welding and NDE before PWHT except closing circ. seam weld joint and against submission of ABG of equivalent amount.

ii. For Heat exchangers and Air fin coolers on satisfactory Inspection of Tube bundle after Tube to Tube plate welding / Expansion and against submission of ABG of equivalent amount.

OR

6.A.1.b 15% of the total PO value

For Pumps/ Compressors / Extruder against receipt of main drivers (For Extruder main drivers are drivers for Extruder and palletizer) and VFD (as applicable) at vendor's works and against submission of ABG of equivalent amount.

6.A.2 30% against dispatch documents (Copy of LR, IRN and packing list, Invoice) with full taxes duties and transportation charges for fabricated equipment like Columns/Pressure vessels/ Reactors/ Heat Exchangers, Air Fin Cooler, Pump, Compressor and Extruder.

OR

6.B. 45 % Payment for EOT Crane

Against dispatch documents for EOT Crane along with copy of LR, IRN and packing list Invoice with full taxes, duties and transportation charges.

7. 5% against receipt and acceptance of material at site

8. 05% on receipt of all Final/As built Drawings/ Documents/ Data/ Manual in requisite number duly certified by Inspection agency as per VDR specified in Purchase Requisition and uploading the same in EIL-portal.

9. 10% on receipt of all material & acceptance of all materials at site.

Major Raw Material for payment against placement of orders:

Columns/Vessels/Reactors/ Coke Drums / Reactor & Regenerator	:	Plates & Forgings

	Heat Exchangers	:	Plates, Tube, Tube sheets and SRN forgings (as applicable)
	Pumps	:	Castings for casings, impellers , drivers and VFD (as applicable)
	Centrifugal Compressors	:	Castings for casings, impellers, forgings for rotors and main drivers and VFD (as applicable)
	Reciprocating Compressors	:	Crank case, Cylinder, Piston, Piston Rods, Main Drivers and VFD (as applicable)
	Extruder:	:	Screw, Main cylinder, Die plate and Main driver for extruder and Palletizer and VFD including Transformer (as applicable)
	Air Fin Coolers	:	Tubes, Header Plates, Fin Material, Motor and VFD (as applicable)
	EOT Crane	:	Main motors, Wire rope, Hooks, Brake and limit switches & Gear Boxes.

Major Raw Material for payment against receipt & identification of raw materials:

Columns/Vessels/Reactors/ Coke Drums/Reactor & Regenerator	:	Plates & Forgings
Heat Exchangers	:	Plates, Tube, Tube sheets and SRN forgings (as applicable)
Pumps	:	Castings for casings, impellers
Centrifugal Compressors	:	Castings for casings, impellor, forgings for rotors
Reciprocating Compressors	:	Crank case, Cylinder, Piston, Piston Rods
Extruder	:	Screw, Main cylinder, Die Plate
Air Fin Coolers	:	Tubes, Header Plates, Fin Material
EOT Crane	:	Main motors, Wire rope, Hooks, Brake and limit switches & Gear Boxes.

1.4 (a)	**Where the MR is for Packages like Nitrogen package, Conveyor package, Bagging package, HVAC, PSA Hydrogen (with significant Bought out item) and calls for Vendor Data requirement**

	(Without site work): **1. Drawing Approval** a. 02% against approval of specific drawings (identified in PO/PR) like interface Drawings, P&ID, Foundation loading plan of pipe rack/equipment wherever required, dimensional Equipment layout at least in Code-2 / Code R and against submission of ABG of equivalent amount. b. 03% against approval of drawings, wherever required (identified in PO/ PR or during KOM if not specified) at least in Code-2 / Code R, 90 % (stage) 3D model and against submission of ABG of equivalent amount. 2. 01% against receipt of foundation Template and foundation Bolt as applicable for equipment and items as per package requirements. 3. 10% against placement of sub-order for specified major raw material (to be specified in MR identified during kick off meeting, if not specified in enquiry) and against submission of ABG of equivalent amount. 4. 19% (20% if foundation template, foundation bolt not required) against receipt and identification of major specified items (to be specified in MR identified during kick off meeting, if not specified in enquiry) at Supplier's works and against submission of ABG of equivalent amount. 5. 45% against dispatch documents (Copy of LR, IRN and packing) list, Invoice) with full taxes duties and transportation charges and Master packing list (as part of the Inspection Certificate cum release note), Invoice with full taxes, duties and transportation charges. Master packing list is to be submitted by the package vendor in EIL -portal in information category. (a) Incase control system is part of Package vendor's scope, Modbus mapping details shall be submitted by the package vendor in EIL-portal for information categ'ry. (b) If package vendor's control and logic needs to be executed in main control system, final P&ID, Cable schedule, point data base & logic diagram shall be submitted in EIL -portal. 6. 5% against receipt and acceptance of material at site 7. 05% on receipt of all Final/ As built Drawings/ Documents/ Data/Manual in requisite number duly certified by Inspection agency as per VDR specified in Purchase Requisition and uploading the same in EIL -portal. 8. 10% on receipt, acceptance and reconciliation of all materials at site and issue of Certificate of verification of all materials in good condition.
1.5	**Where the MR is for fabricated equipment like Columns/Pressure vessels/Reactors/Heat Exchangers/ Air Fin Cooler and rotary equipment like Pumps/ Compressors/ Extruder/EOT Crane (with significant Bought out item) and calls for Vendor Data requirement (With site work):** 1. 02% against approval of drawings, wherever required (identified in PO/ PR/ Kick off Meeting / post order) at least in Code-2 / Code R and against submission of ABG of equivalent amount. 2. 03% against approval of drawings in Code-1 and against submission of ABG of equivalent

amount.

3. 01% against receipt of foundation Template for Column, Reactors, Coke Drums, Reactor & Regenerator (R&R) and vessels as applicable and foundation Bolt for Coke Drums, Reactor & Regenerator (R&R), Compressor, Extruder.

4. 10% against placement of sub-order for specified major raw material (identified during kick off meeting, if not specified in enquiry) and against submission of ABG of equivalent amount.

5. 19% (20% if foundation template, foundation bolt not required) against receipt and identification of major specified raw materials at Supplier's works and against submission of ABG of equivalent amount.

6.A: 45% Payment for fabricated equipment like Columns/ Pressure vessels/ Reactors/ Heat Exchangers/ Air Fin Cooler and rotary equipment like / Pumps/ Compressors/ Extruder etc.

6.A.1.a1 05 % of the total PO value

i. For fabricated equipment like Reactor & Regenerator/ Columns/ Pressure vessels/Reactors against Receipt and satisfactory final inspection of all dished ends at shop and against submission of ABG of equivalent amount.

ii. For Heat exchangers and Air fin coolers against receipt and satisfactory final inspection of Tube sheet after drilling / Header boxes before PWHT respectively and against submission of ABG of equivalent amount.

6.A.1.a2 10% of the total PO value

i For fabricated equipment like Reactor & Regenerator/Coke Drums/ Columns/Pressure vessels/Reactors against satisfactory completion of all long seam and circ. seam welding and NDE before PWHT except closing circ. Seam weld joint and against submission of ABG of equivalent amount.

ii. For Heat exchangers and Air fin coolers on satisfactory Inspection of Tube bundle after Tube to Tube plate welding/Expansion and against submission of ABG of equivalent amount.

OR

6.A.1.b 15% of the total PO value For Pumps/ Compressors/ Extruder against receipt of main drivers (For Extruder main drivers are drivers for Extruder and palletizer) and VFD(as applicable) and against submission of ABG of equivalent amount.

6.A.2 30% against dispatch documents (Copy of LR, IRN and packing list, Invoice) with full taxes duties and transportation charges for fabricated equipment like Columns/Pressure vessels/Reactors/Heat Exchangers, Air Fin Cooler, Pump, Compressor and Extruder..

OR

6.B 45% Payment for EOT Crane

Against dispatch documents (Copy of LR, IRN and packing list, Invoice) with full taxes duties and transportation charges for EOT Crane.

7 5% against receipt and acceptance of material at site

8 05% on receipt of all Final/As built Drawings/Documents /Data /Manual in requisite number duly certified by Inspection agency as per VDR specified in Purchase Requisition and uploading the same in EIL -portal

9. 10% on completion of Site Work.

Major Raw Material for payment against placement of orders:

Columns/Vessels/Reactors/ Coke Drums/ Reactor & Regenerator	:	Plates & Forgings
Heat Exchangers	:	Plates, Tube, Tube sheets and SRN forgings (as applicable)
Pumps	:	Castings for casings, impellers , drivers and VFD (as applicable)
Centrifugal Compressors	:	Castings for casings, impellers, forgings for rotors and main drivers and VFD (as applicable)
Reciprocating Compressors	:	Crank case, Cylinder, Piston, Piston Rods, Main Drivers and VFD(as applicable)
Extruder:	:	Screw, Main cylinder, Die plate and Main driver for extruder and Palletizer and VFD including Transformer (as applicable)
Air Fin Coolers	:	Tubes, Header Plates, Fin Material, Motor and VFD (as applicable)
EOT Crane	:	Main motors, Wire rope, Hooks, Brake and limit switches & Gear Boxes.

Major Raw Material for payment against receipt & identification of raw materials:

Columns/Vessels/Reactors/ Coke Drums/ Reactor & Regenerator	:	Plates & Forgings
Heat Exchangers	:	Plates, Tube, Tube sheets and SRN forgings (as applicable)
Pumps	:	Castings for casings, impellers

	Centrifugal Compressors	:	Castings for casings, Impellor, forgings for rotors
	Reciprocating Compressors	:	Crank case, Cylinder, Piston, Piston Rods
	Extruder	:	Screw, Main cylinder, Die Plate
	Air Fin Coolers	:	Tubes, Header Plates, Fin Material
	EOT Crane	:	Main motors, Wire rope, Hooks, Brake and limit swit Gear Boxes.

1.5 (a) **Where the MR is for Packages like Nitrogen package, Conveyor package, Bagging package, HVAC, PSA Hydrogen (with significant Bought out item) and calls for Vendor Data requirement (With site work):**

1. **Drawing Approval**
   a. 02% against approval of specific drawings (identified in PO/PR) like interface Drawings, P&ID, Foundation loading plan of pipe rack/equipment wherever required, dimensional Equipment layout (identified in PO/ PR or during KOM if not specified) at least in Code-2 / Code R and against submission of ABG of equivalent amount.
   b. 03% against approval of balance drawings, wherever required (identified in PO/ PR or during KOM if not specified) and at least in Code-2 / Code R, 90 % (stage) 3D model and against submission of ABG of equivalent amount
2. 10% against placement of sub-order for specified major raw material ((to be specified in MR or to be identified during kick off meeting, if not specified in enquiry) and against submission of ABG of equivalent amount.
3. 20% against receipt and identification of major specified raw materials (to be specified in MR or to be identified during kick off meeting, if not specified in enquiry) at Supplier's works and against submission of ABG of equivalent amount.
4. 45% against dispatch documents (Copy of LR, IRN and packing list, Invoice) with full taxes duties and transportation charges and Master packing list (as part of the Inspection Certificate cum release note). Master packing list is to be submitted by the package vendor in EIL -portal in information category.

   (a) Incase control system is part of Package vendor's scope, Modbus mapping details shall be submitted by the package vendor in EIL-portal for information cat'gory.

   (b) If package vendor's control and logic needs to be executed in main control system, final P&ID, Cable schedule, point data base & logic diagram shall be submitted in EIL -portal.
5. 05% on receipt, acceptance and reconciliation of all materials at site and issue of Certificate of verification of all materials in good condition.
6. 05% on receipt of all Final/As built Drawings/Documents/ Data/ Manual in requisite

	number duly certified by Inspection agency as per VDR specified in Purchase Requisition and uploading the same in EIL-portal. 7. 10% upon completion of site work and successful performance guarantee test run. **Note : Above payment terms (Sl. no. 1 to 7) is for supply value.** In case site front is not available up to 6 (Six) months (wherever site work is applicable), after receipt of all supplies at site, the payment against the site work (Sl. No. 7) shall be released on submission of additional Bank Guarantee of equivalent amount valid for 1 (One) year or such extended period as may be required. **For Site Work**: a) 90% against monthly progressive bills (based on agreed billing schedule) duly certified by Engineer in-charge. b) 10% on successful completion of site work and handing over of goods/equipment at site.
1.6	**Mobile Water cum foam tenders (Truck loaded)** **For Chassis:** (Supplier shall furnish the sub order copy on the chasis manufacturer and furnish confirmation regarding direct payment to chasis manufacturer against chasis value out of total quoted value of complete package). 1. 10% of sub-order value to chasis manufacturer directly against placement of sub-order for chasis against submission of equivalent Bank Guarantee having validity up to dispatch of chasis from chasis manufacturer's works. 2. 90% of sub-order value shall be made to the chasis manufacturer against commercial invoice to Supplier (against dispatch readiness), duly endorsed by Supplier and against submission of following: a) Ownership of chasis shall be in the name of EIL/Client by sub-vendor along with Insurance policy with the Client as beneficiary to cover all risks during transit and storage at main vendor works. b) In addition Supplier to confirm that they shall assist Owner in final and firm registration of duly built up vehicle at project site. c) No other charges shall be payable on any account w.r.t chassis including transportation of chassis, insurance from Chasis Supplier works to Supplier works etc. d) Supplier to carry out the works in their work shop/ Works which shall be insured including work in progress materials in the shop. Supplier shall furnish all such necessary documents to this effect enabling Owner to release payment to Chasis Supplier. **For Fabrication works at Vendor shop (Total quoted price of package excluding price of chassis as per Work order on chasis vendor):** 1. 02% against approval of drawings, wherever required (identified in PO/ PR/ Kick off Meeting / post order) at least in Code-2 / Code R and against submission of ABG of equivalent amount. 2. 03% against approval of drawings in Code-1 and against submission of ABG of equivalent

	amount. 3. 10% against receipt and identification of major specified items at Supplier's works (Pumps and Power Take off unit) and against submission of ABG of equivalent amount. 4. 70% against dispatch documents (Copy of LR, IRN and packing list, Invoice) with full taxes duties and transportation charges 5. 05% on receipt of all Final/As built Drawings/Documents/ Data/ Manual in requisite number of TPIA certified copies/sets/ VDR specified in Purchase Requisition and uploading the same in EIL-portal. 6. 10 % on receipt of all material & acceptance of all materials at site.
2.	**For supply of Mandatory Spares** (wherever price of mandatory spares obtained separately) 1. 90% against receipt of material at site (after receipt of main equipment at site) along with copy of LR, IRN and packing list, Invoice with full taxes, duties and transportation charges. 2. 10 % on receipt of all material & acceptance of all materials at site.
3.	**Site Work**: 1. 90% against monthly progressive bills (based on agreed billing schedule) duly certified by Engineer-in-charge. 2. 10% on successful completion of site work and handing over of goods/equipment at site.
4.	**Any services on per diem basis like: Supervision of Erection, Testing & Commissioning/ assistance during erection, Testing & Commissioning / Training at site / Supplier's works on per diem basis.** • 100% prorate against monthly bills to be submitted by Supplier duly certified by Engineer-in-Charge.
5.	**Training (lumpsum)/ Applicable for all items wherever lumpsum rates are sought such as 3D MODELLING etc.** • 100 % on successful completion of Training duly certified by EIL/OWNER, as per Purchase Requisition.
6.	**Annual Maintenance Contract (AMC):** • 100% payment shall be paid at the end of each quarter against quarterly progressive bills to be submitted by Supplier duly certified by authorized representative of Owner.
B.	**FOR FOREIGN SUPPLIERS**
1.	
1.1.	**Where the MR is for supply of materials and there is no Vendor Data Requirement (VDR) specified in the MR like Fasteners, Valves, pipes, fittings, gasket etc** 1. 15% thru wire transfer against identification of raw materials at Supplier's works and against submission of ABG of equivalent amount. 2. 85% of PO value along with full Ocean freight (in case of CFR delivery basis) against

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	shipping documents through irrevocable Letter of Credit/ wire transfer.
1.2.	**Where the MR is for supply of materials and calls for Vendor Data requirement (without site work), excep– item included in 1.4 & 1.5 - like Sample cooler, Strainer, Cable, Control valve etc:** 1. 02% against approval of drawings, wherever required (identified in PO/ PR/ Kick off Meeting / post order) at least in Code-2 / Code R and against submission of ABG of equivalent amount. 2. 03% against approval of drawings in Code-1 and against submission of ABG of equivalent amount. 3. 10% thru wire transfer against placement of sub-orders to subvendors for Major raw material and submission of BG of equivalent amount 4. 15% thru wire transfer against receipt and identification of major specified raw materials at Supplier's works and against submission of ABG of equivalent amount. 5. 65% (70% in cases where drawing approval is not required) of PO value along with full Ocean freight (in case of CFR delivery basis) against shipping documents through irrevocable Letter of Credit/wire transfer. 6. 05% thru wire transfer on receipt of all Inspection agency certified Final/As built Drawings/Documents/Data/Manual in requisite number of copies/sets/ VDR specified in Purchase Requisition and uploading the same in EIL-portal.
1.3.	**Where the MR is for supply of materials and calls for vendor Data requirement (with site work), excep– item included in 1.4 & 1.5 - like trays and tower internals, weighing scale etc** 1. 02% against approval of drawings, wherever required (identified in PO/ PR/ Kick off Meeting / post order) at least in Code-2 / Code R and against submission of ABG of equivalent amount. 2. 03% against approval of drawings in Code-1 and against submission of ABG of equivalent amount. 10% thru wire transfer against placement of sub-orders to subvendors for Major raw material and submission of BG of equivalent amount 3. 15% thru wire transfer against receipt and identification of major specified raw materials at Supplier's works and against submission of ABG of equivalent amount. 4. 55% (60% in cases where drawing approval is not required) of PO value along with full Ocean freight (in case of CFR delivery basis) against shipping documents through irrevocable Letter of Credit/wire transfer. 5. 05% thru wire transfer on receipt of all Inspection agency certified Final/As built Drawings/Documents/Data/Manual in requisite number of copies/sets/ VDR specified in Purchase Requisition and uploading the same in EIL-Portal.

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	6. 10% on successful completion of Site Work through wire transfer Note: In case Customs clearance and further transportation of material upto Project site is in the supplier's scope, 55% against shipping documents shall be split in 5% + 50% and 5% shall be paid after receipt of material at Project site. **Note : Above payment terms (Sl. no. 1 to 7) is for supply value.** In case site front is not available up to 6 (Six) months (wherever site work is applicable), after receipt of all supplies at site, the payment against the site work (Sl. No. 7) shall be released on submission of additional Bank Guarantee of equivalent amount valid for 1 (One) year or such extended period as may be required. **For Site Work**: a. 90% against monthly progressive bills (based on agreed billing schedule) duly certified by Engineer-in-charge. b. 10% on successful completion of site work and handing over of goods/equipment at site.
1.4.	**Where the MR is for fabricated equipment like Columns/Pressure vessels/Reactors/Heat Exchangers/Air Fin Cooler and rotary equipment like Pumps/Compressors/Extruder/EOT Crane (with significant Bought out item) and calls for Vendor Data requirement (Without site work):** 1. 02% against approval of drawings, wherever required (identified in PO/ PR/ Kick off Meeting / post order) at least in Code-2 / Code R and against submission of ABG of equivalent amount. 2. 03% against approval of drawings in Code-1 and against submission of ABG of equivalent amount 3. 01% thru wire transfer against receipt of foundation Template for Column, Reactor & Regenerator, Coke Drums, Reactors and vessels as applicable and foundation Bolt for Compressor/Extruder. 4. 10% against placement of sub-order for specified major raw material (to be identified during kick off meeting, if not specified in enquiry) and against submission of ABG of equivalent amount. 5. 19% (20% if foundation template, foundation bolt not required) against receipt and identification of major specified raw materials at Supplier's works and against submission of ABG of equivalent amount. 6. 60% along with 100% Ocean freight (in case of CFR contracts) against shipping documents through irrevocable Letter of Credit/wire transfer. 7. 05% on receipt of Inspection agency certified all Final/As built Drawings/Documents/Data/Manual in requisite number of copies/sets/ VDR specified in Purchase Requisition and uploading the same in EIL-portal. **Major Raw Material for payment against placement of orders:** Columns/Vessels/Reactors/ Coke Drums/ Reactor & Regenerator : Plates & Forgings Heat Exchangers : Plates, Tube, Tube sheets and SRN forgings (as

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			applicable)
	Pumps	:	Castings for casings, impellers , drivers and VFD (as applicable)
	Centrifugal Compressors	:	Castings for casings, impellers, forgings for rotors and main drivers and VFD (as applicable)
	Reciprocating Compressors	:	Crank case, Cylinder, Piston, Piston Rods, Main Drivers and VFD(as applicable)
	Extruder:	:	Screw, Main cylinder, Die plate and Main driver for extruder and Palletizer and VFD (as applicable)
	Air Fin Coolers	:	Tubes, Header Plates, Fin Material, Motor and VFD (as applicable)
	EOT Crane	:	Main motors, Wire rope, Hooks, Brake and limit switches & Gear Boxes

Major Raw Material for payment against receipt & identification of raw materials:

Columns/Vessels/Reactors/ Coke Drums/Reactor & Regenerator	:	Plates & Forgings
Heat Exchangers	:	Plates, Tube, Tube sheets and SRN forgings (as applicable)
Pumps	:	Castings for casings, impellers
Centrifugal Compressors	:	Castings for casings, Impellor, forgings for rotors
Reciprocating Compressors	:	Crank case, Cylinder, Piston, Piston Rods
Extruder	:	Screw, Main cylinder, Die Plate
Air Fin Coolers	:	Tubes, Header Plates, Fin Material
EOT Crane	:	Main motors, Wire rope, Hooks, Brake and limit switches & Gear Boxes

1.4 (a)	**Where the MR is for Packages like Nitrogen package, Conveyor package, Bagging package etc. (with significant Bought out item) and calls for Vendor Data requirement (Without site work):** 1. Drawing Approval

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	a. 02% against approval of specific drawings (identified in PO/PR) like interface Drawings, P&ID, Foundation loading plan of pipe rack/equipment wherever required, dimensional Equipment layout (identified in PO/ PR or during KOM if not specified) at least in Code-2 / Code R and against submission of ABG of equivalent amount. b. 3% against approval of balance drawings, wherever required (identified in PO/ PR or during KOM if not specified) and at least in Code-2 / Code R, 90 % (stage) 3D model and against submission of ABG of equivalent amount 2. 01% against receipt of foundation Template and foundation Bolt as applicable for equipment and items as per package requirements 3. 10% against placement of sub-order for specified major raw material (to be identified during kick off meeting, if not specified in enquiry) and against submission of ABG of equivalent amount. 4. 19% (20% if foundation template, foundation bolt not required) against receipt and identification of major specified raw materials (to be identified during kick off meeting, if not specified in enquiry) at Supplier's works and against submission of ABG of equivalent amount. 5. 55% along with 100% Ocean freight (in case of CFR contracts) against shipping documents through irrevocable Letter of Credit. IRN and Master packing list (as part of the Inspection Certificate cum release note) shall also be part of shipping documents. Master packing list is to be submitted by the package vendor in EIL-portal in information category. (a) In case control system is part of Package vendor's scope ,Modbus mapping details shall be submitted by the package vendor in EIL-portal for information category. (b) If package vendor's control and logic needs to be executed in main control system, final P&ID, Cable schedule, point data base & logic diagram shall be submitted in EIL -portal. 6. 05% on receipt of Inspection agency certified all Final/As built Drawings/Documents/Data/Manual in requisite number of copies/sets/ VDR specified in Purchase Requisition and uploading the same in EIL-portal. 7. 05 % on receipt of all material & acceptance of all materials at site.
1.5.	**Where the MR is for fabricated equipment like Columns/Pressure vessels/Reactors/Air Fin Cooler/Pumps/Compressor/Extruder/EOT Cranes (with significant Bought out item) and calls for Vendor Data requirement (With site work):** 1. 02% against approval of drawings, wherever required (identified in PO/ PR/ Kick off Meeting / post order) at least in Code-2 / Code R and against submission of ABG of equivalent amount. 2. 03% against approval of drawings in Code-1 and against submission of ABG of equivalent amount 3. 01% thru wire transfer against receipt of foundation Template for Column, Reactor & Regenerator, Coke Drums, Reactors and vessels as applicable and foundation Bolt for Compressor/Extruder. 4. 10% against placement of sub-order for specified major raw material (identified in PO/ PR or during KOM if not specified) and against submission of ABG of equivalent amount. 5. 19% (20 % if foundation template, foundation bolt not required) against receipt and identification of major specified raw materials at Supplier's works and against submission

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of ABG of equivalent amount.

6. 50% along with 100% Ocean freight (in case of CFR contracts) against shipping documents through irrevocable Letter of Credit/wire transfer.

7. 05% on receipt of Inspection agency certified all Final/As built Drawings/Documents/Data/Manual in requisite number of copies/sets/ VDR specified in Purchase Requisition and uploading the same in EIL-portal.

8. 10% on completion of site work through wire transfer

Note: In case Customs clearance and further transportation of material up to Project site is in the supplier's scope, 50% against shipping documents shall be split in 5% + 45% and 5% shall be paid after receipt of material at Project site.

Major Raw Material for payment against placement of orders:

Columns/Vessels/Reactors/ Coke Drums/ Reactor & Regenerator	:	Plates & Forgings
Heat Exchangers	:	Plates, Tube, Tube sheets and SRN forgings (as applicable)
Pumps	:	Castings for casings, impellers, drivers and VFD (as applicable)
Centrifugal Compressors	:	Castings for casings, impellers, forgings for rotors and main drivers and VFD (as applicable)
Reciprocating Compressors	:	Crank case, Cylinder, Piston, Piston Rods, Main Drivers and VFD (as applicable)
Extruder:	:	Screw, Main cylinder, Die plate and Main driver for extruder and Palletizer and VFD(as applicable)
Air Fin Coolers	:	Tubes, Header Plates, Fin Material, Motor and VFD (as applicable)
EOT Crane	:	Main motors, Wire rope, Hooks, Brake and limit switches & Gear Boxes-

Major Raw Material for payment against receipt & identification of raw materials:

Columns/Vessels/Reactors/ Coke Drums/Reactor & Regenerator	:	Plates & Forgings
Heat Exchangers	:	Plates, Tube, Tube sheets and SRN forgings (as

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			applicable)	
	Pumps	:	Castings for casings, impellers	
	Centrifugal Compressors	:	Castings for casings, Impellor, forgings for rotors	
	Reciprocating Compressors	:	Crank case, Cylinder, Piston, Piston Rods	
	Extruder	:	Screw, Main cylinder, Die Plate	
	Air Fin Coolers	:	Tubes, Header Plates, Fin Material	
	EOT Crane	:	Main motors, Wire rope, Hooks, Brake and limit switches & Gear Boxes	

1.5 (a)

Where the MR is for Packages like Nitrogen package, Conveyor package, Bagging package, HVAC, PSA Hydrogen etc (with significant Bought out item) and calls for Vendor Data requirement (With site work):

1. **Drawing Approval**

   a. 02% against approval of specific drawings (identified in PO/PR) like interface Drawings, P&ID, Foundation loading plan of pipe rack/equipment wherever required, dimensional Equipment layout at least in Code-2 / Code R and against submission of ABG of equivalent amount.

   b. 03% against approval of drawings, wherever required (identified in PO/ PR or during KOM if not specified) at least in Code-2 / Code R, 90% stage model review and against submission of ABG of equivalent amount.

2. 10% against placement of sub-order for specified major raw material (identified in PO/ PR or during KOM if not specified) and against submission of ABG of equivalent amount.

3. 20% against receipt and identification of major specified raw materials at Supplier's works and against submission of ABG of equivalent amount.

4. 45% along with 100% Ocean freight (in case of CFR contracts) against shipping documents through irrevocable Letter of Credit. IRN and Master packing list (as part of the Inspection Certificate cum release note) shall also be part of shipping documents. Master packing list is to be submitted by the package vendor in EIL-portal in information category.

   (a) In case control system is part of Package vendor's scope ,Modbus mapping details shall be submitted by the package vendor in EIL-portal for information category.

   (b) If package vendor's control and logic needs to be executed in main control system, final P&ID, Cable schedule, point data base & logic diagram shall be submitted in EIL -portal.

5. 05% on receipt of Inspection agency all Final/As built Drawings/ Documents/Data/Manual in requisite number of copies/sets/ VDR specified in Purchase Requisition and uploading the same in EIL-portal.

6. 05% on final acceptance of all materials at site.

7. 10% upon completion of site work and successful performance guarantee test run through wire transfer.

Note: In case Customs clearance and further transportation of material upto Project site is in the

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	supplier's scope, 45% against shipping documents shall be split in 5% + 40% and 5% shall be paid after receipt of material at Project site. **Note: Above payment terms (Sl. no. 1 to 7) is for supply value.** In case site front is not available up to 6 (Six) months (wherever site work is applicable), after receipt of all supplies at site, the payment against the site work (Sl. No. 7) shall be released on submission of additional Bank Guarantee of equivalent amount valid for 1 (One) year or such extended period as may be required. **For Site Work**: a. 90% against monthly progressive bills (based on agreed billing schedule) duly certified by Engineer-in-charge. b. 10% on successful completion of site work and handing over of goods/equipment at site.
2.	**For supply of Mandatory Spares**: • 100% thru irrevocable Letter of Credit against shipping documents after dispatch of main equipment.
3.	**Site Work**: a) 90% against monthly progressive bills (based on agreed billing schedule) duly certified by Engineer-in-charge. b) 10% on successful completion and handing over of goods/equipment at site.
4.	**Any services on per diem basis like: Supervision of Erection, Testing & Commissioning/ assistance during erection, Testing & Commissioning / Training at site / Supplier's works on per diem basis.** • 100% against monthly bills to be submitted by Supplier duly certified by Engineer-in-Charge.
5.	**Training (Lumpsum)**: • 100% through Wire Transfer on successful completion of Training duly certified by EIL/OWNER, as per Purchase Requisition (PR).
6.	**Annual Maintenance Contract (AMC):** • 100% payment shall be paid at the end of each quarter against quarterly progressive bills to be submitted by Supplier duly certified by authorized representative of Owner.

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7.	**Indian sub-supplies in case of a Foreign bidder:** a) 85% through E-Payment with taxes and duties will be paid against receipt of Indian sourced goods/material at project site. b) 10% against receipt of Indian supplies at site and delivery of main equipment by foreign bidder, as per Terms of bidding document and completion of site work, wherever applicable. c) 5% on submission of Final/As built Drawings/Documents/Data/Manual in requisite number of copies/sets/CDs as per VDR specified in Purchase Requisition, by main bidder. • Payment of Indian sub supplies/Services shall be released directly to Indian counterpart against Invoices raised by Indian counterpart duly certified by foreign principal. • In case of Foreign bids with Indian sub supplies, the payment terms of Foreign bidder against shipping documents stands reduced by 5% which shall be released as follows: ➢ 5% payment shall be released thru wire transfer, on delivery of main equipment by foreign principal (as per terms of enquiry document) as well as receipt of Indian supplies at site.
C	**FOR ALL SITE FABRICATED COLUMNS, VESSELS ETC. (FABRICATION YARD WITHIN PROJECT SITE)** 1. 02% against approval of drawings, wherever required (identified in PO/ PR/ Kick off Meeting / post order) at least in Code-2 / Code R and against submission of ABG of equivalent amount. 2. 03% against approval of drawings in Code-1 and against submission of ABG of equivalent amount. 3. 01% against receipt of foundation Template 4. 10% against placement of sub-order for specified major raw material (identified in PO/ PR or during KOM if not specified) and against submission of ABG of equivalent amount. 5. 24% against receipt and identification of major specified raw materials (Plates and Forgings) at supplier's works / Fabrication yard located outside Project site and against submission of ABG of equivalent amount. Submission of ABG is not required in case fabrication yard is located within project site. 6. 5% of the total PO value against Receipt and satisfactory final inspection of all dished ends at Fabrication yard and against submission of ABG of equivalent amount. Submission of ABG is not required in case fabrication yard is located within project site. 7. 20% of the total PO value against satisfactory completion of all long seam and circ seam welding and NDE before PWHT except closing circ. Seam weld joint and against submission of ABG of equivalent amount. Submission of ABG is not required in case fabrication yard is located within project site. 8. 20% with full taxes & duties and transportation charges against completion of all manufacturing & testing and unconditional IRN issued by the Inspection agency. 9. 05% on receipt of Inspection agency all Final/As built Drawings/Documents/Data/Manual in requisite number of copies/sets/ VDR specified in Purchase Requisition and uploading the same in EIL-portal. 10. 10% on receipt at erection site, erection in position (wherever applicable) and acceptance

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thereof all materials at site.

Major Raw Material for payment against placement of orders:

1	Columns/Vessels/Reactors/ Coke Drums/ Reactor & Regenerator	: Plates & Forgings

NOTES:

A. 1ST Milestone payment shall be released only after receipt of CPBG (wherever applicable) Wherever ABG is required to be submitted by the supplier against milestone progress payment, validity of ABG shall be valid till CDD which shall be further extended , as required till last date of receipt of all material at site. However ABG will be released on dispatch/ receipt of material at site (as applicable).

B. Prorata payments shall be applicable on dispatch of equipment. In case of equipment, prorate shall not be on part of equipment.

C. In case of indigenous SUPPLIERs, wherever taxes/duties are separately indicated, the order value shall be exclusive of taxes/duties. 100% payment of GST shall be paid on receipt of GST invoices and on proof of payment of GST, or, on auto-population under GST portal.

D. Payment to indigenous SUPPLIERs shall be released through Electronic Clearing System (ECS) and to foreign SUPPLIERs, payments other than against shipping documents, i.e., for Site Work and Supervision/Training etc. shall be through wire transfer.

E. Uploading of and Tracking of invoice in EIL invoice portal:

Suppliers and Service Providers shall upload the scan copy of invoices and other documents as required in the Purchase Order/Work Order on the EIL Invoice Portal to enable EIL to speed up and cut down on the processing and payment cycle. Post uploading, all correspondence between EIL and Suppliers/Service Providers will be through the portal. Suppliers/Service providers can track the status of the uploaded invoices through the portal.

A user guide on the operation of the portal is available on log in. URL of the portal is http://www.eil.co.in/invoiceportal. Registered Supplier/Contractor can Login with existing Supplier/Contractor code using the radio button. Non-Registered Supplier/Contractor can Login with PAN No. and generate the password using the radio button.

F. Irrevocable Letter of Credit (L/C) shall be acceptable from foreign Suppliers in place of Advance Bank Guarantee as well as Contract cum Performance Bank Guarantee.

G. For payment to Foreign suppliers: L/C shall be established in favor of the supplier in a bank in his country, for an appropriate amount (in line with Payment Terms). L/C shall be opened within 45 days of receipt of acknowledgement of FOA/PO and receipt of CPBG (wherever applicable). In case confirmed L/C is insisted by supplier, L/C confirmation charges shall be to supplier's account.

H. All payments (other than through L/C) shall be released within 30 days of receipt of invoice and all requisite documents, complete in all respects.

I. All bank charges of respective bankers shall be to respective account.

J. Supplier shall submit Billing Schedule within three weeks after placement of FOA/PO

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		(whichever is issued earlier) for EIL/OWNER's approval (wherever applicable). Suppliers requiring multiple dispatches will restrict the number of dispatches to maximum Three, unless agreed otherwise by Project Manager.
	K.	In case site front is not available up to 6 (Six) months (wherever site work is applicable), after receipt of all supplies at site, the payment against the site work shall be released on submission of additional Bank Guarantee of equivalent amount valid for 1 (One) year or such extended period as may be required
	L.	Certification for placement of sub-order and/or identification of major raw material, in the above payment terms, shall be carried out by the nominated Inspection agency.
	M.	Wherever the payment provision is there against ABG, and Vendor is not seeking payment against these milestone, those milestone payment shall be released along with milestone of despatch/ receipt of material at site without seeking any ABG for earlier milestone payment.
	N.	In case of high value Contracts for sophisticated Equipment/ Machinery, if domestic supplier insist payment through LC, this may be considered provided Loading provision is included in Bidding Document.
	O.	Normally foreign bidders insist for commencement of delivery -period until after they have received the Letter of Credit. However, for getting a hold on the delivery requirements, a conditional Letter of Credit may be opened, though, such a conditional Letter of Credit is neither operable nor does it certify any other performance for any commercial transaction. The Letter of Credit in such an event can be made operative upon submission by the supplier of another document which could not be furnished earlier before opening of such a conditional Letter of Credit. (e.g., submission of an unconditional order acceptance and submission of Contract Performance Guarantee). A time frame can be made part of the Letter of Credit to enable seller to submit such documents, as a check to expedite action by him.

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ANNEXURE –II
TO
SPECIAL PURCHASE CONDITIONS

TERMS & CONDITIONS FOR
INDIAN SOURCED COMPONENTS /SERVICES BY FOREIGN BIDDER

NOT APPLICABLE

ANNEXURE –III
TO
SPECIAL PURCHASE CONDITIONS

TERMS & CONDITIONS FOR
SUPERVISION OF ERECTION, TESTING & COMMISSIONING/ TRAINING AT SITE

NOT APPLICABLE

TERMS & CONDITIONS FOR SUPERVISION OF ERECTION, TESTING & COMMISSIONING / TRAINING AT SITE

1. Bidder shall quote per diem charges which shall include lodging, boarding, medical, local transport, all insurances including Bidder's personnel and third party insurance, all other incidental charges and all taxes & duties, including GST (for bidders registered in India). .

2. Tax(s) as per Government policy shall be deducted at source by Purchaser while making payments against each invoice.

3. **For Foreign Bidders**: To & fro air fare by economy class through most economical route preferably by Air India and/or AC 2 Tier by Train Fare**(*)** within India nearest to site, will be reimbursed at actual. Local transportation in bidder's country shall be to bidder's account.

4. **For Indian Bidders**: To & fro air fare by economy class through most economical route preferably by Air India and/or AC 2 Tier by Train Fare**(*)** nearest to site, will be reimbursed at actual.

   (*)In case a bidder travel's by any other mode of transport, the payment shall be made against documentary evidence subject to maximum of AC 2 Tier train fare.

5. Per diem charges shall be payable from the day bidder's person reaches site upto the day he leaves the site. No payment will be made for travel days/period.

6. In case bidder's representative is not called for during Intervening weekly off/Holidays, the same shall be payable at the normal rate of site services. However, in case Seller's representative is called at site during weekly off/Holiday, the same shall be paid @ overtime rate quoted extra by bidder.

7. In case bidder's representative takes leave, per diem charges for that day shall not be payable.

8. Working hours prevailing at site, normally 8 hours/day - Monday through Saturday and holidays as applicable to Purchaser's site personnel shall apply.

9. Selection of Foreign/ Indian supervisory personnel shall be left to Owner's/Purchaser's choice.

10. Vendor's supervisory personnel shall observe/abide by site working conditions prevailing at the existing site, safety codes, Indian laws and local laws.

11. A notice period of 15 days (or as specified in BDS) will be given for mobilization of supervisory personnel for supervision of erection.

12. Validity period of per diem rate shall be upto the end of guarantee period. Further, in case services for supervision are required after the guarantee period, 8% annual escalation shall be applicable.

13. Payment: As per BDS.

14. Requirement of Employment Visa for Foreign Nationals

All foreign nationals coming to India for execution of Projects / Orders will have to ensure compliance to the requirement specified in cl. no. 21 of SPC.

CHARGES FOR SUPERVISION OF ERECTION/TESTING/COMMISSIONING:

S. No.	Description	Vendor's Reply/Information (TO BE QUOTED IN PRICE SCHEDULE) Currency
1.	Per diem charges (per person) for 8 hours work on normal working days (Monday to Saturday)	TO BE QUOTED ON GEM PORTAL /Day
2.	Overtime rate/ hour beyond normal 8 hours work on normal working days.	TO BE QUOTED IN SEPARATE FILE IN FINANCE FOLDER (.in pdf) AS PER PROFORMA PROVIDED BIDDING

		DOCUMENT /Hour
3.	Overtime rate/hour for work on weekly off days/holidays (as applicable at Project site).	TO BE QUOTED IN SEPARATE FILE IN FINANCE FOLDER (.in pdf) AS PER PROFORMA PROVIDED BIDDING DOCUMENT /Hour

Notes:

1. In case bidder recommends more than one category level of supervisory personnel the information desired at Sr. Nos.2 to 3 above in the table shall be furnished separately for each category of supervisory personnel.
2. Quoted per diem rate shall be considered in the evaluation as per RFQ Document.

Bidder's Acceptance:

RFQ No. :
Item :
Offer No. :

Signature with Name & Date and
Seal/Stamp of the Bidder

ANNEXURE –IV Rev.2
TO
SPECIAL PURCHASE CONDITIONS

TERMS & CONDITIONS FOR INSTALATION / SITE WORK (PART OF SUPPLY ITEMS)

Annexure-IV (Rev. 2)

TERMS & CONDITIONS FOR INSTALATION / SITE WORK

1.0 CONSTRUCTION WATER

Water for this work shall be provided by the Owner without any cost, at one point from where CONTRACTOR will make his own arrangement for temporary distribution through tested and certified piping / fittings in line with the provisions of GCC.

However, CONTRACTOR shall arrange drinking water at his own cost.

2.0 CONSTRUCTION POWER

Power/electricity for SITE work shall be provided by the Owner without any cost at one point from where CONTRACTOR shall make his own arrangement for temporary distribution.

3.0 LAND FOR SITE OFICE

Client will offer land for use of contractor's office space and fabrication yard inside the Client's premises up to 3 months after completion of works on free of cost basis. However, in case, contractor fails to clear the site beyond 3 months after completion of works (as defined above), the payment of final Bill and release of CPBG shall be withheld and can be done only after full vacation of site by contractor. Additionally, Client shall charge/levy rent for occupying land inside Client's premises at twice the rate to be decided by rental formula (as per applicable Government norms in force). Decision of Engineer-In-Charge in this regard to applicability of rental charge shall be final and binding on the contractor and same will not be subject of Arbitration process.

The Contractor shall remove all temporary buildings / facilities etc. immediately after completion of all works in all respects.

4.0 ACCOMODATION FOR CONTRACTOR'S SUPERVISORY STAFF AND LABOUR ETC:

The Contractor shall make his own arrangements for the accommodation of labour, Engineers/Supervisors deputed for carrying out Site Works.

Vendor shall arrange for the necessary transport, accommodation, medical, canteen and other facilities for their employees / staff at their own cost and abide by all labour laws, safety codes and statutory regulations and keep Owner indemnified in respect thereof.

5.0 EQUIPMENTS, TOOLS AND PLANT:

All labour (both skilled and unskilled), tools, tackles and consumables shall be arranged by Vendor at his own cost except anything defined in MR / PR.

All tools & tackles, cranes, handling equipment etc., as required, shall be arranged and provided by vendor at his cost. All equipment, vehicles, tools and plants and materials brought to site by the Contractor from his resources shall have distinctive identification marks and the description and quantity of such inflow shall be intimated to OWNER in writing by the Contractor. All construction materials brought by the Contractor shall have prior approval regarding quality and quantity by OWNER. The Contractor shall also provide without extra cost necessary enclosures, containers and protective materials for proper storage of materials inside, whenever so instructed by OWNER without any extra cost.

Wherever Contractor is required to collect the material from Purchaser's stores/Project Site/vendor's own stores (as the case may be), Contractor shall arrange for transportation of material to the installation / erection site at contractor's cost and risk.

No material or equipment or tools etc. shall be taken out of the work-site without the written consent of OWNER.

OWNER shall not be responsible for the safety to protection of the materials of the Contractor and the Contractor shall make his own arrangements for proper watch and ward for his materials.

6.0 RULES AND REGULATIONS AT SITE:

The Contractor shall ensure that all rules and regulations as effected from time to time by the Owner and/or EIL are strictly observed by the Contractor's personnel.

The Contractor shall not permit the entry to the site of any person not directly connected with the execution of the Contract without prior permission of the Engineer-in charge.

7.0 ENTRY/ GATE PASSES

The Contractor shall follow regulations of Owner for arranging entry / Gate passes for his workers and staff in line with the existing rules of OWNER.

8.0 WORKMANSHIP:

The entire job shall be done in accordance with the approved drawings and specifications. The drawings and specifications are intended to be self-explanatory but should any discrepancy arise on anything contained therein, clarification shall be sought from OWNER.

All the work covered under this requisition shall be done to the entire satisfaction of OWNER who shall determine the quality, acceptability and fitness of the work. The Contractor shall provide necessary and sufficient tools, plant, equipment etc. for proper execution of work to the satisfaction of OWNER.

9.0 WORK ON HOLIDAYS AND OUTSIDE NORMAL WORKING HOURS:

The Contractor shall generally restrict his working hour to the normal working hours but may be permitted to work extra hours, on working days, on Sunday and holidays and round the clock depending upon the urgency of the work, with prior request at least 24 hours in advance.

10.0 OTHER AGENCIES AT WORKS:

The Contractor may have to execute work in such a place and condition where other agencies also will be engaged for other work. No claim shall be entertained for execution of work under such circumstances.

11.0 INSPECTION OF WORKS:

OWNER and or EIL will have full power and authority to inspect the works at any time, either on the site or at the Contractor's premises. The Contractor shall afford or procure for the purchase every facility and assistance to carry out such inspection. On no account will the Contractor be allowed to proceed with work of any type unless such work has been inspected and entries are made in the site inspection register by OWNER / EIL.

12.0 ASSISTANCE TO OWNER:

The Contractor shall render such assistance and supply such labour as may be required by OWNER in connection with the works, cost of all such assistance and requirements shall be deemed to be

included and covered by the prices quoted in the offer. The Contractor shall make available to OWNER all necessary instruments and assistance in checking the setting out of works of and taking measurements of works without extra cost to OWNER.

13.0 ACTION IN CASE OF BAD OR DELAYED WORK:

Where it is found by OWNER, the performance of work by the Contractor is not satisfactory in respect of workmanship, deployment of sufficient labour or equipment delay, in execution of work or any other matter, OWNER shall have the right to engage labour at the risk and cost of the Contractor and get the work executed through his own or through any other agency and debit the cost in excess of the value as per order to the Contractor and the Contractor shall have no right to claim compensation thereof. In such a case OWNER shall have the right to utilise the materials and tools brought by the Contractors for the same work.

14.0 **INSURANCE:**

Owner shall arrange Comprehensive Marine Cum Erection Insurance (MCE) policy, therefore insurance shall be excluded from the Contractor's scope. Insurance during transit (for the goods being dispatched to Client's Project site), storage at site and erection of all the material and equipment's to be incorporated in permanent works shall be covered under above MCE insurance policy by Owner. However, Building construction materials shall not be considered as a part of permanent works and hence shall not be covered under above MCE insurance policy by Owner. Contractor is, therefore, requested to arrange insurance towards the full value of Building Construction Materials at his own cost & expense in the joint names of Owner & Contractor (Owner shall be the first beneficiary).

All other insurance required under prevailing Indian laws for Contractor's personnel, equipment as well as Third Party Insurance shall be arranged by Contractor.

15.0 PERMITS, LICENCES ETC.:

The Contractor shall obtain all permits, licences or other authorisations as are required for his work in terms of the order, from local / State or Central Authorities. He shall comply with all rules, regulations and other statutory obligations under the State of Union Legislative enactments. The Contractor shall pay all fees and other legally demandable compensation to any person, body or firm. OWNER shall not be responsible, either directly or indirectly, in any manner whatsoever for any omissions of the Contractor under this clause.

16.0 LOCAL AND OTHER AUTHORITIES NOTICES AND FEES:

The Contractor shall comply with and give notices required by any Act or by any Regulation or bye-law of any local or other public authority who have any jurisdiction with regard to the Contractor's work and shall pay and indemnify OWNER against any fees/or charges legally demandable under such Act, regulation or bye law in respect of the works.

17.0 PROTECTION TO WORK NOT TAKEN OVER BY OWNER/EIL:

Until such time the work is taken over by Owner/EIL, the Contractor shall be responsible for proper protection including proper fencing, guarding, lighting, flagging, watching and for the provision of temporary foot-ways, guards, and fences as far as may be rendered necessary by reason of the work, for the protection of foot passengers, vehicles, animals and to the properties of the Owner/EIL, occupiers of adjoining property and the public. The Contractor shall during the progress of work properly cover up and protect any part of the work liable to damage by exposure to the weather and shall take every reasonable precaution against accident or damage to the work from any cause.

18.0 **OTHER FACILITIES:**

Unless specifically agreed elsewhere in the Contract, the Owner/EIL shall not provide any other facilities to the Contractor and the Contractor shall arrange at his own cost and expense for plumbing, lighting, construction air or steam, sanitary facilities, petrol and other fuels and lubricants for all Contractor's equipments temporary construction of buildings, construction and fabrication equipment, storage materials, tools, machinery (including consumables, costly and sophisticated fittings, instruments, etc.), scaffolding, temporary erection bolts, all hand tools as required, welding equipment, packers and shims, and all other items required to complete the work.

19.0 DEWATERING:

The Contractor will keep his assigned areas free of water and must assume the costs for all pumping conditions including shoring and shuttering as required. The Contractor will tie in all his dumping operations to the existing sewer or drain system all as directed by the Engineer-in-charge. The Contractor will be held responsible for all damage which may be caused due to back water backing up or flowing over through floor or any part of the work or which any of his operation may cause to flow elsewhere.

20.0 HSE

The Contractor shall adhere to the Health, Safety and Environment (HSE) management system as per EIL specification no. 6-82-0001 and MIL's Security Establishments: HEF, Standing Instructions for Electrical Safety in Ordinance Factories 2019, Safety Manual-2019, enclosed.

21.0 COMPLIANCE WITH STATUTORY REGULATIONS:

Contractor shall comply with the following:

a) The Contractor shall be assumed to be familiar with all central, state and local regulations in force as applicable to the operations he is performing.
b) It shall be sole responsibility of the Contractor to execute the Contract in strict accordance with such statutory regulations in force and or to obtain necessary exemption certificates.
c) Any modifications/alterations deletion and/or addition that has to be carried out to meet statutory requirements shall be done at the cost and expense of the Contractor. The Contractor shall not be entitled to any extension in completion date to carry out changes, in order to meet statutory requirements.
d) The Contractor shall at his cost and expense, obtain and furnish Owner/EIL with all statutory certificates/permits, and/or exemption certificates by that are required, to put into operation, the work completed by the Contractor.

ANNEXURE –V
TO
SPECIAL PURCHASE CONDITIONS

TERMS & CONDITIONS
FOR
ANNUAL MENTAINENANCE CONTRACT (AMC)

NOT APPLICABLE

SIGN AND STAMP OF SUPPLIER

ANNUAL MAINTENANCE CONTRACT (AMC)

(TERMS & CONDITIONS)

1. Bidder shall quote for the Post Warranty Annual Maintenance Contract as per scope defined in Material Requisition / Technical portion for a period of years as specified in the Material Requisition. Please furnish the year wise Break-up in respective field provided in Finance Folder of GeM Portal.
2. The AMC Charges quoted in respective field provided in Finance Folder of GeM Portal shall be inclusive of all the charges for Transportation, Lodging, Boarding, all insurances including third party insurance, all Taxes &Duties and all other incidental charges etc. including GST. Owner will not have any liability, whatsoever, over and above the quoted prices.
3. Payment : As per BDS.
4. The order for AMC will be placed before the expiry of contractual Warranty Period. The price of AMC services will remain firm & fixed for the complete execution of AMC contract. In case there is delay in start of AMC from the date of expiry of warranty period, the charges shall be paid on pro rata basis for the duration curtailed from original specified AMC period.
5. Within 2 weeks of placement of Order for AMC, Seller shall submit CPBG for 5% of the Maximum annually AMC amount which shall be valid for the entire AMC period plus 2 months claim period.
6. Periodic and Preventive maintenance: Vendor shall depute their engineers to installation site as & when required for regular checkups, as part of periodic maintenance. Vendor shall also depute their service engineers periodically for preventive maintenance, major repairs /replacement and reporting. Price shall also include emergency visits as necessary.
7. Scope of AMC shall be as per MR/ Technical portion. The quoted lump sum rate shall include providing all manpower, machineries and materials required to carry out the work as per scope of work of AMC defined in the MR.

SIGN AND STAMP OF SUPPLIER

ANNEXURE –VI
TO
SPECIAL PURCHASE CONDITIONS

TERMS & CONDITIONS FOR
TRAINING OF OWNER PERSONNEL
AT VENDOR'S WORKS/TRAINING FACILITY

NOT APPLICABLE

TERMS & CONDITIONS FOR TRAINING OF OWNER PERSONNEL AT VENDOR'S WORKS / TRAINING FACILITY

1. Bidder shall quote Training charges of EIL's/Owner's Operation and Maintenance personnel at Bidder's works/training facility on lumpsum basis.
2. All expenses including but not limited to Air-fare, accommodation, local conveyance, living expenses etc of EIL's/Owner's personnel shall be borne by Purchaser.
3. Quoted prices shall be inclusive of all taxes & duties including GST .
4. A notice period of 15 days (or as specified in BDS) will be given by EIL for prior arrangement.
5. PAYMENT TERMS: As per BDS.

E-INVOICING DECLARATION

[ANNEXURE - VII TO SPECIAL PURCHASE CONDITIONS

<Declaration to be provided by supplier/contractor where turnover is less than INR 5 crores (on letterhead)>

We, **<Name of entity>**, (a Proprietorship firm / Partnership firm / Company), having its registered office at **< address>**, having PAN No. _____and GSTIN No._____ , hereby declare that **<Name of entity>**'s aggregate turnover of all GSTINs in any Financial Year from 2017-18 to 2021-23 is less than INR 5 Crores (Rupees Five Crores) and **<Name of entity>** is not required to comply with e-invoicing provisions proposed under GST.

<Name of entity> also hereby declare that **<Name of entity>** will update Engineers India Limited in case there is any change in the above details or in case **<Name of entity>** is required to adhere to e-invoicing provisions under GST due to any subsequent change in law. In such case, **<Name of entity>** shall comply with provisions of e-invoicing regime as and when the same becomes applicable to **<Name of entity>**.

<Name of entity> hereby declare the above statement is true and correct and **<Name of entity>** shall indemnify and hold Engineers India Ltd good for any demand, credit reversal, denial of refund, loss, interest or penalty, suit, action, costs and expenses whatsoever (including attorneys' fees and associated legal costs) which may be commenced against and/or incurred by Engineers India Limited due to any incorrect declaration or non-compliance by **<Name of entity** and Engineers India Ltd shall have the right to withhold or recover any such loss/cost/expense from any amount payable to **<Name of entity>**

<Name and signature of authorized signatory >

For <Name of entity>

<Entity's Seal/Stamp>

<Date>

ANNEXURE –VIII
TO
SPECIAL PURCHASE CONDITIONS

MODEL DISPUTE RESOLUTION CLAUSE

MODEL DISPUTE RESOLUTION CLAUSE

1. In respect of all or any dispute(s) of any kind whatsoever between the Parties arising out of or in connection with the Contract, the Parties shall seek to resolve any such dispute or difference by mutual consultation, failing which, mandatorily by way of Conciliation through Outside Experts Committee as per EIL Conciliation Rules 2012 (as amended), and only if such Conciliation fails then through Arbitration / Commercial Courts as mentioned herein.

2. There shall be no arbitration, for all or any dispute(s) involving aggregate claims (including interest, all inclusive) less than Rs. 25 Lakhs and for all or any dispute(s) involving aggregate claims (including interest all inclusive) greater than Rs. 5 Crores.

   All or any dispute(s) involving "aggregate claims (including interest, all inclusive) less than Rs. 25 Lakhs and aggregate claims (including interest, all inclusive) greater than Rs. 5 Crores" shall be adjudicated shall be adjudicated by the Courts of competent jurisdiction at New Delhi.

3. All or any dispute(s) arising out of or in connection with the Contract, involving aggregate claims (including interest, all inclusive) between Rs. 25 Lakhs and Rs. 5 Crores, which cannot be resolved through Outside Experts Committee as per EIL Conciliation Rules 2012 (as amended) may be referred to arbitration for adjudication in the manner specified herein.

   Provided that any dispute(s) specifically specified as excluded matters and listed at clause no. 8 shall not be arbitrable.

4. The Arbitration shall be in accordance with Arbitration and Conciliation Act, 1996 (as amended). The fee of arbitrator in respect of claims by the Contractor shall be paid by the Contractor and fee of arbitrator in respect of claims by EIL shall be paid by EIL. This agreement between parties that the fee on contractor's claim is payable by the Contractor and the fee on the EIL's claims shall be paid by EIL, shall valid and such agreement shall be renewed between the parties after the dispute in question has arisen.

   All other expenses (including expense related to venue, travel of the arbitrator, local conveyance, secretarial assistance, and any other incidental expenditure) shall be equally shared by both the parties.

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

6. The Arbitration proceedings shall be in English language and the seat, venue and place of Arbitration shall be New Delhi, India only.

7. Subject to the above, the provisions of Arbitration & Conciliation Act 1996 and any amendment thereof shall be applicable.

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8. List of Excluded matters:

    a. Whether or not a claim sought to be referred to arbitration by the contractor is a notified claim.

    b. Whether or not a notified claim is included in the contractor's final bill in accordance with the provisions of contract.

    c. Any claim, difference or dispute relating to, connected with or arising out of EIL's decision under the provisions of Integrity Pact executed between EIL and the Bidder / Contractor.

    d. Any claim, difference or dispute relating to indulgence of Contractor/Vendor/Bidder in corrupt/collusive/coercive practices and/or the same is under investigation by CBI or Vigilance or any other investigating agency or Government.

    e. Any claim, difference or dispute relating to, connected with or arising out of EIL's decision to initiate any proceedings for suspension or banning, or decision to suspend or to ban business dealings with the Bidder / Contractor and/or with any other person involved or connected or dealing with bid / contract / bidder / contractor

9. Parties mutually agree that Arbitral Tribunal/Arbitrator will not include in the sum for which the award is made any interest for any part of period between the date on which the cause of action arose and the date on which the award is made. Accordingly the Parties mutually agree that neither the arbitral claim nor the arbitral award shall include interest component for any part of period between the date on which the cause of action arose and the date on which the award is made.

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

11. Sub clauses 2 to 9 of this clause shall not be applicable in contracts where both the parties to the contract come under the purview of AMRCD/AMRD Mechanism.

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ANNEXURE –IX
TO
SPECIAL PURCHASE CONDITIONS

EIL CONCILIATION RULES

ENGINEERS INDIA LIMITED CONCILIATION RULES, 2012

Rules for Speedier, Cost-effective, Out-of-Court, Out-of-Arbitration Amicable Dispute Settlement through Conciliation

Whereas Part-III of the Indian Arbitration and Conciliation Act, 1996 makes elaborate provisions for Alternate Dispute Resolution through Conciliation, which is emerging as an effective Dispute Resolution Mechanism for Public Sector Units in India.

Whereas Engineers India Limited desires to approach Conciliation as a Dispute Resolution Mechanism and hereby frames the present Rules in conformity with/supplementary to Part - III of the Indian Arbitration and Conciliation Act, 1996 for speedier, cost-effective and amicable settlement of disputes through Conciliation.

RULE 1: SHORT TITLE

These Rules shall be called the Engineers India Limited Conciliation Rules, 2012.

RULE 2: DEFINITIONS

(a). **"EIL"** shall mean Engineers India Limited, having its registered office at 1, Bhikaji Cama Place, R.K.Puram, New Delhi - 110066.

(b). **"Panel of Conciliators"** shall mean the list of eligible persons maintained by EIL's Legal (Commercial) and approved by the Chairman & Managing Director of EIL to act as Conciliators in Conciliation proceedings under these Rules.

Proposals initiated by Legal (Commercial) for empanelment of such Conciliators shall be approved by Director (Commercial) and Director (Finance) before the same is approved by Chairman & Managing Director of EIL.

(c). **"Party"** means a Party to a defined legal relationship, whether contractual or otherwise or a Party to a Conciliation proceeding under these Rules.

(d). **"Rules"** shall mean the Engineers India Limited Conciliation Rules, 2012.

(e). **"Outside Experts Committee"** shall mean the Committee of Conciliators appointed under Rule 5 (g) of these Rules.

(f). **"Working Day"** shall mean any of the Five days from Monday to Friday, excluding holidays declared by Engineers India Ltd.

RULE 3: APPLICATION OF RULES

(a). The Engineers India Limited Conciliation Rules, 2012 shall apply to any dispute, arising out of or relating to a contractual or defined legal relationship in the form of a contract or otherwise, involving Engineers India Limited as a Party where the parties seeking an amicable settlement of their disputes have agreed that Engineers India Limited Conciliation Rules, 2012 apply.

(b). The scope of Conciliation under these Rules shall encompass both domestic and international disputes of a private law nature, whenever a settlement is possible.

(c). Pendency of Arbitral or Judicial proceedings shall not constitute any bar on commencement of Conciliation proceedings under these Rules, even if the proceedings under these Rules are on the same subject matter/issue as the Arbitral or Judicial proceedings. However, in such case, the parties shall put such arbitral/judicial proceedings on hold to facilitate the Conciliation Proceedings.

(d). These Rules shall not, however, apply to dispute(s) which, by virtue of any law for the time being in force in India, may not be submitted to Conciliation.

(e). These Rules shall be subordinate to and supplementary to Part-III of the Indian Arbitration and Conciliation Act, 1996 and the latter would prevail over the former to the extent of inconsistency, if any.

(f). These Rules are broad standard Conciliation Procedures for a flexible, systematic, expedient and amicable settlement of disputes and Parties may mutually agree to make appropriate adjustments and such mutually agreed departures/deviations from any of these Rules shall not in any circumstance render a Conciliation Proceeding or any Settlement Agreement reached pursuant thereto void Ab-Initio.

(g). Subject to subsequent Agreement between/amongst the Parties, Conciliation under these Rules may be invoked, even if Conciliation is not the prescribed Dispute Settlement Mechanism or these Rules are not the prescribed Conciliation Rules under the relevant Contract/Agreement or any form of defined legal relationship.

(h). Raising of any issue or point of dispute by any Party - factual or otherwise - in writing or otherwise in any earlier communication (electronic or otherwise) between or amongst the Parties (without resolution) shall not be considered 'Conciliation' or part thereof under these Rules, unless such Conciliation proceedings are formally invoked under these Rules.

RULE 4: PANEL OF CONCILIATORS

(a). Legal (Commercial) shall, for the purpose of appointing the Conciliator between the Parties, shall prepare and maintain a Panel of Conciliators, consisting of persons of unquestionable integrity and good public standing within sixty days of coming into force of these Rules in accordance with clause 2 (b) above.

(b). Conciliators in the Panel of Conciliators, maintained by EIL, shall be Independent persons, who are neither employees nor Consultants/ Advisors of Engineers India Limited. However, the ex-employees of EIL are in no manner precluded from being included in such panel, provided they do not draw any benefits from Engineers India Limited during the span of such proposed inclusion in the panel.

(c). The consent of the persons whose names are included in the panel shall be obtained before empanelling them.

(d). The panel shall contain an Annexure, giving details of the qualifications of the conciliators and their professional or technical experience in different fields.

(e). The panel of Conciliators appointed under Clause (a) shall normally be for a period of three years from the date of appointment and further extension of the panel of Conciliators shall be at the discretion of the Chairman & Managing Director of Engineers India Limited.

(f). The following persons shall be eligible for consideration for empanelment in EIL's Panel of Conciliators:

i. Retired Secretary/Additional Secretary of Govt. of India or any equivalent post thereof.
ii. Retired Chairman-cum-Managing Director/Functional Directors of any Central Public Sector Enterprise in India.
iii. Retired Independent Directors who have served on the Board of any Central Public Services Enterprise.
iv. Independent Experts registered with the Indian Council of Arbitration.
v. Retired officials of not less than the rank of Executive Director of any Central Public Sector Enterprise.

(g). Any person in the Panel of Conciliators maintained by EIL shall not be entitled to any monetary benefit or remuneration/fees or other facility(ies) only by virtue of his/her name being in such a Panel, except when he/she is actually appointed as a Conciliator for specific Conciliation proceedings under these Rules vis-a-vis any specific issue(s) or Dispute(s) referred for Conciliation.

(h). The Chairman & Managing Director of EIL is empowered to approve, add or delete any name from the list of panel of Conciliators.

(i). Removal of a person from EIL's Panel of Conciliators shall not have the automatic effect of removal/withdrawal of the said person from an existing Outside Experts Committee in relation to specific Dispute(s) referred for Conciliation, unless the Parties thereto agree on such removal/ withdrawal.

(j). Disqualifications of persons appointed as Conciliators

The following persons shall be deemed to be disqualified for being empanelled as Conciliators:

i. Any person who has been adjudged as insolvent or persons

1. against whom criminal charges involving moral turpitude are framed by a criminal court and are pending; or
2. who have been convicted by a criminal court for any offence involving moral turpitude.

ii. Any person against whom disciplinary proceedings have been initiated by the appropriate disciplinary authority which are pending or have resulted in a punishment.

iii. Any person who is interested or connected with the subject-matter of dispute(s) or is related to any one of the Parties or to those who represent them, unless such objection is waived by all the parties in writing. A Member of Outside Experts Committee before entering into a reference for conciliation shall give an undertaking in the manner prescribed in **Schedule – A.**

iv. Any legal practitioner who has or is appearing for any of the Parties in any suit or in other proceedings(s).

RULE 5: CONCILIATORS - NUMBER & APPOINTMENT

(a). There shall be one Conciliator in cases where claim value does not exceed Rs. 2 Crores. However, in case the amount involved is more than Rs. 2 Crores, the same will be settled by a panel of three Conciliators one each from Technical, Finance/Commercial and Legal fields. All such Conciliators will be outside experts appointed by Chairman & Managing Director of EIL from the panel of Conciliators being maintained by EIL.

(b). The Conciliator(s), as and when appointed by the Parties for a specific Conciliation proceeding, shall constitute and function by the name and style of "Outside Experts Committee" in regard to the dispute(s) referred for Conciliation and shall conduct Conciliation proceedings under these Rules.

(c). If a Conciliator withdraws himself or herself or is removed by the Parties from a Conciliation Proceeding on the ground of continued absence for at least three scheduled meetings/hearings or is otherwise unavailable for the Conciliation proceeding for no justifiable reason(s), the Parties may appoint another Conciliator in the same manner contemplated herein.

RULE 6: INITIATION OF CONCILIATION

(a). EIL or any Party to a defined legal relationship with EIL - Contractual or otherwise, wishing to settle any issue with the other Party(ies), shall serve the other Party(ies) with a Written Notice/Invitation for initiation of Conciliation Proceedings under these Rules, preferably after exhausting the normal official avenues of communication for resolving the issue proposed to be referred to conciliation.

(b) In case EIL desires to initiate the Conciliation Proceedings, the concerned group executing the project, shall first obtain the consent of the other Party.

Thereafter the case shall be moved by the aforesaid project group for approval of Director (Projects), Director (Commercial), Director (Finance) and Chairman & Managing Director for referral to conciliation by constitution of expert committee called 'Outside Experts Committee'.-

(c). A Written Notice/Invitation for initiation of Conciliation proceedings shall, inter alia; contain the following details:

i. Issue(s) in dispute - Factual or Otherwise
ii. Identity of the Party (ies) - Name, Official Address, Contact E-Mail Address, Telephone Number(s), Official Representative etc.
iii. Consent of the Party serving Notice of Conciliation under these Rules
iv. Any other term and condition for conciliation, consistent with the Indian Arbitration and Conciliation Act, 1996

(d). The Party(ies), receiving Written Notice(s)/Invitation(s) for Conciliation under Sub-Rule (a) shall, within 30 days of receipt of Written Notice/Invitation for Conciliation, intimate its/their consent for Conciliation Proceedings under these Rules and the Chairman and Managing Director of EIL shall appoint the Conciliator from the panel of Conciliators being maintained by EIL.

(e). If no Reply(ies) under Sub Rule (c) is/are received from the other Party(ies), on whom Written Notice(s)/Invitation(s) for Conciliation under Sub-Rule (a) has/have been served, within 30 days of Invitation or within such period prescribed in the Written Notice/Invitation for Conciliation, whichever is longer, the Invitation for Conciliation may be treated as 'Rejected'.

(f). Conciliation proceedings under these Rules shall be deemed to commence on the day the Party, receiving Invitation for Conciliation, intimates in writing its acceptance of such an invitation. For Conciliation proceedings with more than two Parties, such proceedings shall be deemed to commence on the day the last intimation of acceptance of Invitation for Conciliation is received from a Party.

(g). If the Parties fail to agree on appointment of Conciliator(s) and constitution of Outside Experts Committee within 90 days of receipt of Reply(ies) from the other Party(ies) under Sub-Rule (e) or such extended time-period, as agreed between/amongst the Parties, whichever is longer, the efforts at dispute settlement through Conciliation shall be treated as 'failed'.

RULE 7 - CONCILIATION PROCEEDINGS

(a). The Outside Experts Committee, within 7 working days of its constitution, may request the Parties to file a brief Written Statement, describing the general nature of the dispute(s) and points at dispute. Any other document may also be filed, if a Party so desires.

(b). The Outside Experts Committee may also request the Parties to submit further Written Statements of the concerned Parties' position and facts and grounds in support thereof, supplemented by any document(s) and other evidence that such a Party deems appropriate. The Parties may also be asked to furnish copies of relevant earlier communications exchanged amongst themselves, if any, on the issue of dispute.

(c). It shall be open to the Parties to make any proposal for amicable settlement of dispute and the Outside Experts Committee shall hear the other party on the said proposal.

(d). The Outside Experts Committee shall make best endeavour to settle the dispute(s) through proposals of the Parties only, before making any Proposal(s) itself first. Nevertheless, as and when it is deemed extremely important or on joint request of the. Parties, the Outside Experts Committee at any point of time during the Conciliation proceeding make any proposal - oral or otherwise.

(e). The first meeting of the Parties shall be called by the Outside Experts Committee, after consulting the Parties involved, at a convenient date and time, within 10 working days of receipt of documents mentioned in the preceding Sub-Rule (a).

(f). During the first meeting, a tentative time-frame and broad work-Schedule of the Conciliation proceedings may be finalized after due consultation with and consent of the Parties.

(g). The Outside Experts Committee shall be free to communicate in whatever manner it deems fit with any Party to furnish any kind of information or document(s) relevant for the purpose of the Conciliation proceeding.

(h). The Outside Experts Committee shall, as much as possible, proceed with the Conciliation proceeding on issue-by-issue basis, but after proper identification of relevant issues with the consent of the Parties.

(i). The Outside Experts Committee, with the consent of the Parties, may also call for material witness(es) to assist the Committee in reaching an amicable solution of the dispute(s) referred.

(j). Each Party shall send a copy of its brief Statement and every other document(s) filed before the Outside Experts Committee to the .other Party(ies).

(k). The Outside Experts Committee shall encourage the Parties to meet and discuss amongst themselves for an amicable settlement of the dispute(s) referred.

(I). The Outside Experts Committee may also provide opportunities for oral hearing and make suggestions - oral or in writing - at any appropriate stage of the Conciliation proceeding, as contemplated by Section 67 of the Indian Arbitration and Conciliation Act, 1996.

RULE 8: REPRESENTATION, VENUE & OTHER BROAD PRINCIPLES

(a). Advocates shall not be allowed to participate in Conciliation Proceedings under these Rules and Parties shall plead their own cases.

(b). Parties shall, however, be free to be represented by their duly authorized officers/ in-house Law Officers to argue their own cases.

(d). Conciliation Proceedings under these Rules shall be held in the office of Engineers India Limited at 1, Bhikaji Cama Place, R.K.Puram, New Delhi - 110066.

(g). Equal Opportunity shall be given to the Parties to express their views before the Outside Experts Committee and the said Committee shall make utmost effort to ensure that the Conciliation proceedings are conducted in a friendly and conducive manner.

(h). Representation of the Parties may be oral or in writing and unless otherwise decided by the Parties, Minutes of the Meetings/Hearings may be recorded

briefly in broad general terms, without, however, recording adversarial submissions/developments, if any. Copies of such minutes of meetings, if recorded in writing, shall be sent to the Parties within 3 working days of each such Meeting/Hearing.

(i). Best efforts shall be made to ensure that Conciliation proceedings are conducted in a time-bound manner, without, however, diluting procedural flexibility of such proceedings.

RULE 9: ROLE OF THE OUTSIDE EXPERTS COMMITTEE

(a). The Outside Experts Committee shall attempt to facilitate voluntary resolution of the dispute(s) by the Parties, and communicate the view of each party to the other(s), assist them in identifying issues, reducing misunderstandings, clarifying priorities, exploring areas of compromise and generating options in an attempt to solve the dispute(s), emphasizing that it is the responsibility of the Parties to take a final decision; he/she/they shall not impose any terms of settlement on the Parties.

(b). The Outside Experts Committee shall be guided by the principles of objectivity, fairness and justice and shall assist the Parties in an independent, impartial and dignified manner to reach amicable settlement of dispute(s).

(c). The Outside Experts Committee shall conduct conciliation proceedings in conformity with Part – III of the Indian Arbitration and Conciliation Act, 1996 and these Rules to the optimum extent possible, but shall be flexible with appropriate adjustments, whenever required or whenever the Parties make joint request.

(d). The broad approach of the Outside Experts Committee shall be speedy, efficient and amicable settlement of disputes, without, however, diluting objectivity of approach, principles of Natural Justice and established principles of law.

(e). The Outside Experts Committee shall act more as facilitators, rather than as Judges/Umpires/Arbitrators and shall not impose any view on any of the Parties involved.

RULE 10: TIME FRAME

(a). The total number of hearings/meetings of the Outside Experts Committee as Conciliators in a Conciliation proceeding shall be not more than 5, but the same may be extended in consultation with and with the mutual consent of the Parties.

(b). The Outside Experts Committee as Conciliator(s) shall attempt to dispose of the entire Conciliation proceeding within a time-frame of four months, but the same may be extended in consultation and with the consent of the Parties, but not beyond the sixth month.

(c). Notwithstanding the above, a Settlement Agreement signed after the 6 Months period stipulated above shall not become void or unenforceable only because of such an Agreement having been signed after the stipulated Six Months period.

RULE 11: REMUNERATION & COST

(a). For each hearing/meeting, a Conciliator shall be paid a sum of Rs.10,000/-. For Secretarial Services, a lump sum amount of Rs. 10,000/- (Rupees Ten Thousand Only) shall be paid by the Parties for the whole Conciliation proceeding.

(b). Apart: from hearing/meeting fees and Secretarial Services fees, expenses incurred on Railway/Air fare, accommodation, local travel of Conciliator(s) for the purpose of the Conciliation proceeding, if any, shall also be borne by the Parties.

(c). Subject to Sub-Rule (c), the cost of Conciliation, mentioned in Sub-Section (2) of Section 78 of Part - III of the Indian Arbitration and Conciliation Act, 1996, including Conciliators' Fees and other expenses incurred by the Outside Experts Committee relating to a Conciliation proceedings and the

Settlement Agreement, shall be equally borne by the Parties, unless the Outside Experts Committee, with the consent of the Parties, provides for a different apportionment of cost with reasons thereof.

(d). Cost of preparing Settlement Agreement shall be fixed by the Outside Experts Committee in the Settlement Agreement, as required by Section 78 of Part - III of the Indian Arbitration and Conciliation Act, 1996.

(e). The cost of Conciliation as determined by the Outside Experts Committee as per Part - III of the Indian Arbitration and Conciliation Act, 1996 and these Rules shall be paid by the Parties within 30 working days of signing the Settlement Agreement.

(f). The Outside Experts Committee, in the alternative, may require the Parties to deposit the required fees and expenses in advance in the manner prescribed by Section 29 of the Indian Arbitration and Conciliation Act, 1996.

RULE 12: DISCLOSURE OF INFORMATION

When a Party to a Conciliation proceeding provides any information concerning any issue of dispute to the Outside Experts Committee, subject to a specific condition that such an information is to be treated confidential, the Outside Experts Committee shall not disclose that information to the other Party(ies).

RULE 13: CO-OPERATION OF PARTIES

(a). The Parties shall in good faith co-operate with the Outside Experts Committee and, in particular, will endeavour to comply with any request of the Outside Experts Committee to submit written materials, provide evidence, give clarification, attend meetings/hearings etc.

(b). Conciliation being an amicable Dispute Settlement Mechanism, the Parties shall not take adversarial roles, but instead make every possible effort to accommodate the other Party's/Parties' viewpoints, without, however, diluting the correct legal position.

(c). The Parties shall make every possible effort to render optimum co-operation for a speedy, efficient and yet mutually acceptable & amicable resolution of disputes.

(d). The .Parties shall not in any manner make any attempt to unduly influence the Conciliation process or the Outside Experts Committee or the Conciliator(s) by way of inducement in any form or manner and shall conduct themselves with full dignity, honesty and integrity.

RULE 14: SETTLEMENT AGREEMENT

(a). After discussing with and hearing all the Parties involved, the Conciliator(s) shall formulate the draft terms of a possible settlement and submit the same to the Parties for their consideration/observations/comments.

(b). If any part of the draft Terms of Settlement is not acceptable to any of the Parties, further meetings/hearings shall be held for possible resolution till a final mutually acceptable Conciliation Agreement emerge.

(c). When a consensus can be arrived at only in regard to any one or some of the issues referred for Conciliation, a Settlement Agreement may be signed in regard to the said Issue(s), which shall not be non-binding only because the Parties have failed to reach a similar Settlement in regard to the rest of the other issue(s) referred for Conciliation.

(d). A Settlement Agreement shall contain a statement to the effect that each of the person(s) signing thereto (i) is fully authorized by the respective Party(ies) he/she represents, (ii) has fully understood the contents of the same and (iii) is signing on the same out of complete freewill and consent, without any pressure, undue influence.

(e). When a Settlement Agreement is signed, the same shall be final and binding on the Parties and the persons claiming under/through them respectively.

(f). The Conciliator(s) shall authenticate the Settlement Agreement and make as many original copies of the same as there are parties and every Party shall be given an Original Copy of the signed Original Agreement.

RULE 15: CONFIDENTIALITY & ADMISSIBILITY OF EVIDENCE

(a). The Outside Experts Committee or any of the Conciliators (in case of multi Conciliator Committee) and the Parties shall keep confidential all information furnished, documents filed, evidence produced/adduced during the course of Conciliation proceedings. Confidentiality must extend to the settlement agreement, except where its disclosure is necessary for purposes of implementation and enforcement.

(b). Confidentiality under this Rule shall extend to Proposals, Alternative Proposals, Communications exchanged between/amongst the Parties, Communications exchanged between any of the Parties and the Outside Experts Committee or any of the Conciliators (in case of multi Conciliator Committee), Minutes of Meeting/Hearings, draft Settlement Agreement(s), Expert Opinions, Evidence of Witnesses etc.

(c). No part of any information furnished to the Outside Experts Committee, documents filed, evidence produced, communication exchanged, views expressed, suggestions/admissions made, the factum of expression of willingness to accept a proposal by any Party during the course of the Conciliation proceeding shall be used as any form of evidence in any Arbitral or Judicial proceeding.

(d). The above provisions on Confidentiality and Admissibility of Evidence shall also extend to even Arbitral and Judicial proceedings relating to disputes; which are not the subject matters of the same Conciliation proceedings.

(e). No Conciliator shall be held liable for anything bonafide done or omitted to be done by him/her during the conciliation proceedings for civil or criminal action nor shall he/she be summoned by any Party to any suit or proceedings to appear in a Court of law to testify in regard to information received by him/her or action taken by him/her or in respect of drafts or

records prepared by him/her or shown to him/her during the conciliation proceedings.

RULE 16: ARBITRAL OR JUDICIAL PROCEEDINGS

(a). During the course of/pendency of Conciliation proceedings under these Rules, the Parties shall not initiate or take any step to initiate any Arbitral or Judicial proceedings in respect of a dispute, which is a subject matter of the pending conciliation proceedings.

(b) The Parties shall be at liberty to approach the Conciliation proceedings during any stage of arbitral/judicial proceedings and to facilitate such conciliation proceedings, the parties shall, with mutual consent put on hold such arbitral/judicial proceedings.

(b). Subject to the above Sub-Rule (a), reference of any Dispute to Conciliation under these Rules shall be without any prejudice to any of the Rights and interest of the Parties involved, more particularly the rights of the Parties to resort to other Dispute Resolution mechanisms such as Arbitration, Litigation etc.

RULE 17: APROVAL OF SETTLEMENT AGREEMENT

(a). Once the Parties come to a consensus and the draft Settlement Agreement is prepared by the Outside Experts Committee, the draft Settlement Agreement shall be placed before the Competent Authority for consideration and approval .

RULE 18 -TERMINATION OF CONCILIATION PROCEEDINGS

(a} The conciliation proceedings are terminated:

i. By the signing of the Settlement Agreement by the parties, on the date of the Agreement; or

ii. By a written declaration of the Outside Experts Committee, after consultation with the Parties, to the effect that further efforts at Conciliation are no longer justified, on the date of the declaration; or

iii. By a written declaration of the Parties addressed to the Outside Experts Committee to the effect that the conciliation proceedings are terminated, on the date of the declaration; or

iv. By a written declaration of a Party to the other Party(ies) and the Outside Experts Committee, if appointed, to the effect that the conciliation proceedings are terminated, on the date of the declaration.

RULE 19: MISCELLANEOUS

(a). None of the Conciliators shall act as a representative or counsel of a Party in any arbitral or judicial proceeding in respect of a dispute that is the subject of the conciliation proceeding. Similarly, none of the Parties or their Authorized Representative(s) shall act as the Representative or Counsel of the Conciliator(s) in any Alternate Dispute Resolution proceeding or Judicial proceeding of any kind.

(b). The Parties shall not present a Conciliator as witness in any Alternate Dispute Resolution or Judicial proceedings.

(e). The official language of Conciliation proceedings under these Rules shall be English, unless the Parties agree on some other language.

SCHEDULE- A

DECLARATION OF ACCEPTANCE AND INDEPENDENCE BY MEMBERS OF SETTLEMENT ADVISORY COMMITTEE

I, the undersigned, do hereby agree to serve as a member of the Outside Experts Committee in the instant case and hereby make the following declarations:

i. I am familiar with requirements of law, particularly the Arbitration and Conciliation Act of 1996 and Engineers India Limited Conciliation Rules, 2012.

ii. I am available to serve as a Member of the Outside Experts Committee and I am independent of any of the Parties involved in the instant Conciliation proceeding and have no interest - financial or otherwise - in any part of the Contract under reference or subject matter of the Conciliation proceeding.

iv. I have not dealt earlier with the contract under reference or the subject matter of the conciliation proceeding in any manner or capacity, which could compromise my ability/independence to impartially resolve the dispute(s).

v. The fees and other facilities for conciliation, offered to and accepted by me, will remain fixed and under no circumstances will there be any demand from me for any alteration/change therein.

(Signature)
Name:
Address:

Date:

Operating Methodology for functioning of Outside Experts Committee

The methodology for functioning of Outside Experts Committee (OEC) of EIL is solely based on the Conciliation Rules of EIL. These rules define the constitution, method of selection, functioning, time frame and conclusion of the Outside Experts Committee as well as methodology for acceptance of the settlement agreement reached through this mechanism. The broad features of this methodology are captured as follows:

- Panel of Conciliators belonging to Technical, Finance/ Commercial, Legal fields to be maintained by EIL
- Party wishing to settle issue through OEC to serve written notice on the other party. Notice to include issues in dispute, identity of parties, consent to enter settlement under DEC Rules of EIL and any other terms.
- Party receiving notice to respond within 30 days.
- Upon intimation of acceptance of invitation for conciliation, Chairman & Managing Director of EIL to appoint conciliator(s).One conciliator to be appointed wherein claim value does not exceed Rs. 2 Crore and three conciliators where claim value exceeds Rs. 2 Crores.
- Outside Experts Committee within 7 days of its constitution to request parties to file a brief written statement.
- Outside Experts Committee to make endeavour to settle disputes through proposals of parties only before making any proposals itself first.
- Outside Experts Committee may call for material witnesses with consent of parties to reach amicable solution of disputes.
- Parties to plead their own cases and advocates not allowed to participate in proceedings.
- Representations can be oral also, with minutes to be recorded.

- Outside experts Committee to be guided by principles of objectivity, fairness and justice.
- Total number of hearings to be not more than 5, but to be extended with mutual consent, however overall time frame of disposal being 4-6 months.
- Parties to share the fee of Conciliators, secretarial services, expenses incurred on railway/ air fare, accommodation, local travel etc.
- Parties not to adopt adversarial roles, but to make effort to accommodate other party's view points, without diluting the correct legal position.
- After discussions, conciliator to formulate draft terms of possible settlement for observation/ comments/ consideration of parties.
- Settlement once signed to become final & binding on the Parties. EIL's acceptance of settlement agreement subject to consideration and approval of EIL's Committee of Functional Directors.
- Arbitral/judicial proceedings to be put on hold during pendency of conciliation proceedings
- Reference to Conciliation without prejudice to rights of parties to resort to other dispute resolution mechanism

The above features are designed to reflect impartial exercise of fairness in the proceedings which strike equilibrium with the acceptability quotient of the settlement proposal from a commercial angle. It also seeks to gain an edge over the existing dispute resolution mechanism in terms of speedy disposal as well costs involved.

ANNEXURE – X

TO

SPECIAL PURCHASE CONDITIONS

FORMAT FOR CPBG

FORM OF CONTRACT PERFORMANCE GUARANTEE

[ON APPROPRIATE STAMP PAPER]

Beneficiary: Engineers India Limited
Bank Guarantee No. [.....]

THIS DEED OF GUARANTEE is executed on this [.....*insert day*] day of [..... *insert month and year*] at [.....*insert place*] by [.....***INSERT NAME OF BANK***] having its head/registered office at [..... *insert address*], (hereinafter referred to as the "**Guarantor**", which expression shall unless it is repugnant to the subject or context thereof include successors and assigns)

IN FAVOUR OF:

ENGINEERS INDIA LIMITED, a public limited company incorporated under the Indian Companies Act, 1956, having its registered office at [.....], (hereinafter referred to as the "**EIL**", which expression shall unless it is repugnant to the subject or context thereof include successors and assigns).

WHEREAS

I. EIL has entered into a Contract vide Purchase Order/ Letter of Acceptance/ Fax of Acceptance no.....dated ..... **(the "Contract")** with .....**[insert name of Contractor] (*the "Contractor"*)** having its registered office at ..... (the "Contractor", which expression shall, unless it be repugnant to the context or meaning thereof, include its successors-in-title and permitted assigns), for the project.

II. In terms of the Contract, the Contractor is required to furnish to EIL, an unconditional, irrevocable, on demand bank guarantee for an amount..... **[insert amount in figures & words] (the "Guaranteed Amount")** which is equal to.....% of the Contract Price, as security for due and punctual performance/ discharge of the Contractor's obligations under the Contract.

III. At the request of Contractor, the Guarantor has agreed to provide an unconditional, irrevocable and on-demand bank guarantee, for the due and punctual performance/ discharge by the Contractor of its obligations under the Contract during the Contract Validity Period.

NOW THEREFORE THIS DEED WITNESSETH AS FOLLOWS:

1. The Guarantor hereby irrevocably and unconditionally guarantees and secures (as primary obligor and not merely as guarantor) to EIL (as beneficiary) the payment in full of all amounts at any time that may be due, owing or payable to EIL from the Contractor for the failure of the Contractor to duly and punctually perform all of its obligations under the Contract (the "Guarantee"), without any demur, reservation, protest or recourse, immediately on receipt of a demand from EIL.

   The Guarantor further agrees that this Guarantee does not limit the number of claims that may be made by EIL against the Guarantor upto the value of Guaranteed Amount.

   Payment made hereunder shall be made free and clear of and without any deductions so that EIL receives the full Guaranteed Amount due hereunder.

2. The Guarantor shall, pay to EIL sums not exceeding the Guaranteed Amount, within 5 (five) Business Days of receipt of a written demand from EIL stating that the Contractor has failed to meet its performance obligations under the Contract. The Guarantor shall not be required to go into the veracity of any breach or failure on the part of the Contractor or status /stage of the contract or validity of demand so made by EIL and shall pay the amount specified in the demand notwithstanding any direction to the contrary given or any dispute whatsoever raised by the Contractor or any other Person. The Guarantor's obligations hereunder shall

subsist until all such demands are duly met and discharged in accordance with the provisions hereof.

3. The obligations of the Guarantor herein are absolute and unconditional, irrespective of the value, genuineness, validity, regularity or enforceability of the Contract or the insolvency, bankruptcy, reorganization, dissolution or liquidation of the Contractor or any sanctions on the Contractor or any change in ownership of the Contractor, or the pendency of any suit or other legal proceedings including arbitration or conciliation pending before any court, tribunal or arbitrator or conciliator(s) relating thereto or any purported assignment by the Contractor or any other circumstance whatsoever which might otherwise constitute a discharge or defence of a guarantor or a surety.

   Further, this Guarantee is in no way conditional upon any requirement that EIL first attempt to procure the Guaranteed Amount from the Contractor, or any other Person, or resort to any other means of obtaining payment of the Guaranteed Amount, prior to make any recourse to this Guarantee.

4. EIL shall be entitled to treat the Guarantor as the principal debtor. The obligations of the Guarantor under this Guarantee shall not be affected by any act, omission, matter or thing which would reduce, release or prejudice the Guarantor from any of the Guaranteed Amount or prejudice or diminish the Guaranteed Amount in whole or in part, including (whether or not known to it, or EIL):

   (a) any time or waiver granted to, the Contractor or any other Person;

   (b) any incapacity or lack of powers, of the Contractor or any other Person;

   (c) any variation of the Contract

   (d) any unenforceability or illegality or invalidity of any obligation of any Person under the Contract or of the Guarantor under this Guarantee or of any Person under any other document or guarantee, to the extent that each obligation under this Guarantee shall remain in full force as a separate, continuing and primary obligation, and its obligations be construed accordingly, as if there were no unenforceability or illegality or invalidity;

   (e) the partial or entire release of any Guarantor or other Person primarily or secondarily liable or responsible for the performance, payment or observance of any of the Contractor's obligations during the Contract Period; or by any extension, waiver, or amendment whatsoever which may release the Guarantor or

   (f) any part performance of the Contract by the Contractor or by any failure by EIL to timely pay or perform any of its obligations under the Contract.

5. If, and to the extent that, for any reason the Contractor enters or threatens to enter into any proceedings in bankruptcy or reorganization or otherwise, or if, for any other reason whatsoever, the performance or payment by the Contractor of the Guaranteed Amount becomes or may reasonably be expected to become impossible, then the Guaranteed Amount shall be promptly paid

   by the Guarantor to EIL on demand.

6. The Guarantor further represents and warrants to EIL that:
   (a) it has the power to execute, deliver and perform the terms and provisions of this Guarantee and has taken all necessary action to authorize the execution, delivery and performance by it of this Guarantee;
   (b) No actions / omissions of The Guarantor shall effect the legality, validity, binding effect or enforceability of this Guarantee.
   (c) the Guarantor has duly executed and delivered this Guarantee, and this Guarantee constitutes its legal, valid and binding obligation enforceable in accordance with its terms

7. If any one or more of the provisions contained in this Guarantee are or become invalid or unenforceable in any respect, the validity and enforceability of the remaining provisions shall

not in any way be affected or impaired thereby, and the Guarantor shall enter into good faith negotiations with EIL to replace the invalid or unenforceable provision.

8. Any notice, request, demand or claim or other communication to be given or made under this Guarantee shall be in writing addressed to the Guarantor and may be transmitted to the Guarantor either by post or by email address as set opposite its signature hereunder.

9. This Guarantee shall be governed by, and construed in accordance with, the laws of India. The Guarantor irrevocably agrees that any legal action, suit or proceeding arising out of or relating to this Guarantee may be brought in the courts in Delhi.

10. Neither party shall assign or transfer any or all parts of its interest herein to any other person without express written consent of the other party.

11. "Notwithstanding anything contained herein:

a) Our liability under this guarantee shall not exceed..... (Amount in figures & words) and

b) This bank guarantee shall be valid upto.....(expiry date) and

c) We are liable to pay the guaranteed amount only and only if we receive a written claim or demand on or before ..... (not less than 2 months from expiry date).

IN WITNESS WHEREOF the Guarantor has set its hands hereunto on the day, month and year first hereinabove written.

Signed and delivered by its constituted attorney
(Signature of a person authorized to sign on behalf of the Guarantor)
insert name of Bank] Bank by hand

Name:

Designation;

Address:

Email:

Section- I

A. Price basis w.r.t inclusion/exclusion of taxes and duties

1. The quoted price(s) shall be inclusive of all the taxes and duties except GST (i.e. IGST or CGST and SGST/UTGST applicable in case of interstate supply or intra state supply respectively) and GST compensation cess, (if applicable) leviable on sale of finished goods/services.
2. In case of foreign bidders, bidders shall submit their prices on FOB international sea port of exit basis/CFR on destination port basis *Note-1 (INCOTERM XXXX *Note-2), unless otherwise stated in the bid document. FOB/CFR *Note-1 prices quoted shall be inclusive of all applicable taxes up to FOB international sea port of exit/CFR on destination port basis *Note-1.
3. Transportation charges (if applicable) up to respective project site shall be exclusive of GST.
4. Site work prices, if applicable shall be inclusive of all taxes and duties except GST. All necessary registrations, if required, for carrying out the site activities shall be done by the bidder and costs towards the same shall be included in quoted site work prices.
5. Prices of per diem supervision charges, training/AMC, HAZOP Study etc. (as applicable) shall be exclusive of GST. However, GST shall not be applicable on training provided at foreign bidder's work/training facilities in any territory other than India.

B. TAX CLAUSES

1. Goods and Services Tax

a. The supplier/contractor will be liable to register with the respective tax authorities and to submit self-attested copy of such registration certificates and the supplier/contractor will be responsible for procurement of goods/services in its own registration (GSTN).

b. Supplier/Contractor shall be required to issue tax invoice in the form and manner prescribed under GST Act read with Rules thereunder including E-Invoicing provisions so that input tax credit under GST can be availed by EIL. In the event that the supplier/contractor fails to provide the Tax Invoice/E-Invoice in the form and manner prescribed under the GST act read with GST invoicing rules thereunder, EIL shall not be liable to make any payment on account of GST against such invoice.

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c. In case supplier/contractor is not subject to E-Invoicing provisions under the GST Laws as amended from time to time, then a declaration to this effect shall be furnished by the supplier/contractor in format prescribed along with the Invoice.

d. GST shall be paid to supplier/contractor against receipt of Tax Invoice/E-Invoice and on auto-population of input tax credit on GSTN portal. In case of non-receipt of Tax Invoice/E-Invoice and/or non-auto-population of input tax credit on GSTN portal, EIL shall with hold the payment of GST.

e. The supplier/contractor shall always comply with the requirements of applicable laws and provide necessary documents as prescribed under the rules and regulations, as applicable from time to time. In particular, if any tax credit, refund or any other benefit Is denied/delayed to EIL or any interest/penalty is charged to EIL due to any non-compliance/ delayed compliance by the supplier/contractor under the GST Law (including but not limited to failure to upload the details of the sale on GSTN portal, failure to pay GST to the government or due to non-furnishing or furnishing of incorrect or incomplete documents, non-filing of GST return by the supplier/contractor), the supplier/contractor shall be liable to reimburse EIL for all such losses and other consequences including but not limited to the tax loss, interest and penalty. EIL shall be entitled to recover such amount from the supplier/contractor by way of adjustment from the next invoice, encashment of BG or by way of any other means either of same project or any other project of the EIL.

f. In case of any Advance including Mobilization/Secured/Other Advance is granted to supplier/contractor as per the provisions of Contract, then the supplier/contractor shall issue a Receipt Voucher / GST Invoice in the form and manner prescribed under GST Act read with Rules thereunder including e-invoicing provisions.

g. In case of any Price Variation as per the provisions of Contract, the supplier/contractor shall issue an Invoice in the form and manner prescribed under the GST Act read with Rules thereunder including e-invoicing provisions.

h. GST payable under reverse charge for specified services/goods under GST Act read with Rules thereunder, if any, shall not be paid to the supplier/contractor but will be directly deposited by EIL to the appropriate Government Tax Authority. If the same has already been reimbursed / paid to the supplier/contractor for any reason whatsoever, then EIL shall be entitled to deduct/set off /recover such amount against any amounts paid/payable by EIL to supplier/contractor.

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i. Where EIL has the obligation to discharge GST liability under reverse charge mechanism and EIL has paid or is liable to pay GST to the government on which interest/penalty becomes payable as per GST law for any reason which is not attributable to EIL or Input Tax Credit w.r.t. such payment is not available to EIL for any reason which is not attributable to EIL, then EIL shall be entitled to deduct/set off /recover such amount against any amounts paid/payable by EIL to contractor/supplier.

j. TDS under GST, if applicable shall be deducted from supplier/contractor bills at applicable rates and a certificate as per rules for tax so deducted shall be provided to supplier/contractor.

k. The supplier/contractor will be under obligation for charging correct rate of tax as prescribed under the respective tax laws. Further the supplier/contractor shall avail and pass on benefits of all exemptions/concessions available under applicable tax laws.

l. In case bidder is covered under composition scheme under GST law, then bidder shall quote the price inclusive of GST. Further, such bidder should mention "Covered under GST Composition Scheme" in column for GST of relevant price schedule(s). In case subsequently such bidder gets covered under regular GST regime, the prices including GST under regular GST regime shall not exceed the prices quoted by the bidder under composition scheme.

m. EIL prefers to deal with registered supplier/contractor of goods/services under GST. Therefore, bidders are requested to get themselves registered under GST, If not registered yet. However, in case any unregistered bidder is submitting bid, their prices will be loaded with applicable GST while evaluation of bid as per evaluation methodology of tender document. However, where EIL is entitled for input credit of GST, the same will be considered for evaluation of bid as per evaluation methodology of tender document.

n. In case of foreign bidders, for supervision/site-work/training, services provided by foreign bidder at project site, GST shall be paid by EIL directly to appropriate Government Tax Authorities, under Reverse Charge Mechanism, if applicable and prices of such services will be loaded with applicable GST while evaluation of bid as per clause E (Evaluation Methodology).

o. Bidder will be required to quote applicable tax rate (along with applicable HSN/SAC Code) as per provisions of GST Laws for all the line items forming part of the enquiry. Any higher rate of tax actually invoiced in excess of

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quoted rate of tax (except in compliance with provisions of Statutory Variation clauses) shall be adjusted in basic price.

p. In case of delay in supply/execution of contract, supplier/contractor shall be liable to raise invoices for reduced value as per Price Reduction Schedule (PRS) provision of the bidding document. In case the supplier/contractor raises invoices for full value, then supplier/contractor shall issue Credit Note, in the form and manner prescribed under relevant GST Act read with Rules thereunder, towards applicable PRS amount with applicable GST thereon.

In case supplier/contractor fails to submit invoices with reduced value or does not issue Credit Note as mentioned above, EIL shall release payment to the supplier/contractor after giving effect to the PRS clause with corresponding reduction in taxes from invoice(s) of supplier/contractor.

In case any financial implication arises on EIL due to issuance of invoice without reduction in prices or non-issuance of Credit Note by supplier/contractor, the same shall be to the account of supplier/contractor. EIL shall be entitled to recover the amount of such financial implication paid or becoming payable by EIL together with penalty and interest thereon, if any.

q. E-way bills shall be issued directly by supplier/contractor in all cases except in cases of direct imports by EIL where E-way bill shall be issued by EIL.

r. In case of applicability of any recovery as per provisions of the contract, EIL shall raise Invoice on supplier/contractor after charging GST at applicable rates as per prevailing provisions of GST Laws.

2. IMPORT DUTIES

a. Direct supplies by foreign supplier, where EIL becomes consignee

   i. Consignee shall be EIL, bill of entry shall be filed by EIL, all import duties, Social Welfare Surcharge, IGST and GST Compensation Cess etc. as applicable in India shall be paid by EIL .

b. Imported supplies by Indian suppliers as built in import content where Suppliers/Contractors will become consignee of the goods by filling Bill of Entry for Home consumption

   i. Custom duties, Social Welfare Surcharge, IGST, GST Compensation Cess, etc. as applicable in India on the imported materials shall be included in the quoted prices by the bidder (considering the input tax credit of IGST, GST Compensation Cess on imported material) and supplier/contractor shall be responsible for the timely payment of the

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custom duties to the relevant government authority. All harbor dues/ pilotage fees, port fees, wharfage, unloading costs, demurrage charges etc. incurred in India in respect of any imported goods shall be to supplier's/contractor's account.

ii. Bidder to indicate, in relevant price schedule, CIF value of built-in import content and applicable merit rate of custom duty, Social Welfare Surcharge on custom duty (considering the input tax credit of IGST, GST Compensation Cess on imported material) included in quoted price, in the price schedule.

iii. In case merit rate of custom duty is applicable and bids are invited on the basis of same, however at a later stage concessional rate of custom duty becomes applicable, concessional certificate shall be issued towards import of material against the advance request letter submitted by the domestic bidder and the differential custom duties between concessional rate and quoted merit rate of custom duty by supplier/contractor shall be passed on to the EIL or it shall be recovered by the EIL from the supplier/contractor's invoice.

iv. The supplier/contractor shall be responsible for and shall exercise due diligence in properly classifying the goods and materials, undertaking the payment of custom duties, and/or otherwise complying with all applicable laws w.r.t. import of the goods and materials.

v. If bidder does not furnish built in CIF value and rates of custom duty, in that case bidder shall not be entitled to claim any variation in the custom duties even if bidder has quoted their prices considering custom duties.

vi. If custom duty rate actually paid on import of materials and components is found to be lower than the quoted rate of custom duty, then benefit of the same shall be passed on to the EIL.

vii. If bidder has considered Import Duty other than Merit Rate of Import Duty, then statutory variation on the Import Duty shall be payable extra on the Merit Rate of Import Duty or the rate of Import Duty considered by the bidder, whichever is lower.

viii. In case, no import is made for execution of the order, clauses related to Imports will not be applicable.

c. General points:

i. In case EIL is exposed to any penal action, interest /penalties by the custom authorities for incorrect declaration and / or valuation of the goods or material by the supplier/contractor, or otherwise on account of any breach of applicable laws in the course of the import of the goods and material by supplier/contractor, the supplier/contractor shall indemnify and hold harmless EIL for any and all costs, expenses or losses suffered or incurred by EIL in this regard

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ii. If bidder intends to source import of goods from a country with which India has Free Trade Agreement (FTA) or Comprehensive Economic Partnership Agreement (CEPA) or any such multi-lateral / bi-lateral Agreement or Treaty with India or under Generalized System of Preference (GSP); or under any other notification (allowing lower rate of custom duty), then the bidder is advised to ascertain and confirm its applicability along with supporting documents in the bid and ensure that conditions of such agreement/treaty etc. are strictly complied with.

iii. The bidder shall be liable to provide all documentation to ensure availment of the exemption/waiver. In case the bidder defaults on this due to any reason, whatsoever, he shall be liable to bear the incremental custom duty applicable if any

iv. Any additional custom duty applicability on account of any change in the notification (allowing lower rate of custom duty)/ CEPA/FTA/multi-lateral/bi-lateral trade agreement shall be to bidder's account.

v. Documentation to be furnished for availing the exemption/waiver of custom duty shall be specifically listed in the letter of credit also as a prerequisite for release of payment against shipping documents and this documentation shall necessarily form a part of shipping documents.

vi. EIL will not bear any liability towards payment of Safeguard Duty, Anti-Dumping Duty, Protective Duty and applicable IGST including GST Cess on same or Countervailing Duty on subsidized articles or any other such duties of Customs imposed by Government under Customs Tariff Act, 1975.

vii. In case custom duty rate as quoted by foreign bidder is less than Actual rate applicable on due date of submission of last price bid and payment of custom duty is on EIL's Account, differential amount on account of above-mentioned rate variation will be recovered from foreign bidder.

3. INCOME TAX

a. Foreign supervisors/suppliers/contractors

Prices of site work, contracts and other services of foreign supplier/contractor shall be gross of income tax i.e., inclusive of Indian

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income tax at the applicable prevailing rate as per Indian Income Tax Act and Rules there under.

EIL shall deduct withholding tax at source (TDS) as applicable while making payments against each invoice. Certificate for TDS shall be provided to the supplier/contractor.

In case foreign bidder quotes Prices of site work, contracts and other services "net of Income Tax" i.e., exclusive of Indian income tax, EIL shall deduct and deposit TDS as applicable after grossing up the sums due while making payments against each invoice at the applicable prevailing rate as per Indian Income Tax Act and Rules thereunder.

Foreign bidder shall furnish the information required in line with the prevalent provisions of Income tax act read with rules thereunder including but not limited to Tax residency certificate, Form 10F, No permanent establishment declaration, No business connection certificate, PAN in India if available.

Failing to provide above documents/information, tax will be withheld at rates applicable as per the provisions of Income Tax Act, 1961 read with rules thereunder and the benefit of reduced rates will not be given.

If the non-resident is unable to obtain & submit Tax Residency Certificate to the EIL within a reasonable time, the bidder should furnish Form 10F along with an undertaking to the effect that the bidder is a tax resident of (the specified country) and that they shall obtain and provide the tax residency certificate (TRC) to the EIL before 30 days of submission of first Invoice by them or within 3 months from the date of entering into contract whichever is earlier.

In case of contracts with term exceeding one financial year, the relevant documents like TRC, Form 10 F, No PE / Business Connection Certificate etc. as applicable, as per Income Tax Act, 1961 must be submitted at the beginning of each financial year and the EIL will not bear additional tax liability (if any) arising from non-submission of documents.

The bidder shall be liable to intimate the subsequent changes (if any) to the information submitted against any of the above particulars, along with full details.

In addition to the above particulars, the bidder should also provide any other information as may be required at a later stage for determining the taxability of the amount to be remitted to the non-residents.

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In case, any additional tax liability arises on the EIL due to any action of bidder like delay in submission / non-submission of information / documents required as above or change in residential status post submission of documents or change in any document (like TRC, Form 10F etc.) after its submission shall be recovered from the supplier/contractor.

b. Indian resident supervisors/ suppliers/contractors

Prices for supply and services of Indian suppliers/ contractors shall be inclusive of income tax.

Tax shall be deducted at source (TDS) by EIL on all sums due to supplier/contractor in accordance with the provisions of Indian Income Tax act read with rules thereunder as in force at the relevant point of time.

EIL shall issue a Tax Deduction Certificate to the supplier/contractor evidencing the tax deducted or withheld and deposited by EIL on payments made to the supplier/contractor to enable the supplier/contractor to claim the credit of Tax deducted by EIL.

c. INCOME TAX (General Points):-

i. The supplier/contractor shall also be responsible for ensuring compliance with all applicable provisions of the Direct Tax Laws of India including, but not limited to, the filing of relevant Tax Returns and shall promptly provide all information required by the EIL for discharging any of its responsibilities/liabilities under such laws in relation to or arising out of the Contract. For the lapses/failure, if any, on the part of the supplier/contractor and consequential penal action taken by the Income Tax department, EIL shall not take any responsibility whether financial or otherwise and shall be indemnified by the supplier/contractor.

ii. The Indian Income Tax Act and Rules made thereunder contains provisions permitting deduction of tax at source (TDS) at lesser rate if the supplier/contractor is able to justify to the Income Tax Authorities such lesser rate of deduction. However, a deduction once made has to be deposited by the EIL with the Income Tax Authorities in India and will not be adjustable by the EIL. It is therefore in the interest of the supplier/contractor that prior to release of any payment due to the supplier/contractor under the Contract that the supplier/contractor obtains from the relevant Income Tax Authorities in India, a certificate specifying the rate of deduction/withholding of

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Income tax at source, failing which, payment to the supplier/contractor shall be made by the EIL after withholding/deduction at the rate as may be applicable to the supplier/contractor as per provisions of Income Tax Act, 1961.

iii. TDS on interest recovered on Mobilization/Other Advance will be deposited by the supplier/contractor and same would be reimbursed by the EIL against submission of Form-16A (TDS certificate).

C. INVOICING METHODOLOGY W.R.T. TAXATION

Following invoicing methodology shall be followed :

1. In case of domestic / foreign PO's (Other than 2 below) , Invoice/E-Invoice shall be raised by the supplier/contractor in the name of EIL and consignee shall be EIL.
2. In case of package MR's (where title transfer or take over is envisaged to take place at site after completion of site work) and tenders, supplier/contractor shall bring material at project site in their own name and they themselves shall be consignee. As per provisions of contract between EIL and supplier/contractor, Invoice/E-Invoice shall be raised by supplier/contractor to EIL after charging GST.

D. APPLICABILITY OF TAX CREDIT

Input credit is available to EIL as per GST law.

E. EVALUATION METHODOLOGY W.R.T. TAXES

Following shall be loaded for evaluation:

1. Applicable Custom Duty, Social Welfare Surcharge etc, (excluding IGST & GST Compensation Cess (if applicable) on imported material which shall be dealt as per bid evaluation methodology given in E2 below) shall be loaded for price bid evaluation in respect of supplies for which bill of entry has to be filled by EIL.
2. GST on which input credit is not available to EIL including GST Compensation Cess (if applicable).
3. Applicable Income tax, in case foreign bidder quotes prices net of taxes.

F. TAXATION TERMS FOR INDIAN SOURCED SUPPLIES (Applicable in case of foreign supplier)

Shall be the same as applicable for Indian bidders.

G. TAX IMPLICATION WHERE FABRICATION YARD IS OUTSIDE THE FACTORY PREMISES, WHEREVER APPLICABLE

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In case of package MRs and tenders, since contractors/suppliers shall bring material at project site in their own name and raise invoice to EIL (as per payment milestone achieved) after charging GST, location of fabrication yard whether inside or outside factory premises will not attract any additional liability.

H. TAX IMPLICATION WHERE EIL WILL ISSUE FREE ISSUE MATERIAL (FIM) TO CONTRACTORS/SUPPLIERS

Where EIL issues FIM's to suppliers/contractors, material will be released against delivery challan and such FIM shall be received back in factory premises as per provision of GST.

I. STATUTORY VARIATION (IN CASE OF MRS & TENDERS)

No variation on account of taxes and duties, statutory or otherwise, shall be payable to Supplier/Contractor except for the following:

1. GST: If after the due date of submission of last price bid and up to the contractual delivery/completion period (*Note 4), any increase/decrease occurs in the applicable rate of GST, the variation in such GST shall be to EIL's account and shall be adjusted (increase / decrease) to / from the Supplier's/Contractor's invoices based on the documentary evidence.

   Any increase in GST after the contractual delivery/completion period (*Note 4) shall be to Supplier's/Contractor's account. However, any decrease in the rate of GST shall be passed on to EIL.

   For calculating Statutory Variations ceiling amount as declared by the Bidder in price schedule shall only be considered.

2. Basic Custom Duty (BCD) & Social Welfare Surcharge (SWS): If after the due date of submission of last price bid and upto the XX (*Note-3) of contractual delivery/completion period (*Note 4), any increase/decrease occurs in the applicable rate of BCD & SWS on materials imported, the variation in such BCD & SWS shall be to EIL's account and shall be adjusted (increase/decrease) to/from the Supplier's/Contractor's invoices based on the documentary evidence.

   Any increase in rate of BCD & SWS on materials imported after the XX (*Note-3) of the contractual delivery/completion period (*Note 4) shall be to Supplier's/Contractor's account. However, any decrease in the rate of BCS & SWS on materials imported shall be passed on to EIL.

   For calculating Statutory Variations in BCD/SWS, ceiling amount of CIF Value and rate of custom duty as declared by the Bidder in relevant price schedule shall only be considered.

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Note: Indian supplier/contractor to consider input tax credit of IGST and GST Compensation Cess if any (in case of import of raw Materials / components) in their quoted prices. Hence, Statutory variations on same in case of imported materials from outside India in Supplier's/Contractor's name (i.e., for Indian Bidders) shall be to Supplier/Contractor account.

3. Any new output taxes, duties, cess, levies notified or imposed after the due date of submission of last price bid but upto the contractual date of delivery/completion (*Note 4) shall be to EIL's account. These shall be reimbursed against documentary evidence. However, in case of delay attributable to supplier/contractor, any new output taxes, duties, cess, levies notified or imposed after Time for Completion, defined as above, shall be to supplier's/Contractor's account.

J. TAX INDEMNITY

Any omission/ errors of interpretation of applicability of taxes, duties, cesses and levies, whatsoever named, howsoever named, as are payable to any government, local or statutory authority in India or in any country other than India by the supplier/contractor shall be to supplier's/contractor's account.

If any fine/penalty/any other levy is required to be met by the EIL arising out of any non-compliance/fault/fraud/willful suppression/misstatement of facts/information/documents, whatsoever, of any applicable laws of India or any country other than India by the supplier/contractor/their personnel/sub-contractors/agencies, the same shall be recovered from any amount payable to the supplier/contractor under this contract or under any other contract of the EIL.

If any tax is paid / required to be paid by supplier/contractor in pursuance of any demand of any law enforcement agency/Tax Authority on account of non-compliance/fault/fraud/willful suppression/misstatement of facts/information/documents, whatsoever, of any applicable laws of India or any country other than India by the supplier/contractor/their personnel/sub-contractors/agencies, the same shall be to supplier's/contractor's account only.

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GENERAL:

~~1. *Note-1 Mode of Transport i.e. Sea / Air or otherwise and Price Basis i.e. FOB/CFR/CIF or otherwise to be decided and incorporated in bid document by SCM as per applicable guidelines/instructions.~~

~~2. *Note-2 Applicable INCOTERM to be defined by SCM.~~

~~3. *Note-3 Time period to be decided and incorporated in bid by SCM as per applicable guidelines/instructions~~

4. *Note-4 Contractual delivery/completion period shall include extended contractual delivery/completion period for the reasons attributable to EIL or due to Force Majeure condition.

Note 1 : Mode of Transportion and Price basis shall be as per Bidding Document
Note 2 : Applicable Incoterm shall be Incoterms 2020
Note 3 : Time period shall be as defined in SPC cl. no. 9.3

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ANNEXURE –XI
TO
SPECIAL PURCHASE CONDITIONS

TAXES & DUTIES

ANNEXURE –XII
TO
SPECIAL PURCHASE CONDITIONS

MIL INSURANCE

ENGINEERS INDIA LIMITED
5TH FLOOR, EI BHAWAN, PLOT NO. 85, SECTOR-11,
KHARGHAR, NAVI MUMBAI, RAIGARH,
MAHARASHTRA- 410210

Subject: MARINE CUM ERECTION POLICY NO.: 130162422120047124/13012242423M000503

Dear Sir,

Welcome to the Reliance General Insurance Family!

We are honored to have you as our valuable customer and are truly thankful that you have chosen Reliance General Insurance for your Insurance requirements.

We are pleased to inform you that you have been insured under Policy No. **130162422120047124/ 13012242423M000503**. Attached herewith your policy document, with all the details which have been prepared based on the details furnished to us. We request you to kindly go through the same.

Should you find any discrepancy in the document, kindly write to us immediately for necessary rectification. In the absence of any communication from your end, the contents and coverage of the policy shall stand accepted by you.

To enable us to serve you better, you are requested to mention your Policy Number in all your further Correspondences.

With Reliance General Insurance, you get nothing less than excellent and unparalleled services. Thanking you once again for choosing us. Look forward to a long lasting and delightful relationship.

Yours sincerely,

For Reliance General Insurance Company Limited

Authorised Signatory

Reliance General Insurance Company Limited. IRDAI Registration No. 103. An ISO 9001:2015 Certified Company
The Registered Office & Corporate Office/Policy Issuing Office: Reliance General Insurance Company Limited, 6th Floor, Oberoi Commerz, International Business Park, Oberoi Garden City, Off Western Express Highway, Goregaon (East), Mumbai – 400 063. Corporate Identity No.U66603MH2000PLC128300. UIN:. Trade Logo displayed above belongs to Anil Dhirubhai Ambani Ventures Private Limited and used by Reliance General Insurance Company Limited under License. RGI/MCOM/CO/HIIP/POLICY-SCHEDULE/Ver. 1.0/121219

Reliance Marine Cum Erection Policy
Schedule

Policy Issuing Office: Reliance General Insurance Company Limited 6th Floor, Oberoi Commerz, Oberoi Garden City, Off Western Express Highway Goregaon (East), Mumbai - 400 063, India	**Policy Servicing Branch Office:** Reliance General Insurance Co. Ltd FLAT NO-10-15 14TH FLOOR, VIJAYA BUILDING, 17, BARAKHAMBA ROAD, CENTRAL DELHI - 110001 Contact No. 011-39975617
Broker & Code: Direct	
Policy No: 130162422120047124/13012242423M000503	
Tax Invoice No. & Date: P102824101205 & P102824101243 30/10/2024	
GSTIN/UIN of the Insured: **27AAACE5318C1Z3**	Details of previous policy (in case of renewal) Previous policy No: **NA** Date of expiry: **NA**
Insured Name: **ENGINEERS INDIA LIMITED** **Communication address and Place of Supply** 5TH FLOOR, EI BHAWAN, PLOT NO. 85, SECTOR-11, KHARGHAR, NAVI MUMBAI, RAIGARH, MAHARASHTRA, - 410210	
Address of the Insured Premises: MUNITIONS INDIA LIMITED, HIGH EXPLOSIVES FACTORY (HEF) KHADKI, PUNE STATE-MAHARASHTRA PIN-411003	
Financial Interest: **NA**	
Name of the Principal: Munitions India Limited **Address of the Principal**: High Explosives Factory (HEF) Khadki, Pune, Maharashtra, Pin code - 411003	
Name of the Contractor: Engineers India Limited **Address of the Contractor**: 5th Floor, EI Bhawan, Plot No. 85, Sector-11, Kharghar, Navi Mumbai, Raigad, Maharashtra - 410210 and other Sub-Contractors	

Nature / Description Of Project: Erection of Trinitrotoluene (TNT) Plant Risk Code : 50903
Period of Insurance: From 00:01 HOURS OF 15/10/2024 TO MID-NIGHT OF 14/03/2027 Project Period: From 15/10/2024 TO 14/03/2027 Including 3 Months Testing Period

Reliance General Insurance Company Limited. IRDAI Registration No. 103. An ISO 9001:2015 Certified Company
The Registered Office & Corporate Office/Policy Issuing Office: Reliance General Insurance Company Limited, 6th Floor, Oberoi Commerz, International Business Park, Oberoi Garden City, Off Western Express Highway, Goregaon (East), Mumbai – 400 063. Corporate Identity No.U66603MH2000PLC128300. UIN:. Trade Logo displayed above belongs to Anil Dhirubhai Ambani Ventures Private Limited and used by Reliance General Insurance Company Limited under License. RGI/MCOM/CO/HIIP/POLICY-SCHEDULE/Ver. 1.0/121219

Sum Insured Details	
EAR	**Sum Insured INR**
Completely Erected Value	3,399,300,000

Sum Insured Details	
MARINE	**Sum Insured INR**
Initial Sum Insured	2,229,700,000
Import- PSL Limit INR 300,000,000/- PLL Limit INR 350,000,000/- Basis Of Valuation - Invoice + 10%	
Inland- PSL Limit INR 300,000,000/- PLL Limit INR 350,000,000/- Basis Of Valuation - Invoice + 10%	

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Endorsements & Warranties/Conditions/Exclusion attached: For EAR 130162422120047124

- End-11 Safety Measures for Flood and Inundation
- Firefighting facilities
- Earthquake
- ENGG/END-101: CIVIL ENGINEERING WORKS
- ENGG/END-110: ENDORSEMENT CONCERNING STORAGE
- ENGG/END-111: ENDORSEMENT REGARDING SAFETY MEASURES
- ENGG/END-112: ENDORSEMENT REGARDING DAMAGE TO CROPS, FORESTS ETC
- ENGG/END-114: WARRANTY CONCERNING UNDERGROUND CABLES AND PIPES
- Losses prior to receipt of premium is not payable
- Project is not commenced before 15/10/2024
- Third Party Liability Cover with Cross Liability in Policy period INCLUDING Maintenance period - 10% of the project cost or INR 25 Crores whichever is lower" Covered
- Owners' Surrounding Property during policy period including Maintenance period -Up to 10% of Policy SI WITH FLEXA risks Covered
- Automatic Reinstatement Clause- Upto 10% of SI Covered
- Debris Removal limit per occurrence -Upto INR 5 Crs. Covered AOA:AOY
- Waiver of Subrogation Clause To be restricted between Principal & Contractor Only
- Waiver of contribution Clause To be restricted between Principal & Contractor Only
- Cover of Extra Charges for Overtime, Night Work, Work on O Covered upto 5 Cr AOA:AOY
- Air Freight - Above 30 % of claims amount ; Up to INR 5Cr Covered upto 5 Cr AOA:AOY
- Extended maintenance cover Covered for 12 Months Only
- Design Defect Liability as per Munich Re wording - DE-4/DE-3 Covered
- Additional Custom duty - up to INR 5 Crores Covered AOA:AOY
- Cover for Valuable documents - up to INR 50 lakhs Covered AOA:AOY
- Loss minimization expenses - up to INR 5 Crores Covered AOA:AOY
- Professional fees - up to INR 1 Crores Covered AOA:AOY
- Waiver of Contribution clause (between Principal and the Contractor only) Covered
- 50:50 Clause Covered
- 72 Hours Clause Covered
- Non-Vitiation Clause Covered
- Put to Use 1 months Covered
- Policy Extension on Pro Rata As per EAR tariff provisions ;Subject to total project period within treaty and claims exp less than 50 %
- CPM Required- up to INR 25 Lakhs Covered
- Continuity Of Cover During Operational Phase For Integral Testing Covered for 1 months
- Any losses prior to receipt of premium will be out of scope of this policy.
- Warranted that project is yet to be started
- Warranted there is no works in water/wet works
- Warranted there is no Tunnelling/Blasting work
- Warranted there is no underground works
- Warranted there is no Road works.
- Dismantling works and use of prototype/second hand machinery excluded from scope of coverage

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- ENGG/END-102: Endorsements for Fire/Explosion claims and Fire Fighting
- ENGG/END-103: ENDORSEMENT REGARDING CROSS LIABILITY COVER
- ENGG/ENGG-105: ENDORSEMENT REGARDING AIR FREIGHT
- ENGG/END-113: (b)EXTENDED MAINTENANCE COVER
- Warranted that stock of construction materials/stock should be kept in closed godown which should be kept always locked when not in use.
- Testing Period 3 months.
- Terrorism Damage Exclusion Warranty
- Any direct or indirect loss by infectious or contagious disease is excluded as per Communicable Disease Exclusion Clause.
- Warranted that second hand machinery is not covered.

Endorsements & Warranties/Conditions/Exclusion attached: For Marine 13012242423M000503

- Institute Cargo Clauses (A) Cl 382 dated 1/1/2009
- Institute Cargo Clauses (B) Cl 383 dated 1/1/2009
- Institute War Clauses (Cargo) Cl 385 dated 1/1/2009
- Institute Strikes Clauses (Cargo) Cl 386 dated 1/1/2009
- Inland Transit Rail-Road (A) - All Risk
- Inland Transit Rail-Road (B)
- Strike, Riot & Civil Commotion Clause
- Limitation of Liability Clause
- Institute War Cancellation Clause (Cargo) CL 271 1/12/1982
- Institute Strike Cancellation Clause
- Institute Cyber Attack Exclusion Clause CL 380 10/11/2003
- Institute Radioactive Contamination, Chemical, Biological, Bio-Chemical And Electromagnetic Weapons Exclusion Clause Cl 370 dated 10/11/2003
- Institute Classification Clause CL 354 1/1/2001
- Cargo Ism Endorsement (1 May1998) JC 98/019
- Important Notice Clause
- Institute Standard Conditions For Cargo Contracts CL 261 01.04.82
- Cargo Termination of Storage in Transit Clause(ammended) dated 1/4/2020
- Termination of Transit Clause (Terrorism) 2009 JC 2008/024 11 December 2008
- Open Policy Clause
- Institute Cargo Clauses (Air) Cl 387 dated 1/1/2009(excluding sendings by Post)
- Institute War Clauses (Air Cargo) Cl 388 01/01/2009
- Institute Strike Clauses (Air Cargo) Cl 389 01/01/2009
- SRCC Clause (Inland Transit)
- Dispatch by Private Carriers Clause
- Registered Post Parcel Clause
- Registered Post Parcel Clause (amended for courier)
- Institute Replacement Clause CL 161 01/01/1934
- Institute Replacement (Second Hand Machinery Clause)

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- Duty Insurance Clause
- Joint Excess of Loss Cyber Losses Clause JX2020-007
- Pair and Set Clause
- Specified Territory Exclusion Clause:
  Notwithstanding anything to the contrary herein, all Specified Territory Exposures whether direct or indirect are excluded. The term Specified Territory Exposure includes but is not limited to any activity, transaction, legal proceedings, operation, entity, subsidiary, headquarters, branch, products, good, property, asset, services in a Specified Territory or, as applicable, delivered to, located in, originating in, transitioning from, to or through a Specified Territory, as well as any person ordinarily resident in a Specified Territory, the government of a Specified Territory as well as any entity owned or controlled by an entity in a Specified Territory including, without limitations, affiliates outside of a Specified Territory.

- Specified Territory means The Republic of Belarus, Ukraine and/or The Russian Federation.
- Loading and Unloading clause: excluding second hand cargo and Tail end transit.
- SANCTION LIMITATION AND EXCLUSION CLAUSE LMA 3100 (Amended) No (Re)insurer shall be deemed to provide cover and no (re)insurer shall be liable to pay any claim or provide any benefit hereunder to the extent that the provision of such cover, payment of such claim or provision of such benefit would expose that (re)insurer to any sanction, prohibition or restriction under United Nations resolutions or the trade or economic sanctions, laws or regulations of the European Union, United Kingdom, United States of America or Switzerland.
- War and Strike Risk Termination Clause: This clause shall be paramount and shall override anything contained in this reinsurance agreement inconsistent therewith.
- Notwithstanding anything to the contrary stated herein or subsequently added hereto, it is understood and agreed that if this treaty provides that war and strikes, riot and civil commotions risks (including terrorism) may be ceded hereunder, then the cover afforded by this reinsurance in respect of such war and strikes, riot and civil commotions risks (including terrorism) shall be subject to terms and conditions no wider than the relevant London Institute War and Strikes Clauses current at the inception of the risk ceded hereunder, or current at the later of either the inception date or the most recent anniversary date of this treaty. The acceptance of war and strikes, riot and civil commotions risks (including terrorism) under this contract is at all times subject to 72 hours' notice of cancellation by insurers or reinsurers. Such cancellation becoming effective on the expiry of 72 hours from midnight of the day on which notice of cancellation is issued by either party. Notice of cancelation can be given by e mail and is deemed served at the time that the e mail is sent. Also, any notice of cancelation given to the placing reinsurance broker or intermediary under this section shall be deemed to satisfy any requirement of notice provided for anywhere in this reinsurance agreement and shall override any inconsistent provisions as to notice within this reinsurance agreement.
- Five Powers War Clause Where any war risks coverage is provided by underwriters, this(re)insurance excludes loss damage liability or expense arising from the outbreak of war (whether there be a declaration of war or not) between any of the following: United Kingdom, United States of America, France, the Russian Federation, the People's Republic of China. JC2023-024 6th Jan 2023.
- COMMUNICABLE DISEASE EXCLUSION LMA 5394 (amended)
- Marine Cyber Endorsement Clause LMA5403

1. Subject only to paragraph 3 below, in no case shall this insurance cover loss, damage, liability or expense directly or indirectly caused by or contributed to by or arising from the use or operation, as a means for inflicting harm, of any computer, computer system, computer software programme, malicious code, computer virus, computer

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process or any other electronic system. 2. Subject to the conditions, limitations and exclusions of the policy to which this clause attaches, the indemnity otherwise recoverable hereunder shall not be prejudiced by the use or operation of any computer, computer system, computer software programme, computer process or any other
electronic system, if such use or operation is not as a means for inflicting harm. 3. Where this clause is endorsed on policies covering risks of war, civil war, revolution, rebellion, insurrection, or civil strife arising therefrom, or any hostile act by or against a belligerent power, or terrorism or any person acting from a political motive, paragraph 1 shall not operate to exclude losses (which would otherwise be covered) arising from the use of any computer, computer system or computer software programme or any other electronic system in the launch and/or guidance system and/or firing mechanism of any weapon or missile. LMA5403 11 November 2019.

RUB:
Excluding all losses, damages, liabilities or expenses caused by or arising from or in connection with any conflicts involving Russian armed forces, Russian-backed forces, and/or Russian authorities, within the territories (including territorial waters) of Ukraine, The Republic of Belarus, The Republic of Moldova and The Russian Federation (including the disputed territories of Donetsk Region, Luhansk Region and Crimea). Also excluded shall be all losses, damages, liabilities or expenses where the aforementioned conflict is deemed to be the direct cause of such losses, damages, liabilities or expenses. Excluding all losses, damages, liabilities or expenses occurring in the territorial scope of The Russian Federation (including territorial waters) and/or any disputed territories (including but not limited to the Donetsk Region, Luhansk Region and Crimea), in respect of Russian insureds and reinsured.

IRAN EXCLUSION CLAUSE
It is understood and agreed that this contract does not provide cover and does not include any liability to pay any claim or provide any benefit hereunder in respect of any
risk from Iran.
“Iran Risks” refers to any goods, services or insured items or risks located in Iran, of Iranian origin, to be transported to or from Iran or directly or indirectly owned by an Iranian person or entity or in any other way subject to an Iranian interest.

As per Section 64 VB of the Insurance Act, 1938, adequate premium balance is required to be maintained before the commencement of a shipment. Inadequate premium balance would render a shipment uncovered.

Overage additional premium-To be read in conjunction with Institute Classification Clause CL 354 dated 1-1-2001, Upto 15 Years-No Additional Premium,15 to 20 Years–TBA,20 to 25 Years–0.01%,25 to 30 Years–0.02% and More than 30 Years–to be referred to Insurer.

Per Location Limit (PLL): Notwithstanding anything to contrary contained in this Policy, the limit of Insurer’s liability in respect of any one accident or series of accidents arising from the same event in any one location shall not exceed the amount as specified in the schedule of the policy. This means accumulation of all shipments at any one place at any one time. Eg., Accumulation at Port awaiting shipment and/or similar places or intermediate storage at carrier’s godown or warehouse etc. If such accumulations do take place exceeding the Location Limit, unless prior notice is given to the Insurer and suitable endorsements have been made in the Policy, Condition of Average will be applicable at the time of claim.

Per Sending Limit (PSL): Notwithstanding anything to contrary contained in this Policy the limit of the Insurer’s liability in respect of any one accident or series of accidents arising from the same event shall not exceed the amount as specified in the schedule of the policy. Shipment values exceeding this limit, unless prior notice is given to the Insurer

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and suitable amendments have been made in the policy insured will be self-insurer and for partial losses condition of average will be applicable at time of claim.

Tail end Transit shall be covered for ITC A subject to satisfactory pre- acceptance inspection report at assured's cost else coverage shall be restricted to ITC B

Warranted any transit from, to or through Iran, Afghanistan, Iraq, Libya, North Korea, Northern Sri Lanka, Somalia, Chechnya, Bosnia and any of the European Union and/or United States and/or United Nations and/or United Kingdom sanctioned countries are not covered under the policy.

Warranted Brand New Goods and in Original Manufacturers Packing.

Warranted cargo is carried under - deck unless it is containerized.

Warranted coverage under the policy will not exceed liability of Insured as per invoice INCO terms.

Warranted for shipments from African countries, cover to commence once the goods are loaded on to the carrying Vessel / Aircraft at dispatch Seaport / Air port

Warranted loading/ unloading/ fastening of Over Dimensional cargo from the carrying vessel to be supervised by our approved Surveyors at insured's cost and the recommendations of the Surveyor regarding loading/ unloading/ fastening of cargo be complied with.

Warranted Over Dimensional cargo is carried in multi – axle, low-bed Trailer and should be adequately lashed / strapped before commencement of inland transit. Such consignments are to be loaded / stowed and secured on to the inland conveyance under the supervision of a Surveyor approved by the Insurer at the Assured's cost and all recommendation of the Surveyor be complied with.

Warranted that goods are transported in closed wagons and /or trucks to be covered with tarpaulin or any other water proof material to avoid ingress of water

Warranted that if the weight of the cargo exceeds than Registration Laden weight or Licensed Carrying Capacity of the vehicle, as mentioned in the Registration Certificate of the vehicle, then any loss or damage arising out of such transit is not covered under the above mentioned policy.

Warranted that Sales Return Goods / Second Hand goods shall be covered only under ICC B / ITC B Plus War / SRCC.

Excluding Denting, Bending, Scratching and Chipping unless caused by perils covered under ICC "B" / ITC "B"
Excluding Fragile items.

Excluding Mechanical, Electronic & Electrical Derangement unless caused by visible physical damages.

Excluding Rejection and Quality losses.

Excluding Rust, Oxidation & Discoloration unless caused by perils covered under ICC "B" / ITC "B"

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Excluding War & SRCC Cover for transit to/from/through UAE, Bahrain, Iraq, Kuwait, Oman, Qatar & Saudi Arabia whilst the vessel is sailing through the Persian Gulf (High Risk Area). The above War & SRCC Cover can be reinstated as per Institute War Clauses 2009 and Institute Strikes Clauses 2009, in the policy by paying additional premium at the rate of 0.025% plus GST.

a) Principal details: Munitions India Limited, High Explosives Factory (HEF) Khadki, Pune, Maharashtra, Pin code - 411003

b) Contractor Details: Engineers India Limited, 5th Floor, EI Bhawan, Plot No. 85, Sector-11, Kharghar, Navi Mumbai, Raigad, Maharashtra - 410210 and other Sub-Contractors.

Over-dimensional cargo is defined as cargo having one or more of the following characteristics: 1.Replacement time (manufacturing time plus transport time) in excess of 13 weeks; 2. any equipment for which the repair, even the slightest one, cannot be made at place of destination; any equipment which because of its weight and/or
volume requires the use of a special conveyance, and/or any item which including packing does not fit inside a standard 40 container or equivalent road trailer, thus having dimensions in excess of 12m. length and/or 2.5m wide and/or 2.5m high &/or any item with weight in excess of 25 MT.

Survey and Claim Settlement
In the event of loss or damage which may involve a claim under this insurance, immediate notice thereof and application for survey should be given to: Agents of W. K. Websters & Co. / web site: www.wkwebster.com (for Export policy) and Reliance General Insurance Company Limited (for import and inland policy)."

DECLARATION (Quarterly Basis)
It is a condition of this insurance that, until completion of the contract, the Assured is bound to declare here under to the company each and every despatch/shipment without exception, in the form prescribed by the Company for the purpose, within hours/days of the : a) departure of the Overseas Vessel from the port of shipment in the case of exports b) receipt of adviceof despatch / shipment, in the case of imports c) issue of the Railway Receipt / Parcel Way bill / postal Receipt / Consignment Note in the case of Inland Transits. The Company being bound to accept the same up to but not exceeding, the limits specified herein. The Company and/or its agents will have the previlege at any time during the business hours to inspect Asured's record of dispatches made with in the terms of the Policy.

BASIS OF VALUTATION DETAILS
Import- Invoice + 10%
Inland- Invoice + 10%

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Excess/Deductibles For EAR	
For Storage & Erection Claims	5% of the claim amount subject to a minimum of 100,000/-
For Testing Period Claims	5% of the claim amount subject to a minimum of 400,000/-
For Acts of God Claims	10% of the claim amount subject to a minimum of 400,000/-
For Fire/Explosion Claims	10% of the claim amount subject to a minimum of 400,000/-
Transit Excess	
0.5% of Consignment Value.	

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Installment Details for EAR					
Sr. No.	**Due Date**	**Premium (Excluding GST)**	**GST**	**Gross Premium**	**Status**
1	15-Oct-24	693,140	124,765	817,905	**Paid**
2	15-Jan-25	487,764	87,798	575,562	Due
3	15-Apr-25	487,764	87,798	575,562	Due
4	15-Jul-25	487,764	87,798	575,562	Due
5	15-Oct-25	487,764	87,798	575,562	Due
6	15-Jan-26	487,764	87,798	575,562	Due
7	15-Apr-26	487,764	87,798	575,562	Due
8	15-Jul-26	487,764	87,798	575,562	Due
Total Premium INR				**48,46,836**	

Premium Details	**Amount (Rs.)**
EAR Net Premium	4,107,488.00
Marine Net Premium	129,323.00
Total Net Premium	4,236,810.00
Add: IGST (18%)	762,626.00
Total Premium	4,999,436.00

GSTIN: 07AABCR6747B1ZI ; HSN: 997139 ; Description of services: Other non-life insurance services (excluding reinsurance services)

Consolidated Stamp duty paid vide Letter of Authorisation No. NO LOA/ENF-1/CSD/62/2024-25/(Validity Period Dt.01/10/2024 to Dt. 01/12/2025)/4634 dated 25th September 2024 at General Stamp Office, Mumbai.
** Not Applicable for the State of Jammu & Kashmir.

This document shall be treated as a Tax Invoice as per Rule 46 of the Central Goods and Services Tax Rules 2017.

We hereby declare that though our aggregate turnover in any preceding financial year from 2017-18 onwards is more than the aggregate turnover notified under sub-rule (4) of rule 48, we are not required to prepare an invoice in terms of the provisions of the said sub-rule.

Note: In the event of the dishonour of cheque, this policy document automatically stands cancelled from inception, irrespective of whether a separate communication is sent or not.

In witness whereof this policy has been signed at Mumbai on policy original tax invoice date 30/10/2024 in lieu of Policy No. as mentioned in the policy.

For any assistance with claims, please contact us on 74004 22200, (022) 4890 3009 or email us at rgicl.services@reliancegeneral.co.in

In case of a renewal, the benefits provided under the policy and/or terms and conditions of the policy including premium rate may be subject to change.

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For and on behalf of
Reliance General Insurance Company Limited,



Authorised Signatory

The policy wording with detailed terms, conditions and exclusions are available on our website www.reliancegeneral.co.in
The Customer Information Sheet (CIS) for this product is available on our website https://www.reliancegeneral.co.in/insurance/about-us/downloads.aspx
Grievance Clause: For resolution of any query or grievance, Insured may contact the respective branch office of the Company or may call at (022) 4890 3009 or may write an email at rgicl.services@relianceada.com. In case the insured is not satisfied with the response of the office, insured may contact the Nodal Grievance Officer of the Company at rgicl.grievances@relianceada.com. In the event of unsatisfactory response from the Nodal Grievance Officer, insured may email to Head Grievance Officer at rgicl.headgrievances@relianceada.com. In the
event of unsatisfactory response from the Head Grievance Officer, he/she may, subject to vested jurisdiction, approach the Insurance Ombudsman for the redressal of grievance. Details of the offices of the Insurance Ombudsman are available at IRDAI website www.irda.gov.in or on company website www.reliancegeneral.co.in or on www.gbic.co.in. The insured may also contact the following office of the Insurance
Ombudsman within whose territorial jurisdiction the branch or office of the Company is located: Smt. Sandhya Baliga Office of the Insurance Ombudsman,2/2 A,Universal Insurance Building,Asaf Ali Road,New Delhi â€“ 110 002. Tel.: 011 - 23239633 / 23237532 Fax: 011 - 23230858 Email: bimalokpal.delhi@cioins.co.in

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Reliance Erection All Risks Insurance-Insurance Policy 130162422120047124

WHEREAS the insured named in the Schedule hereto by a proposal and declaration, which shall be the basis of this contract and is deemed to be incorporated herein has applied to the Reliance General Insurance Co. Ltd. (hereinafter called the Company) for the insurance hereinafter contained and has paid the premium as consideration for such Insurance in respect of accident or damage occurring during the period of Insurance stated in the Schedule or during any subsequent period for which the Insured pays and the Company may accept the premium for the renewal of this Policy.

NOW THIS POLICY OF INSURANCE WITNESSETH

that subject to and in consideration of the Insured having paid to the Company, the premium mentioned in the said Schedule and subject to the terms, exclusions, provisions and conditions contained herein or endorsed here on the company will indemnify the Insured against sudden and unforeseen physical loss of or damage to the property insured in the manner and to the extent hereinafter provided.

General Exclusions –

The Company will not indemnify the Insured in respect of loss, damage or liability directly or indirectly caused by or arising out of or aggravated by -
a) War, invasion, act of foreign enemy, hostilities or war like operations (whether war be declared or not), civil war, rebellion, revolution, insurrection, mutiny, civil commotion, military or usurped power, martial law, conspiracy, confiscation, commandeering a group of malicious persons or persons acting on behalf of or in connection with any political organisation, requisition or destruction or damage by order of any government dejure or de facto or by any public, municipal or local authority.
b) Nuclear reaction, nuclear radiation or radioactive contamination.
c) Wilful act or wilful negligence of the Insured or of his responsible representative
d) Cessation of work whether total or partial.
e) Terrorism Damage Exclusion Warranty: "Notwithstanding any provision to the contrary within this insurance it is agreed that this insurance excludes loss, damage cost or expense of whatsoever nature directly or indirectly caused by, resulting from or in connection with any act of terrorism regardless of any other cause or event contributing concurrently or in any other sequence to the loss.

For the purpose of this warranty an act of terrorism means an act, including but not limited to the use of force or violence and /or the threat thereof, of any person or group(s) of persons whether acting alone or on behalf of or in connection with any organisation(s) or governments(s) committed for political, religious, ideological or similar purpose including the intention to influence any government and/or to put the public, or any section of the public in fear.

The warranty also excludes loss, damage, cost or expenses of whatsoever nature directly or indirectly caused by, resulting from or in connection with any action taken in controlling, preventing, suppressing or to in any way relating to action taken in respect of an act of terrorism.

If the Company alleges that by reason of this exclusion, any loss, damage, cost or expenses is not covered by this insurance the burden of proving the contrary shall be upon the Assured."
In the event any portion of this endorsement is found to be invalid or unenforceable, the remainder shall remain in full force and effect.

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In any action, suit or other proceedings where the company allege that by reason of the provisions of Exclusion (a) above any loss, destruction, damage or liability is not covered by this insurance, the burden of proving that such loss, destruction, damage or liability is covered shall be upon the Insured.

Period Of Cover -

The liability of the Company shall commence, (notwithstanding any date to the contrary specified in the Schedule) only from the time after the unloading of the property specified in the Schedule from any conveyance at the site specified in the schedule and shall continue until immediately after the first test operation or test loading is concluded (whichever is earlier) but in no case beyond four weeks from the day on which after completion of erection a trial running is made and/or readiness for work is declared by the erectors/contractors, whichever is earlier. If however, a part of a plant or one or several machine/s is/are tested and put into operation the cover and consequently the liability of the Company for that particular part of the plant or machine ceases whereas it continues for the remaining parts which are not yet ready.

In case after the expiry of four weeks of trial running, approval of the plant or any part thereof is not given by the concerned Authorities the cover for the extended period of further trial running can be covered at extra premium to be arranged beforehand.

If the actual erection period is shorter than the period indicated in the Schedule, no refund of premium shall be allowed, unless specifically allowed by Insurers.

In the case of second-hand/used property, the insurance hereunder shall however, cease immediately on the commencement of the testing.

At the latest, the insurance shall expire on the date specified in the Schedule but if the work of erection and test operations included in the insurance is not completed within the time specified hereunder, the company may extend the period of Insurance but the Insured shall pay to the Company additional premium at agreed rates.

General Conditions –

1. The due observance and fulfilment of the terms of this Policy in so far as they relate to anything to be done or complied with by the Insured and the truth of the statements and answers in the questionnaire and proposal made by the Insured shall be a condition precedent to any liability of the company.

2. The Schedule and the Section(s) shall be deemed to be incorporated in and form part of this policy and the expression 'this Policy' wherever used in this contract shall be read as including the Schedule and the Section(s). Any word or expression to which a specific meaning has been attached in any part of this Policy or of the Schedule or of the Section(s) shall bear such meaning wherever it may appear.

3. The Insured shall at his own expense take all reasonable precautions and comply with all reasonable recommendations of the Company to prevent loss, damage or liability and comply with statutory requirements and manufacturers' recommendations.

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4. a) Representatives of the Company shall at any reasonable time have the right to inspect and examine the risk and the Insured shall provide the representatives of the company with all details and information necessary for the assessment of the risk.

b) The Insured shall immediately notify the Company by telegram and in writing of any material change in the risk and cause at his own expense such additional precautions to be taken as circumstances may require and the scope of cover and/or premium shall, if necessary be adjusted accordingly.

No material alteration shall be made or admitted by the Insured whereby the risk is increased unless the continuance of the Insurance be confirmed in writing by the Company.

5. In the event of any occurrence, which might give rise to a claim under this Policy, the Insured shall –

a) Immediately notify the Company by telephone or telegram as well as in writing giving an indication as to the nature and extent of loss or damage.
b) take all steps within his power to minimize the extent of the loss or damage
c) preserve the parts affected and make them available for inspection by a representative of the company or surveyor deputed by the Company.
d) furnish all such information and documentary evidence as the company may require.
e) inform the police authorities in case of loss or damage due to theft or burglary.

The Company shall not in any case be liable for loss, damage or liability of which no notice has been received by the company within 14 days of its detection.

Upon notification being given to the Company under this condition, the Insured may carry out the repair or replacement of any minor damage not exceeding 7,500/-. In all other cases a representative of the company shall have the opportunity of inspecting the loss or damage before any repairs or alterations are affected. If a representative of the company does not carry out the inspection within a period of time which could be considered as adequate under the circumstances the Insured is entitled to proceed with the repairs or replacement.

The liability of the Company under this Policy in respect of any item sustaining damage shall cease if said item is not repaired properly without delay.

6. The Insured shall at the expense of the Company do and concur in doing and permit to be done all such acts and things as may be necessary or required by the Company in the interest of any rights or remedies, or of obtaining relief or indemnity from parties (other than those insured under this Policy) to which the company shall be or would become entitled or subrogated upon their paying for or making good any loss or damage under this Policy, whether such acts and things shall be or become necessary or required before or after the Insured's indemnification by the company.

7. The parties to the contract may mutually agree and enter into a separate Arbitration Agreement to settle any and all disputes in relation to this policy. Arbitration shall be conducted under and in accordance with the provisions of the Arbitration and Conciliation Act, 1996.

8. If a claim is in any respect fraudulent, or if any false declaration is made or used in support thereof, or if any fraudulent means or devices are used by the Insured or anyone acting on his behalf to obtain any benefit under this

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Policy, or if a claim is made and rejected and no action or suit is commenced within three months after such rejection or, in case of arbitration taking place as provided therein, within three months after the Arbitrator or Arbitrators or Umpire have made their award, all benefit under this Policy shall be forfeited.

9. If at the time any claim arises under this Policy there be any other insurance covering the same loss, damage or liability the company shall not be liable to pay or contribute more than their rateable proportion of any claim for such loss, damage or liability.
10. This insurance may be terminated at the request of the Insured at any time in which case the Insurers will refund appropriate premium amount subject to the following conditions.
i) Claims experience under the policy as on date of cancellation should be less than 60 % of reworked premium.
ii) The unexpired period is not less than 3 months or 25% of the policy period, whichever is less
iii) Testing period should not have commenced.

This insurance may also at any time be terminated at the option of the Insurer by 15 days notice to that effect being given to the Insured in which case the Insurers shall be liable to repay on demand a rateable proportion of the premium for the unexpired term from the date of cancellation.

Section I - Material Damage
The Company hereby agrees with the Insured (subject to the exclusions and conditions contained herein or endorsed here on) that if, at any time during the period of insurance stated in the said Schedule, or during any further period of extension thereof the property (except packing materials of any kind) or any part thereof described in the said Schedule be lost, damaged or destroyed by any cause, other than those specifically excluded hereunder, in a manner necessitating replacement or repair the Company will pay or make good all such loss or damage up to an amount not exceeding in respect of each of the items specified in the Schedule the sum set opposite thereto and not exceeding in the whole the total sum insured hereby -
The Company will also reimburse the Insured for the cost of clearance and removal of debris following upon any event giving rise to an admissible claim under this policy but not exceeding in all the sum (if any) set opposite thereto in the Schedule.

Exclusion To Section I -
The Company, shall not, however, be liable for -
a) the first amount of the loss arising out of each and every occurrence shown as Excess in the Schedule;
b) loss discovered only at the time of taking an inventory;
c) normal wear and tear, gradual deterioration due to atmospheric conditions or otherwise, rust, scratching of painted or polished surfaces or breakage of glass;
d) loss or damage due to faulty design, defective material or casting, bad workmanship other than faults in erection.
Note - This exclusion shall be limited to the items immediately affected and shall not be deemed to exclude loss or damage to other insured items resulting from such excluded perils;
e) the cost necessary for rectification or correction of any error during erection unless resulting in physical loss or damage;
f) loss of or damage to files, drawings, accounts, bills, currency, stamps, deeds, evidence of debt, notes, securities cheques, packing materials such as cases, boxes, crates;
g) any damage or penalties on account of the Insured's non- fulfilment of the terms of delivery or completion under his Contract of Erection or of any obligations assumed there under including consequential loss of any kind or description or for any aesthetic defects or operational deficiencies.

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Provisions Applying To Section I -
Memo 1. SUM INSURED –

It is a requirement of this insurance that the Sum of Insurance stated in the Schedule shall not be less than the completely erected value of the property inclusive of freights, customs duty, erection cost and the Insured undertakes to increase or decrease the amount of insurance in the event of any material fluctuation in the level of wages or prices. Provided always that such increase or decrease shall take effect only after the same has been recorded on the Policy by the Company.
If, in the event of the occurrence of a loss, or damage it is found that the Sum Insured representing the completely erected value of the property and/or of particular items involved is less than the amount required to be insured the amount recoverable by the Insured under the Policy shall be reduced in such proportion as the Sum Insured bears to the amount required to be insured.

Memo 2. PREMIUM ADJUSTMENT –

The sum insured under the Policy representing the completely erected value of the plant machinery/project shall be adjustable at completion of erection on the basis of the actual values to be declared by the insured in respect of freight and handling charges, customs dues and costs of erection and the difference in premium shall be met with by payment, at the rate agreed to or by the insured as the case may be. Any increase or decrease in prime cost of Plant and Equipment shall not be the subject matter of premium adjustment.

Memo 3. BASIS OF LOSS SETTLEMENT -
In the event of any loss or damage the basis of any settlement under this Policy shall be -
a) in the case of damage which can be repaired, the cost of repairs necessary to restore the items to their condition immediately before the occurrence of the damage less salvage, OR

b) in the case of a total loss the actual value of the items immediately before the occurrence of the loss less salvage;
However, only to the extent the costs claimed has to be borne by the Insured and to the extent they are included in the Sum Insured and provided always that the provisions and conditions have been complied with.
All damages which can be repaired shall be repaired, but if the cost of repairing any damage equals or exceeds the value of the items immediately before the occurrence of the damage the settlement shall be made on the basis provided for in (b) above. The cost of any provisional repairs will be borne by the Company if such repairs constitute part of the final repairs and do not increase the total repair expenses.
The cost of any alterations, additions and/or improvements shall not be recoverable under this Policy.

Extension of Cover - Any extra charges incurred for overtime, work on holidays, express freight (including air freight), are not covered by this insurance, unless agreed upon at an additional premium.

In the event of loss or damage the insurance shall notwithstanding be maintained in force during the period of insurance for the sum insured, the insured undertaking to pay a pro-rata additional premium of the full amount of each claim for the loss or damage from the date of such loss to the expiry of the period of insurance.

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Memo 4. CONSTRUCTION PLANT AND MACHINERY –

Loss of or damage to Construction Plant and Machinery excludes loss or damage directly caused by its own explosion or its own mechanical or electrical breakdown or derangement.

Memo 5 - SURROUNDING PROPERTY –

Loss or damage to property located on or adjacent to the site and belonging to or held in care, custody or control of the Principal(s) or the Contractor (s) shall only be covered if occurring directly due to the erection, construction or testing of the items insured under Section I and happening during the period of cover, and provided that a separate Sum therefore has been entered in the Schedule under Section I, Item 5 for Principal's specified surrounding property. This cover does not apply to construction/erection machinery, plants and equipment.

Memo 6 - MAJOR PERILS/ACTS OF GOD CLAIMS -
The Major Perils/Acts of God Claims shall mean the claims arising out of -
a) Earthquake - Fire & Shock
b) Landslide/Rockslide/Subsidence,
c) Flood/Inundation,
d) Storm/Tempest/Hurricane/Typhoon/Cyclone/lightning or other atmospheric disturbances.

Section II - THIRD PARTY LIABILITY

The Company will indemnify the Insured against -
a) Legal liability for accidental loss or damage caused to property of other persons including property held in trust by or under custody of the Insured for which he is responsible excluding any such property used in connection with erection thereon;

b) Legal liability (liability under contract excepted) for fatal or non-fatal injury to any person other than the Insured's own employees or workman or employees of the owner of the works or premises or other firms connected with any other erection work thereon, or members of the Insured's family or of any of the aforesaid; directly consequent upon or solely due to the erection of any property described in the Schedule.

Provided that the total liability of the Company during the period of Insurance under this clause shall not exceed the limits of Indemnity set opposite thereto in the Schedule.
In respect of a claim for compensation to which the indemnity provided herein applies, the Company will, in addition, indemnify the Insured against -

a) all cost and expenses of litigation recovered by any claimant from the Insured, and

b) all costs and expenses incurred with the written consent of the Company.
The exclusion contained in paragraphs (d), (f) & (g) in Section I of this Policy shall apply to this Section also.

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Exclusions To Section II -

The Company will not indemnify the Insured in respect of -

1. The Excess stated in the Schedule to be borne by the Insured in any one occurrence related to property damage
2. Expenditure incurred in doing or redoing or making good or repairing or replacing anything covered or coverable under Section I of this Policy;
3. Liability consequent upon -

a) bodily injury to or illness of employees or workmen of the Contractor(s) or the Principal(s) or any other firm connected with the project which or part of which is insured under Section I, or members of their families;

b) loss of or damage to property belonging to or held in care, custody or control of the Contractor(s), the Principal(s) or any other firm connected with the project which or part of which is insured under Section I, or an employee or workman of one of the aforesaid;

c) any accident caused by vehicles licensed for general road use or by waterborne vessels or aircraft;

d) any agreement by the Insured to pay any sum by way of indemnity or otherwise unless such liability would have attached also in the absence of such agreement.

Conditions Applying To Section II -

1. No admission, offer, promise, payment or indemnity shall be made or given by or on behalf of the Insured without the written consent of the Company who shall be entitled if they so desire, to take over and conduct in the name of the Insured the defence or settlement of any claim or to prosecute for their own benefit in the name of the Insured any claim for indemnity or damage or otherwise and shall have full discretion in the conduct of any proceedings or in the settlement of any claim and the Insured shall give all such information and assistance as the Company may require.
2. The Company may, so far as any accident is concerned, pay to the Insured the limit of indemnity for any one accident, any one period, but deducting there from in such case any sum/s already paid as compensation in respect thereof or any lesser sum for which the claim or claims arising from such accident can be settled and the company shall thereafter be under no further liability in respect of such accident under this section.

Terrorism Damage Exclusion Warranty

This Policy excludes loss, damage, cost or expense of whatsoever nature directly or indirectly caused by, resulting from or in connection with any act of terrorism regardless of any other cause or event contributing concurrently or in any other sequence to the loss.

For the purpose of this exclusion, an act of terrorism means an act or series of acts, including but not limited to the use of force or violence and/or the threat thereof, of any person or group(s) of persons, whether acting alone or on behalf of or in connection with any organisation(s) or government(s), or unlawful associations, recognized under Unlawful Activities (Prevention) Amendment Act, 2008 or any other related and applicable national or state legislation formulated to combat unlawful and terrorist activities in the nation for the time being in force, committed for political, religious, ideological or similar purposes including the intention to influence any government and/or to put the public or any section of the public in fear for such purposes.

This exclusion also includes loss, damage, cost or expense of whatsoever nature directly or indirectly caused by, resulting from or in connection with any action taken in controlling, preventing, suppressing or in any way relating to the above.

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ENGG/END-101: CIVIL ENGINEERING WORKS -

It is hereby declared and agreed, subject to the exceptions contained herein, or endorsed hereon, that this Policy is extended to cover the risks of loss or damage to property brought on to the Site of Erection for the performance of the erection contract, details of which are stated as under --

a) All permanent Civil Engineering Works such as buildings, foundations earthwork including materials for the constructions thereon.

b) All temporary works such as buildings, sheds

PROVIDED that the following exclusions shall apply -

i) loss or damage directly caused by defective workmanship material, or design or wear and tear,

ii) loss or damage directly caused by mechanical breakdown or derangement,

iii) loss or damage directly caused by deterioration due to lack of use or obsolescence,

iv) any loss of property either by disappearance or by shortage if such disappearance or shortage alone is revealed during and after an inventory is made,

v) Cessation of work whether total or partial,

vi) loss, destruction or damage of accounts, bills, currency stamps, deeds, evidence of debt, money, notes or securities.

The exclusions of loss or damage caused by (i), (ii) and (iii) above shall be limited to the machine structure or work immediately affected and shall not extend to other work or the property lost or damaged in consequence of the defect, wear & tear, breakdown, derangement or deterioration, subject to the Condition that:-

The Insured shall take all reasonable precautions in the selection of labour and to maintain in efficient condition all tools and equipments used in connection with performance of this erection contract.

Provided that all the conditions of this Policy shall apply in all respects to the Insurance granted by this extension save in so far as the same are expressly varied hereby and any reference to loss or damage in the conditions of the Policy shall be deemed to include the perils hereby insured against.

ENGG/END-110: ENDORSEMENT CONCERNING STORAGE -

It is agreed and understood that otherwise subject to the terms, exclusions, provisions and conditions contained in the policy or endorsed thereon, the Insurers shall only indemnify the Insured for loss of or damage to the Insured items during storage upto a value per storage unit not exceeding the equivalent of Rs.50 Crores

The individual storage units shall be either at least 15 m apart or separated by fireproof walls.

ENGG/END-111: ENDORSEMENT REGARDING SAFETY MEASURES -

It is agreed and understood that otherwise subject to the terms, exclusions, provisions and conditions contained in the policy or endorsed thereon, the

Insurers shall only indemnify the Insured for loss, damage or liability directly or indirectly caused by flood and inundation if adequate safety measures have been taken during planning and execution of the project. Adequate safety measures in this context shall mean that the average monthly rainfall, flood and inundation hazard as known from statistics of the competent meteorological offices for the respective month and location has been taken into account.

ENGG/END-112: ENDORSEMENT REGARDING DAMAGE TO CROPS, FORESTS ETC.

It is agreed and understood that otherwise subject to the terms, exclusions, provisions and conditions contained in the policy or endorsed thereon, the Insurers shall not indemnify the Insured for loss, damage or liability directly or indirectly caused to crops, forests and/or any cultures during the execution of the contract works.

ENGG/END-114: WARRANTY CONCERNING UNDERGROUND CABLES AND PIPES -

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It is agreed and understood that otherwise subject to the terms, exclusions, provisions and conditions contained in the policy or endorsed thereon, the insurers shall only indemnify the Insured in respect of loss of or damage to existing underground cables and/or pipes or other underground facilities if, prior to the commencement of works, the Insured has enquired with the relevant authorities about the exact position of such cables, pipes or other underground facilities.
The indemnity shall in any case be restricted to the repair costs of such cables, pipes or other underground facilities, any consequential damage being excluded from the cover.

EARTHQUAKE:-
Article 1
It is hereby agreed and declared that notwithstanding anything stated in the printed exclusions of this policy to the contrary, this Insurance is extended to cover loss or Damage (including loss or Damage by Fire) to any of the property insured by this policy occasioned by or through or in consequence of earthquake including flood or overflow of the sea, lakes, reservoirs and rivers and / or Landslide / Rockslide resulting therefrom.
Special conditions: -
1. Excess as mentioned in the policy for Act of God Perils
2. Onus of proof
In the event of the Insured making any claim for loss or damage under this policy the insured must (if so required by the Company) prove that the loss or damage was occasioned by or through or in consequence of earthquake.

Article 2
The coverage is on First Loss Basis with Limit of Liability up to under of SI per event.

Special Conditions Concerning Fire Fighting Facilities

It is agreed and understood that otherwise subject to the terms, exclusions, provisions and conditions contained in the Policy or endorsed thereon, the Insurers shall only indemnify the Insured for loss or damage resulting directly or indirectly from fire and/or explosion if the following requirements are fulfilled:-
° Adequate fire-fighting equipment and extinguishing agents of sufficient capacity must always be available at the site and ready for immediate use.
° Sufficient number of workmen must be fully trained in the use of such equipment and must be available for immediate intervention at all times.
° If storage of material for the construction or erection of the contract works is necessary at site or any other location within India, storage must be subdivided into storage units not exceeding the equivalent value of Rs 50 Cr per storage unit. The individual storage units must either be at least 15 meters apart or separated by fire-proof walls.
All inflammable materials (such as shuttering material not fitted for concreting, litter, etc.) and especially all inflammable liquids and gases must be stored at a sufficiently large distance from the property under construction or erection and any hot work like welding etc.
° Provided further that in respect of storages of Indian sourced materials at locations other than the site, the amount payable shall not exceed Rs. 50 Cr at any one location.
° Welding, soldering or the use of an open flame in the vicinity of combustible material is permitted only if at least one workman suitably equipped with extinguishers and well trained in fire-fighting is present.
° At the beginning of testing all fire-fighting facilities designed for the operation of the plant must be installed and serviceable.

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Communicable Disease Exclusion Clause

1. Notwithstanding any provision, clause or term the policy to the contrary, the policy excludes any loss, cost, damage, liability, claim, fines, penalty or expense or any other amount of whatsoever nature, whether directly or indirectly and/or in whole or in part, related to, caused by, contributed to by, resulting from, as
a result of, as a consequence of, attributable to, arising out of, arising under, in connection with, or in any way involving (this includes all other terms commonly used and/or understood to reflect or describe nexus and/or connection from one thing to another whether direct or indirect):
1.1 a Communicable Disease and/or the fear or threat (whether actual or perceived) of a Communicable Disease and/or the actual or alleged transmission of a Communicable Disease regardless of any other cause or event contributing and/ or occurring concurrently or in any sequence thereto, and
1.2 a pandemic or epidemic, as declared by the World Health Organisation or any governmental authority.
2. As used herein, Communicable Disease means: any infectious, contagious or communicable substance or agent and/or any infectious, contagious or communicable disease which can be caused and/or transmitted by means of substance or agent where:
2.1 the disease includes, but is not limited an illness, sickness, condition or an interruption or disorder of body functions, systems or organs, and
2.2 the substance or agent includes, but is not limited to, a virus, bacterium, parasite, other organism or other micro-organism (whether asymptomatic or not); including any variation or mutation thereof, whether deemed living or not, and
2.3 the method of transmission, whether direct or indirect, includes but not limited to, airborne transmission, bodily fluid transmission, transmission through contact with human fluids, waste or the like, transmission from or to any surface or object, solid, liquid or gas or between organisms including between humans, animals, or from any animal to any human or from any human to any animal, and

2.4 the disease, substance or agent is such:
2.4.1 that causes or threatens damage or can cause or threaten damage to human health or human welfare, or
2.4.2 that causes or threatens damage to or can cause or threaten damage to, deterioration to, contamination of, loss of value of, loss of marketability of or
loss of use or usefulness of, tangible or intangible property.
For avoidance of doubt, Communicable Disease includes but is not limited to Coronavirus Disease 2019 (Covid -19) and any variation or mutation thereof.
3. For further avoidance of doubt, any contingent or other business interruption loss, cost, damage, loss of income, loss of use, increased cost of working
and/or extra expense arising out of or attributable to:
3.1 any partial or complete closure of and/or slowdown in, including but not limited to any closure by or under the advisories of public, military, government or
civil authorities, or any denial of access to reinsured premises, or customer and or supplier premises (including service / utility providers), or
3.2 change in consumer behaviour, or
3.3 an absence of infected employees or employees suspected of being infected shall not be covered by the policy.
4. For still further avoidance of doubt, loss, cost, damage, liability, claim, fines, penalty or expense or any other amount excluded hereby, includes but is not limited to any cost to identify, clean-up, detoxify, disinfect, decontaminate, mitigate, remove, evacuate, repair, replace, monitor, sanitize or test: (1) for a
Communicable Disease or (2) any tangible or intangible property covered by the policy that is affected by such Communicable Disease.

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5. It is clarified that (1) no other prior, concurrent or subsequent provision, clause, term or exception of the policy(including (but not limited to) any prior, concurrent or subsequent endorsement and/or any provision, clause, term, buy back or exception that operates, or is intended to operate, to extend the coverage of, or protections provided by, the policy by whatever name called like any coverage extension, additional coverage, global extension, exception to any exclusion); (2) any change in the law, clause or similar provision; (3) any follow the fortunes clause or similar provision; and/or (4) no change in the law or any regulation (to the extent permitted by applicable law), shall operate to provide any reinsurance, coverage or protection under the policy that would otherwise be excluded through the exclusion set forth in this [Clause].
6. If the insurer alleges that by reason of this [Clause]any amount is not covered by the policy, the burden of proving the contrary shall rest in the insured.

Wordings for Reliance Marine-Insurance Policy 13012242423M000503

Institute Cargo Clauses (A)- 1/1/2009 CL 382

RISKS COVERED
1. This insurance covers all risks of loss of or damage to the subject-matter insured except as excluded by the provisions of Clauses 4, 5, 6 and 7 below.
General Average
2. This insurance covers general average and salvage charges, adjusted or determined according to the contract of carriage and/or the governing law and practice, incurred to
avoid or in connection with the avoidance of loss from any cause except those excluded in Clauses 4, 5, 6 and 7 below.
"Both to Blame Collision Clause"
3. This insurance indemnifies the Assured, in respect of any risk insured herein, against liability incurred under any Both to Blame Collision Clause in the contract of carriage. In
the event of any claim by carriers under the said Clause, the Assured agree to notify the Insurers who shall have the right, at their own cost and expense, to defend the
Assured against such claim.

EXCLUSIONS
4. In no case shall this insurance cover
4.1 loss damage or expense attributable to wilful misconduct of the Assured
4.2 ordinary leakage, ordinary loss in weight or volume, or ordinary wear and tear of the subject-matter insured
4.3 loss damage or expense caused by insufficiency or unsuitability of packing or preparation of the subjectmatter insured to withstand the ordinary incidents of the insured transit here such packing or preparation is carried out by the Assured or their employees or prior to the attachment of this insurance (for the purpose of these Clauses "packing" shall be deemed to include stowage in a container and "employees" shall not include independent contractors)
4.4 loss damage or expense caused by inherent vice or nature of the subject-matter insured
4.5 loss damage or expense caused by delay, even though the delay be caused by a risk insured against (except expenses payable under Clause 2 above)
4.6 loss damage or expense caused by insolvency or financial default of the owners managers charterers or operators of the vessel where, at the time of loading of the subject-matter insured on board the vessel, the Assured are aware,

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or in the ordinary course of business should be aware, that such insolvency or financial default could prevent the normal prosecution of the voyage This exclusion shall not apply where the contract of insurance has been assigned to the party claiming hereunder who has bought or agreed to buy the subject-matter insured in good faith under a binding contract
4.7 loss damage or expense directly or indirectly caused by or arising from the use of any weapon or device employing atomic or nuclear fission and/or fusion or other like reaction or radioactive force or matter.

5.

5.1 In no case shall this insurance cover loss damage or expense arising from
5.1.1 unseaworthiness of vessel or craft or unfitness of vessel or craft for the safe carriage of the subject-matter insured, where the Assured are privy to such unseaworthiness or unfitness, at the time the subject-matter insured is loaded therein
5.1.2 unfitness of container or conveyance for the safe carriage of the subject-matter insured, where loading therein or thereon is carried out prior to attachment of this insurance or by the Assured or their employees and they are privy to such unfitness at the time of loading.

5.2 Exclusion 5.1.1 above shall not apply where the contract of insurance has been assigned to the party claiming hereunder who has bought or agreed to buy the subject matter insured in good faith under a binding contract.

5.3 The Insurers waive any breach of the implied warranties of seaworthiness of the ship and fitness of the ship to carry the subject-matter insured to destination.

6. In no case shall this insurance cover loss damage or expense caused by
6.1 war civil war revolution rebellion insurrection, or civil strife arising therefrom, or any hostile act by or against a belligerent power
6.2 capture seizure arrest restraint or detainment (piracy excepted), and the consequences thereof or any attempt thereat
6.3 derelict mines torpedoes bombs or other derelict weapons of war.

7. In no case shall this insurance cover loss damage or expense
7.1 caused by strikers, locked-out workmen, or persons taking part in labour disturbances, riots or civil commotions
7.2 resulting from strikes, lock-outs, labour disturbances, riots or civil commotions
7.3 caused by any act of terrorism being an act of any person acting on behalf of, or in connection with, any organisation which carries out activities directed towards the overthrowing or influencing, by force or violence, of any government whether or not legally constituted

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DURATION
Transit Clause

8.

8.1 Subject to Clause 11 below, this insurance attaches from the time the subject-matter insured is first moved in the warehouse or at the place of storage (at the place named in the contract of insurance) for the purpose of the immediate loading into or onto the carrying vehicle or other conveyance for the commencement of transit, continues during the ordinary course of transit and terminates either

8.1.1 on completion of unloading from the carrying vehicle or other conveyance in or at the final warehouse or place of storage at the destination named in the contract
of insurance,

8.1.2 on completion of unloading from the carrying vehicle or other conveyance in or at any other warehouse or place of storage, whether prior to or at the destination named in the contract of insurance, which the Assured or their employees elect to use either for storage other than in the ordinary course of transit or for allocation or distribution, or

8.1.3 when the Assured or their employees elect to use any carrying vehicle or other conveyance or any container for storage other than in the ordinary course of transit
Or

8.1.4 on the expiry of 60 days after completion of discharge overside of the subject-matter insured from the oversea vessel at the final port of discharge, whichever shall first occur.

8.2 If, after discharge overside from the oversea vessel at the final port of discharge, but prior to termination of this insurance, the subject-matter insured is to be forwarded to a destination other than that to which it is insured, this insurance, whilst remaining subject to termination as provided in Clauses 8.1.1 to 8.1.4, shall not extend beyond the time the subject-matter insured is first moved for the purpose of the commencement of transit to such other destination.

8.3 This insurance shall remain in force (subject to termination as provided for in Clauses 8.1.1 to 8.1.4 above and to the provisions of Clause 9 below) during delay beyond the control of the Assured, any deviation, forced discharge, reshipment or transhipment and during any variation of the adventure arising from the exercise of a liberty granted to carriers under the contract of carriage.

Termination of Contract of Carriage

8. If owing to circumstances beyond the control of the Assured either the contract of carriage is terminated at a port or place other than the destination named therein or the transit is otherwise terminated before unloading of the subject-matter insured as provided for in Clause 8 above, then this insurance shall also terminate unless prompt notice is given to the Insurers and continuation of cover is requested when this insurance shall remain in force, subject to an additional premium if required by the Insurers, either

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9.1 until the subject-matter insured is sold and delivered at such port or place, or, unless otherwise specially agreed, until the expiry of 60 days after arrival of the subjectmatter insured at such port or place, whichever shall first occur, or

9.2 if the subject-matter insured is forwarded within the said period of 60 days (or any agreed extension thereof) to the destination named in the contract of insurance or to any other destination, until terminated in accordance with the provisions of Clause 8 above.

Change of Voyage

10.

10.1 Where, after attachment of this insurance, the destination is changed by the Assured, this must be notified promptly to Insurers for rates and terms to be agreed. Should a loss occur prior to such agreement being obtained cover may be provided but only if cover would have been available at a reasonable commercial market rate on reasonable market terms.

10.2 Where the subject-matter insured commences the transit contemplated by this insurance (in accordance with Clause 8.1), but, without the knowledge of the Assured or their employees the ship sails for another destination, this insurance will nevertheless be deemed to have attached at commencement of such transit.

CLAIMS

Insurable Interest

11.

11.1 In order to recover under this insurance the Assured must have an insurable interest in the subjectmatter insured at the time of the loss.

11.2 Subject to Clause 11.1 above, the Assured shall be entitled to recover for insured loss occurring during the period covered by this insurance, notwithstanding that the loss occurred before the contract of insurance was concluded, unless the Assured were aware of the loss and the Insurers were not.

Forwarding Charges

12. Where, as a result of the operation of a risk covered by this insurance, the insured transit is terminated at a port or place other than that to which the subject-matter insured is covered under this insurance, the Insurers will reimburse the Assured for any extra charges properly and reasonably incurred in unloading storing and forwarding the subject matter insured to the destination to which it is insured.

This Clause 12, which does not apply to general average or salvage charges, shall be subject to the exclusions contained in Clauses 4, 5, 6 and 7 above, and shall not include
charges arising from the fault negligence insolvency or financial default of the Assured or their employees.

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Constructive Total Loss

13. No claim for Constructive Total Loss shall be recoverable hereunder unless the subject-matter insured is reasonably abandoned either on account of its actual total loss appearing to be unavoidable or because the cost of recovering, reconditioning and forwarding the subject-matter insured to the destination to which it is insured would exceed its value on arrival.

Increased Value

14.

14.1 If any Increased Value insurance is effected by the Assured on the subject-matter insured under this insurance the agreed value of the subject-matter insured shall be deemed to be increased to the total amount insured under this insurance and all Increased Value insurances covering the loss, and liability under this insurance shall be in such proportion as the sum insured under this insurance bears to such total amount insured.

In the event of claim the Assured shall provide the Insurers with evidence of the amounts insured under all other insurances.

14.2 Where this insurance is on Increased Value the following clause shall apply: The agreed value of the subject-matter insured shall be deemed to be equal to the total amount insured under the primary insurance and all Increased Value insurances

covering the loss and effected on the subject-matter insured by the Assured, and liability under this insurance shall be in such proportion as the sum insured under this insurance bears to such total amount insured.
In the event of claim the Assured shall provide the Insurers with evidence of the amounts insured under all other insurances.

BENEFIT OF INSURANCE

15. This insurance

15.1 covers the Assured which includes the person claiming indemnity either as the person by or on whose behalf the contract of insurance was effected or as an assignee,

15.2 shall not extend to or otherwise benefit the carrier or other bailee.

MINIMISING LOSSES

Duty of Assured

16. It is the duty of the Assured and their employees and agents in respect of loss recoverable hereunder

16.1 to take such measures as may be reasonable for the purpose of averting or minimising such loss, and
16.2 to ensure that all rights against carriers, bailees or other third parties are properly preserved and exercised and the Insurers will, in addition to any loss recoverable hereunder, reimburse the Assured for any charges properly and reasonably incurred in pursuance of these duties.

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Waiver

17. Measures taken by the Assured or the Insurers with the object of saving, protecting or recovering the subjectmatter insured shall not be considered as a waiver or acceptance of abandonment or otherwise prejudice the rights of either party.

AVOIDANCE OF DELAY

18. It is a condition of this insurance that the Assured shall act with reasonable despatch in all circumstances within their control.

LAW AND PRACTICE

19. This insurance is subject to English law and practice

NOTE:- Where a continuation of cover is requested under Clause 9, or a change of destination is notified under Clause 10, there is an obligation to give prompt notice to the Insurers and the right to such cover is dependent upon compliance with this obligation.

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CL382
01/01/2009

Institute Cargo Clauses B CL 383 01/01/2009

RISKS COVERED

Risks

1. This insurance covers, except as excluded by the provisions of Clauses 4, 5, 6 and 7 below,

1.1 loss of or damage to the subject-matter insured reasonably attributable to
1.1.1 fire or explosion
1.1.2 vessel or craft being stranded grounded sunk or capsized
1.1.3 overturning or derailment of land conveyance
1.1.5 collision or contact of vessel craft or conveyance with any external object other than water
1.1.6 discharge of cargo at a port of distress
1.1.7 earthquake volcanic eruption or lightning,

1.2 loss of or damage to the subject-matter insured caused by
1.2.1 general average sacrifice
1.2.2 jettison or washing overboard
1.2.3 entry of sea lake or river water into vessel craft hold conveyance container or place of storage,

1.3 total loss of any package lost overboard or dropped whilst loading on to, or unloading from, vessel or craft.

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General Average

2. This insurance covers general average and salvage charges, adjusted or determined according to the contract of carriage and/or the governing law and practice, incurred to avoid or in connection with the avoidance of loss from any cause except those excluded in Clauses 4, 5, 6 and 7 below.

"Both to Blame Collision Clause"

3. This insurance indemnifies the Assured, in respect of any risk insured herein, against liability incurred under any Both to Blame Collision Clause in the contract of carriage. In the event of any claim by carriers under the said Clause, the Assured agree to notify the Insurers who shall have the right, at their own cost and expense, to defend the Assured against such claim.

EXCLUSIONS

4. In no case shall this insurance cover

4.1 loss damage or expense attributable to wilful misconduct of the Assured

4.2 ordinary leakage, ordinary loss in weight or volume, or ordinary wear and tear of the subject-matter insured

4.3 loss damage or expense caused by insufficiency or unsuitability of packing or preparation of the subjectmatter insured to withstand the ordinary incidents of the nsured transit where such packing or preparation is carried out by the Assured or their employees or prior to the attachment of this insurance (for the purpose of these Clauses "packing" shall be deemed to include stowage in a container and "employees" shall not include independent contractors)

4.4 loss damage or expense caused by inherent vice or nature of the subject-matter insured

4.5 loss damage or expense caused by delay, even though the delay be caused by a risk insured against (except expenses payable under Clause 2 above)

4.6 loss damage or expense caused by insolvency or financial default of the owners managers charterers or operators of the vessel where, at the time of loading of the subject-matter insured on board the vessel,the Assured are aware, or in the ordinary course of business should be aware, that such insolvency or financial default could prevent the normal prosecution of the voyage This exclusion shall not apply where the contract of insurance has been assigned to the party claiming hereunder who has bought or agreed to buy the subject-matter insured in good faith under a binding contract

4.7 deliberate damage to or deliberate destruction of the subject-matter insured or any part thereof by the wrongful act of any person or persons

4.8 loss damage or expense directly or indirectly caused by or arising from the use of any weapon or device employing atomic or nuclear fission and/or fusion or other like reaction or radioactive force or matter.

5.

5.1 In no case shall this insurance cover loss damage or expense arising from

5.1.1 unseaworthiness of vessel or craft or unfitness of vessel or craft for the safe carriage of the subject-matter insured, where the Assured are privy to such unseaworthiness or unfitness, at the time the subject-matter insured is loaded therein

5.1.2 unfitness of container or conveyance for the safe carriage of the subject-matter insured, where loading therein or thereon is carried out prior to attachment of this insurance or by the Assured or their employees and they are privy to such unfitness at the time of loading.

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5.2 Exclusion 5.1.1 above shall not apply where the contract of insurance has been assigned to the party claiming hereunder who has bought or agreed to buy the subjectmatter
insured in good faith under a binding contract.

5.3 The Insurers waive any breach of the implied warranties of seaworthiness of the ship and fitness of the ship to carry the subject-matter insured to destination.

6. In no case shall this insurance cover loss damage or expense caused by
6.1 war civil war revolution rebellion insurrection, or civil strife arising therefrom, or any hostile act by or against a belligerent power
6.2 capture seizure arrest restraint or detainment, and the consequences thereof or any attempt thereat
6.3 derelict mines torpedoes bombs or other derelict weapons of war.

7. In no case shall this insurance cover loss damage or expense

7.1 caused by strikers, locked-out workmen, or persons taking part in labour disturbances, riots or civil commotions
7.2 resulting from strikes, lock-outs, labour disturbances, riots or civil commotions
7.3 caused by any act of terrorism being an act of any person acting on behalf of, or in connection with, any organisation which carries out activities directed towards the overthrowing or influencing, by force or violence, of any government whether or not legally constituted
7.4 caused by any person acting from a political, ideological or religious motive.

DURATION
Transit Clause
8.

8.1 Subject to Clause 11 below, this insurance attaches from the time the subject-matter insured is first moved in the warehouse or at the place of storage (at the place named in the contract of insurance) for the purpose of the immediate loading into or onto the carrying vehicle or other conveyance for the commencement of transit, continues during the ordinary course of transit and terminates either

8.1.1 on completion of unloading from the carrying vehicle or other conveyance in or at the final warehouse or place of storage at the destination named in the contract of insurance,
8.1.2 on completion of unloading from the carrying vehicle or other conveyance in or at any other warehouse or place of storage, whether prior to or at the destination named in the contract of insurance, which the Assured or their employees elect to use either for storage other than in the ordinary course of transit or for allocation or distribution, or
8.1.3 when the Assured or their employees elect to use any carrying vehicle or other conveyance or any container for storage other than in the ordinary course of transit
8.1.4 Or
on the expiry of 60 days after completion of discharge overside of the subject-matter insured from the oversea vessel at the final port of discharge, whichever shall
first occur.

8.2 If, after discharge overside from the oversea vessel at the final port of discharge, but prior to termination of this insurance, the subject-matter insured is to be forwarded to a destination other than that to which it is insured, this

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insurance, whilst remaining subject to termination as provided in Clauses 8.1.1 to 8.1.4, shall not extend beyond the time the subject-matter insured is first moved for the purpose of the commencement of transit to such other destination.
8.3 This insurance shall remain in force (subject to termination as provided for in Clauses 8.1.1 to 8.1.4 above and to the provisions of Clause 9 below) during delay beyond the control of the Assured, any deviation, forced discharge, reshipment or transhipment and during any variation of the adventure arising from the exercise of a liberty granted to carriers under the contract of carriage.

Termination of Contract of Carriage

9. If owing to circumstances beyond the control of the Assured either the contract of carriage is terminated at a port or place other than the destination named therein

or the transit is otherwise terminated before unloading of the subject-matter insured as provided for in Clause 8 above, then this insurance shall also terminate unless prompt notice is given to the Insurers and continuation of cover is requested when this insurance shall remain in force, subject to an additional premium if required by the Insurers, either

9.1 until the subject-matter insured is sold and delivered at such port or place, or, unless otherwise specially agreed, until the expiry of 60 days after arrival of the subject matter insured at such port or place, whichever shall first occur, or
9.2 if the subject-matter insured is forwarded within the said period of 60 days (or any agreed extension thereof) to the destination named in the contract of insurance or to any other destination, until terminated in accordance with the provisions of Clause 8 above.

Change of Voyage
10.
10.1 Where, after attachment of this insurance, the destination is changed by the Assured, this must be notified promptly to Insurers for rates and terms to be agreed. Should a loss occur prior to such agreement being obtained cover may be provided but only if cover would have been available at a reasonable commercial market rate on reasonable market terms.
10.2 Where the subject-matter insured commences the transit contemplated by this insurance (in accordance with Clause 8.1), but, without the knowledge of the Assured or their employees the ship sails for another destination, this insurance will nevertheless be deemed to have attached at commencement of such transit.

CLAIMS
Insurable Interest
11.
11.1 In order to recover under this insurance the Assured must have an insurable interest in the subjectmatter insured at the time of the loss.
11.2 Subject to Clause 11.1 above, the Assured shall be entitled to recover for insured loss occurring during the period covered by this insurance, notwithstanding that the loss occurred before the contract of insurance was concluded, unless the Assured were aware of the loss and the Insurers were not.

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Forwarding Charges

12. Where, as a result of the operation of a risk covered by this insurance, the insured transit is terminated at a port or place other than that to which the subject-matter insured is covered under this insurance, the Insurers will reimburse the Assured for any extra charges properly and reasonably incurred in unloading storing and forwarding the subjectmatter insured to the destination to which it is insured.

Constructive Total Loss

13. No claim for Constructive Total Loss shall be recoverable hereunder unless the subject-matter insured is reasonably abandoned either on account of its actual total loss appearing to be unavoidable or because the cost of recovering, reconditioning and forwarding the subject-matter insured to the destination to which it is insured would exceed its value on arrival.

Increased Value

14.

14.1 If any Increased Value insurance is effected by the Assured on the subject-matter insured under this insurance the agreed value of the subject-matter insured shall be deemed to be increased to the total amount insured under this insurance and all Increased Value insurances covering the loss, and liability under this insurance shall be in such proportion as the sum insured under this insurance bears to such total amount insured.
In the event of claim the Assured shall provide the Insurers with evidence of the amounts insured under all other insurances.

14.2 Where this insurance is on Increased Value the following clause shall apply:
The agreed value of the subject-matter insured shall be deemed to be equal to the total amount insured under the primary insurance and all Increased Value insurances
covering the loss and effected on the subject-matter insured by the Assured, and liability under this insurance shall be in such proportion as the sum insured under this insurance bears to such total amount insured.

In the event of claim the Assured shall provide the Insurers with evidence of the amounts insured under all other insurances.

BENEFIT OF INSURANCE

15. This insurance

15.1 covers the Assured which includes the person claiming indemnity either as the person by or on whose behalf the contract of insurance was effected or as an assignee,
15.2 shall not extend to or otherwise benefit the carrier or other bailee.

MINIMISING LOSSES

16. It is the duty of the Assured and their employees and agents in respect of loss recoverable hereunder

16.1 to take such measures as may be reasonable for the purpose of averting or minimising such loss, and
16.2 to ensure that all rights against carriers, bailees or other third parties are properly preserved and exercised and the Insurers will, in addition to any loss recoverable hereunder, reimburse the Assured for any charges properly and reasonably incurred in pursuance of these duties.

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Waiver

17. Measures taken by the Assured or the Insurers with the object of saving, protecting or recovering the subjectmatter insured shall not be considered as a waiver or acceptance of abandonment or otherwise prejudice the rights of either party.

AVOIDANCE OF DELAY

18. It is a condition of this insurance that the Assured shall act with reasonable despatch in all circumstances within their control.

LAW AND PRACTICE

19. This insurance is subject to English law and practice.

NOTE:- Where a continuation of cover is requested under Clause 9, or a change of destination is notified under Clause 10, there is an obligation to give prompt notice to the Insurers and the right to such cover is dependent upon compliance with this obligation.

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CL383
01/01/2009

Institute War Clauses (Cargo) CL 385 01/01/2009

RISKS COVERED

Risks

1. This insurance covers, except as excluded by the provisions of Clauses 3 and 4 below, loss of or damage to the subject-matter insured caused by

1.1 war civil war revolution rebellion insurrection, or civil strife arising therefrom, or any hostile act by or against a belligerent power

1.2 capture seizure arrest restraint or detainment, arising from risks covered under 1.1 above, and the consequences thereof or any attempt thereat

1.3 derelict mines torpedoes bombs or other derelict weapons of war.

General Average

2. This insurance covers general average and salvage charges, adjusted or determined according to the contract of carriage and/or the governing law and practice, incurred to avoid or in connection with the avoidance of loss from a risk covered under these Clauses.

EXCLUSIONS

3. In no case shall this insurance cover

3.1 loss damage or expense attributable to wilful misconduct of the Assured

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3.2 ordinary leakage, ordinary loss in weight or volume, or ordinary wear and tear of the subject-matter insured
3.3 loss damage or expense caused by insufficiency or unsuitability of packing or preparation of the subject-matter insured to withstand the ordinary incidents of the insured transit where such packing or preparation is carried out by the Assured or their employees or prior to the attachment of this insurance (for the purpose of these Clauses "packing" shall be deemed to include stowage in a container and "employees" shall not include independent contractors)
3.4 loss damage or expense caused by inherent vice or nature of the subject-matter insured
3.5 loss damage or expense caused by delay, even though the delay be caused by a risk insured against (except expenses payable under Clause 2 above)
3.6 loss damage or expense caused by insolvency or financial default of the owners managers charterers or operators of the vessel where, at the time of loading of the subject-matter insured on board the vessel, the Assured are aware, or in the ordinary course of business should be aware, that such insolvency or financial default could prevent the normal prosecution of the voyage.

This exclusion shall not apply where the contract of insurance has been assigned to the party claiming hereunder who has bought or agreed to buy the subject-matter insured in good faith under a binding contract.

3.7 any claim based upon loss of or frustration of the voyage or adventure
3.8 loss damage or expense directly or indirectly caused by or arising from any hostile use of any weapon or device employing atomic or nuclear fission and/or fusion or other like reaction or radioactive force or matter.

4.

4.1 In no case shall this insurance cover loss damage or expense arising from

4.1.1 unseaworthiness of vessel or craft or unfitness of vessel or craft for the safe carriage of the subject-matter insured, where the Assured are privy to such unseaworthiness or unfitness, at the time the subject-matter insured is loaded therein
4.1.2 unfitness of container or conveyance for the safe carriage of the subject-matter insured, where loading therein or thereon is carried out prior to attachment of this insurance or by the Assured or their employees and they are privy to such unfitness at the time of loading.

4.2 Exclusion 4.1.1 above shall not apply where the contract of insurance has been assigned to the party claiming hereunder who has bought or agreed to buy the subjectmatter insured in good faith under a binding contract.

4.3 The Insurers waive any breach of the implied warranties of seaworthiness of the ship and fitness of the ship to carry the subject-matter insured to destination.

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DURATION

Transit Clause

5.

5.1 This insurance

5.1.1 attaches only as the subject-matter insured and as to any part as that part is loaded on an oversea vessel and

5.1.2 terminates, subject to 5.2 and 5.3 below, either as the subject-matter insured and as to any part as that part is discharged from an oversea vessel at the final port or place of discharge, or on expiry of 15 days counting from midnight of the day of arrival of the vessel at the final port or place of discharge, whichever shall first occur;

nevertheless, subject to prompt notice to the Insurers and to an additional premium, such insurance

5.1.3 reattaches when, without having discharged the subject-matter insured at the final port or place of discharge, the vessel sails therefrom, and

5.1.4 terminates, subject to 5.2 and 5.3 below, either as the subject-matter insured and as to any part as that part is thereafter discharged from the vessel at the final (or substituted) port or place of discharge, or on expiry of 15 days counting from midnight of the day of re-arrival of the vessel at the final port or place of discharge or arrival of the vessel at a substituted port or place of discharge, whichever shall first occur.

5.2 If during the insured voyage the oversea vessel arrives at an intermediate port or place to discharge the subject-matter insured for on-carriage by oversea vessel or by

aircraft, or the subject-matter insured is discharged from the vessel at a port or place of refuge, then, subject to

5.3 below and to an additional premium if required, this insurance continues until the expiry of 15 days counting from midnight of the day of arrival of the vessel at such port or place,but thereafter reattaches as the subject-matter insured and as to any part as that part is loaded on an on-carrying oversea vessel or aircraft. During the period of 15 days the insurance remains in force after discharge only whilst the subject-matter insured and as to any part as that part is at such port or place. If the subject-matter insured is oncarried within the said period of 15 days or if the insurance reattaches as provided in this Clause 5.2

5.2.1 where the on-carriage is by oversea vessel this insurance continues subject to the terms of these Clauses,

Or

5.2.2 where the on-carriage is by aircraft, the current Institute War Clauses (Air Cargo) (excluding sendings by Post) shall be deemed to form part of the contract of insurance and shall apply to the on-carriage by air.

5.3 If the voyage in the contract of carriage is terminated at a port or place other than the destination agreed therein, such port or place shall be deemed the final port of discharge and this insurance terminates in accordance with 5.1.2. If the subject-matter insured is subsequently reshipped to the original or any other destination, then provided notice is given to the Insurers before the commencement of such further transit and subject to an additional premium, this insurance reattaches.

5.3.1 in the case of the subject-matter insured having been discharged, as the subject-matter insured and as to any part as that part is loaded on the on-carrying vessel for the voyage;

5.3.2 in the case of the subject-matter not having been discharged, when the vessel sails from such deemed final port of discharge; thereafter this insurance terminates in accordance with 5.1.4.

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5.4 The insurance against the risks of mines and derelict torpedoes, floating or submerged, is extended whilst the subject-matter insured or any part thereof is on craft whilst in transit to or from the oversea vessel, but in no case beyond the expiry of 60 days after discharge from the oversea vessel unless otherwise specially agreed by the Insurers.

5.5 Subject to prompt notice to Insurers, and to an additional premium if required, this insurance shall remain in force within the provisions of these Clauses during any deviation, or any variation of the adventure arising from the exercise of a liberty granted to carriers under the contract of carriage. (For the purpose of Clause 5 "arrival" shall be deemed to mean that the vessel is anchored, moored or otherwise secured at a berth or place within the Harbour Authority area.

If such a berth or place is not available, arrival is deemed to have occurred when the vessel first anchors, moors or otherwise secures either at or off the intended port or place of discharge "oversea vessel" shall be deemed to mean a vessel carrying the subject-matter from one port or place to another where such voyage involves a sea passage by that vessel)

Change of Voyage
6.
6.1 Where, after attachment of this insurance, the destination is changed by the Assured, this must be notified promptly to Insurers for rates and terms to be agreed. Should a loss occur prior to such agreement being obtained cover may be provided but only if cover would have been available at a reasonable commercial market rate on reasonable market terms.
6.2 Where the subject-matter insured commences the transit contemplated by this insurance (in accordance with Clause 5.1), but, without the knowledge of the Assured or their employees the ship sails for another destination, this insurance will nevertheless be deemed to have attached at commencement of such transit.

7. Anything contained in this contract which is inconsistent with Clauses 3.7, 3.8 or 5 shall, to the extent of such inconsistency, be null and void.

CLAIMS
Insurable Interest
8.

8.1 In order to recover under this insurance the Assured must have an insurable interest in the subjectmatter insured at the time of the loss.
8.2 Subject to Clause 8.1 above, the Assured shall be entitled to recover for insured loss occurring during the period covered by this insurance, notwithstanding that the loss occurred before the contract of insurance was concluded, unless the Assured were aware of the loss and the Insurers were not.

Increased Value
9.

9.1 If any Increased Value insurance is effected by the Assured on the subject-matter insured under this insurance the agreed value of the subject-matter insured shall be deemed to be increased to the total amount insured under this insurance and all Increased Value insurances covering the loss, and liability under this insurance shall be in such proportion as the sum insured under this insurance bears to such total amount insured.

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In the event of claim the Assured shall provide the Insurers with evidence of the amounts insured under all other insurances.
9.2 Where this insurance is on Increased Value the following clause shall apply:
The agreed value of the subject-matter insured shall be deemed to be equal to the total amount insured under the primary insurance and all Increased Value insurances

covering the loss and effected on the subject-matter insured by the Assured, and liability under this insurance shall be in such proportion as the sum insured under this insurance bears to such total amount insured.
In the event of claim the Assured shall provide the Insurers with evidence of the amounts insured under all other insurances.

BENEFIT OF INSURANCE
10. This insurance

10.1 covers the Assured which includes the person claiming indemnity either as the person by or on whose behalf the contract of insurance was effected or as an assignee,
10.2 shall not extend to or otherwise benefit the carrier or other bailee.

MINIMISING LOSSES
Duty of Assured

11. It is the duty of the Assured and their employees and agents in respect of loss recoverable hereunder
11.1 to take such measures as may be reasonable for the purpose of averting or minimising such loss, and
11.2 to ensure that all rights against carriers, bailees or other third parties are properly preserved and exercised and the Insurers will, in addition to any loss recoverable hereunder, reimburse the Assured for any charges properly and reasonably incurred in pursuance of these duties.

Waiver

12. Measures taken by the Assured or the Insurers with the object of saving, protecting or recovering the subject-matter insured shall not be considered as a waiver or acceptance of abandonment or otherwise prejudice the rights of either party.

AVOIDANCE OF DELAY
13. It is a condition of this insurance that the Assured shall act with reasonable despatch in all circumstances within their control.

LAW AND PRACTICE
14. This insurance is subject to English law and practice.

NOTE:- Where a reattachment of cover is requested under Clause 5, or a change of destination is notified under Clause 6, there is an obligation to give prompt notice to the Insurers and the right to such cover is dependent upon compliance with this obligation.

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CL385
01/01/2009

Institute Strike Clauses (Cargo) CL 386 01/01/2009

RISKS COVERED

Risks

1. This insurance covers, except as excluded by the provisions of Clauses 3 and 4 below, loss of or damage to the subject-matter insured caused by

1.1 strikers, locked-out workmen, or persons taking part in labour disturbances, riots or civil commotions

1.2 any act of terrorism being an act of any person acting on behalf of, or in connection with, any organisation which carries out activities directed towards the overthrowing or influencing, by force or violence, of any government whether or not legally constituted

1.3 any person acting from a political, ideological or religious motive.

General Average

2. This insurance covers general average and salvage charges, adjusted or determined according to the contract of carriage and/or the governing law and practice, incurred to avoid or in connection with the avoidance of loss from a risk covered under these Clauses.

EXCLUSIONS

3. In no case shall this insurance cover

3.1 loss damage or expense attributable to wilful misconduct of the Assured

3.2 ordinary leakage, ordinary loss in weight or volume, or ordinary wear and tear of the subject-matter insured

3.3 loss damage or expense caused by insufficiency or unsuitability of packing or preparation of the subjectmatter insured to withstand the ordinary incidents of the insured transit where such packing or preparation is carried out by the Assured or their employees or prior to the attachment of this insurance (for the purpose of this Clause 3.3"packing" shall be deemed to include stowage in a container and "employees" shall not include independent contractors)

3.4 loss damage or expense caused by inherent vice or nature of the subject-matter insured

3.5 loss damage or expense caused by delay, even though the delay be caused by a risk insured against (except expenses payable under Clause 2 above)

3.6 loss damage or expense caused by insolvency or financial default of the owners managers charterers or operators of the vessel where, at the time of loading of the subject-matter insured on board the vessel, the Assured are aware, or in the ordinary course of business should be aware, that such insolvency or financial default could prevent the normal prosecution of the voyage

This exclusion shall not apply where the contract of insurance has been assigned to the party claiming hereunder who has bought or agreed to buy the subject-matter insured in good faith under a binding contract

3.7 loss damage or expense arising from the absence shortage or withholding of labour of any description whatsoever resulting from any strike, lockout, labour disturbance, riot or civil commotion

3.8 any claim based upon loss of or frustration of the voyage or adventure

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3.9 loss damage or expense directly or indirectly caused by or arising from the use of any weapon or device employing atomic or nuclear fission and/or fusion or other like reaction or radioactive force or matter
3.10 loss damage or expense caused by war civil war revolution rebellion insurrection, or civil strife arising therefrom, or any hostile act by or against a belligerent power.

4.1 In no case shall this insurance cover loss damage or expense arising from
4.1.1 unseaworthiness of vessel or craft or unfitness of vessel or craft for the safe carriage of the subject-matter insured, where the Assured are privy to such unseaworthiness or unfitness, at the time the subject-matter insured is loaded therein
4.1.2 unfitness or container or conveyance for the safe carriage of the subject-matter insured, where loading therein or thereon is carried out prior to attachment of this insurance or by the Assured or their employees and they are privy to such unfitness at the time of loading.
4.2 Exclusion 4.1.1 above shall not apply where the contract of insurance has been assigned to the party claiming hereunder who has bought or agreed to buy the subjectmatter insured in good faith under a binding contract.
4.3 The Insurers waive any breach of the implied warranties of seaworthiness of the ship and fitness of the ship to carry the subject-matter insured to destination.

DURATION

Transit Clause
5.
5.1 Subject to Clause 8 below, this insurance attaches from the time the subject-matter insured is first moved in the warehouse or at the place of storage (at the place named in the contract of insurance) for the purpose of the immediate loading into or onto the carrying vehicle or other conveyance for the commencement of transit, continues during the ordinary course of transit and terminates either
5.1.1 on completion of unloading from the carrying vehicle or other conveyance in or at the final warehouse or place of storage at the destination named in the contract of insurance,
5.1.2 on completion of unloading from the carrying vehicle or other conveyance in or at any other warehouse or place of storage, whether prior to or at the destination named in the contract of insurance, which the Assured or their employees elect to use either for storage other than in the ordinary course of transit or for allocation or distribution, or
5.1.3 when the Assured or their employees elect to use any carrying vehicle or other conveyance or any container for storage other than in the ordinary course of transit
Or
5.1.4 on the expiry of 60 days after completion of discharge overside of the subject-matter insured from the oversea vessel at the final port of discharge, whichever shall first occur.
5.2 If, after discharge overside from the oversea vessel at the final port of discharge, but prior to termination of this insurance, the subject-matter insured is to be forwarded to a destination other than that to which it is insured, this insurance, whilst remaining subject to termination as provided in Clauses 5.1.1 to 5.1.4, shall not extend beyond the time the subject-matter insured is first moved for the purpose of the commencement of transit to such other destination.
5.3 This insurance shall remain in force (subject to termination as provided for in Clauses 5.1.1 to 5.1.4 above and to the provisions of Clause 6 below) during delay beyond the control of the Assured, any deviation, forced discharge, reshipment or transhipment and during any variation of the adventure arising from the exercise of a liberty granted to carriers under the contract of carriage.

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Termination of Contract of Carriage

6. If owing to circumstances beyond the control of the Assured either the contract of carriage is terminated at a port or place other than the destination named therein or the transit is otherwise terminated before unloading of the subject-matter insured as provided for in Clause 5 above, then this insurance shall also terminate unless prompt notice is given to the Insurers and continuation of cover is requested when this insurance shall remain in force, subject to an additional premium if required by the Insurers, either

6.1 until the subject-matter insured is sold and delivered at such port or place, or, unless otherwise specially agreed, until the expiry of 60 days after arrival of the subjectmatter insured at such port or place, whichever shall first occur,
Or
6.2 if the subject-matter insured is forwarded within the said period of 60 days (or any agreed extension thereof) to the destination named in the contract of insurance or to any other destination, until terminated in accordance with the provisions of Clause 5 above.

Change of Voyage

7.

7.1 Where, after attachment of this insurance, the destination is changed by the Assured, this must be notified promptly to Insurers for rates and terms to be agreed. Should a loss occur prior to such agreement being obtained cover may be provided but only if cover would have been available at a reasonable commercial market rate on reasonable market terms.
7.2 Where the subject-matter insured commences the transit contemplated by this insurance (in accordance with Clause 5.1), but, without the knowledge of the Assured or their employees the ship sails for another destination, this insurance will nevertheless be deemed to have attached at commencement of such transit.

CLAIMS

Insurable Interest

8.
8.1 In order to recover under this insurance the Assured must have an insurable interest in the subjectmatter insured at the time of the loss.
8.2 Subject to Clause 8.1 above, the Assured shall be entitled to recover for insured loss occurring during the period covered by this insurance, notwithstanding that the loss occurred before the contract of insurance was concluded, unless the Assured were aware of the loss and the Insurers were not.

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Increased Value

9.

9.1 If any Increased Value insurance is effected by the Assured on the subject-matter insured under this insurance the agreed value of the subject-matter insured shall be deemed to be increased to the total amount insured under this insurance and all Increased Value insurances covering the loss, and liability under this insurance shall be in such proportion as the sum insured under this insurance bears to such total amount insured.

In the event of claim the Assured shall provide the Insurers with evidence of the amounts insured under all other insurances.

9.2 Where this insurance is on Increased Value the following clause shall apply:
The agreed value of the subject-matter insured shall be deemed to be equal to the total amount insured under the primary insurance and all Increased Value insurances

covering the loss and effected on the subject-matter insured by the Assured, and liability under this insurance shall be in such proportion as the sum insured under this insurance bears to such total amount insured.
In the event of claim the Assured shall provide the Insurers with evidence of the amounts insured under all other insurances.

BENEFIT OF INSURANCE

10. This insurance
10.1 covers the Assured which includes the person claiming indemnity either as the person by or on whose behalf the contract of insurance was effected or as an assignee,
10.2 shall not extend to or otherwise benefit the carrier or other bailee.

MINIMISING LOSSES

Duty of Assured

11. It is the duty of the Assured and their employees and agents in respect of loss recoverable hereunder
11.1 to take such measures as may be reasonable for the purpose of averting or minimising such loss, and
11.2 to ensure that all rights against carriers, bailees or other third parties are properly preserved and exercised and the Insurers will, in addition to any loss recoverable hereunder, reimburse the Assured for any charges properly and reasonably incurred in pursuance of these duties.

Waiver

12. Measures taken by the Assured or the Insurers with the object of saving, protecting or recovering the subjectmatter insured shall not be considered as a waiver or acceptance of abandonment or otherwise prejudice the rights of either party.

AVOIDANCE OF DELAY

13. It is a condition of this insurance that the Assured shall act with reasonable despatch in all circumstances within their control.

LAW AND PRACTICE

14. This insurance is subject to English law and practice.

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NOTE:- Where a reattachment of cover is requested under Clause 5, or a change of destination is notified under Clause 6, there is an obligation to give prompt notice to the Insurers and the right to such cover is dependent upon compliance with this obligation.

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CL386
01/01/2009

Inland Transit Rail-Road (A) - All Risk

RISKS COVERED

1. This insurance covers all risks of loss or damage to the subject-matter insured except as provided in clause Nos. 2, 3, 4 and 5 below.

Risks Clause

EXCLUSIONS

2. In no case shall this insurance cover

2.1 loss damage or expense attributable to willful misconduct of the assured. General Average Clause

2.2 ordinary leakage, ordinary loss in weight or volume, or ordinary wear and tear of the subject-matter insured.
2.3 loss damage or expense caused by insufficiency or unsuitability of packing or preparation of the subject-matter insured (for the purpose of this Clause 2.3 "packing" shall be deemed to include stowage in a container or liftvan but only when such stowage is carried out prior to attachment of this insurance or by the Assured or their servants).
2.4 loss damage or expense proximately caused by delay even though the delay be caused by a risk insured against.
2.5 loss damage or expense caused by inherent vice or nature of the subject-matter insured.
3. This clause shall be paramount and shall override anything contained in this insurance inconsistent therewith. In no case shall this insurance cover loss, damage, liability or expense directly or indirectly caused by or contributed to by or arising from
3.1 Ionising radiations from or contamination by radioactivity from any nuclear fuel or from any nuclear waste or from the combustion of nuclear fuel.

Nuclear Radioactive Exclusion Clause

3.2 The radioactive toxic explosive or other hazardous or contaminating properties of any nuclear installation, reactor or other nuclear assembly or nuclear component thereof.

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3.3 Any weapon of war employing atomic or nuclear fission and/or fusion or other like reaction or radioactive force or matter.

4. In no case shall this insurance cover loss, damage or expense caused by
4.1 war, civil war, revolution, rebellion, insurrection, or civil strife arising therefrom or any hostile act by or against a belligerent power
4.2 capture, seizure, arrest, restraint or detainment, the consequences thereof or any attempt thereat

War
Exclusion
Clause

4.3 derelict mines, bombs or other derelict weapons of war.
5. In no case shall this insurance cover loss damage or expense
5.1 caused by strikers, locked out workmen or person taking part in labour disturbances, riots or civil commotions

Strike
Exclusion
Clause

5.2 resulting from strikes, lock-outs, labour disturbances, riots or civil commotions
5.3 caused by any terrorist or any person acting from a political motive

DURATION

6. This insurance attaches from the time the goods leave the warehouse and/or store at the place named in the policy for the commencement of transit and continues during the ordinary course of transit including customary transhipment, if any.

Transit Clause

i) until delivery to the final warehouse at the destination named in the policy or
ii) in respect of transit by Rail only or Rail and Road, until expiry of 7 days after arrival of the railway wagon at the final destination railway station
iii) Or
in respect of transits by Road only until expiry of 7 days after arrival of the vehicle at the destination town named in the policy whichever shall first occur.

N.B.1 The period of 7 days referred to above shall be reckoned from the midnight of the day of arrival of railway wagon at the destination railway station or vehicle at the destination town named in the policy.
2 Transit by Rail only shall include incidental transit by Road performed by Railway Authorities to or from Railway Out-Agency.

CLAIMS
7.

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7.1 In order to recover under this insurance the Assured must have an insurable interest in the subject-matter insured at the time of loss.

Insurable
Interest
Clause

7.2 Subject to 7.1 above the insured shall be entitled to recover for insured loss occurring during the period covered by this insurance, notwithstanding that the loss occurred before the contract of insurance was concluded unless the Assured were aware of the loss and the Underwriters were not.

BENEFIT OF INSURANCE
8. This insurance shall not inure to the benefit of the carrier or other bailees.

Not to
Inure
Clause

MINIMISING LOSSES

9. It is the duty of the Assured and their servants and agents in respect of loss recoverable hereunder
9.1 to take such measures as may be reasonable for the purpose of averting or minimising such loss and

Duty of
Assured Clause

9.2 against railway/road carriers/bailees within six months from the date of railway/lorry receipt or as prescribed by the relevant statute and the underwriters will, in addition to any loss recoverable hereunder, reimburse the Assured for any charges properly and reasonably incurred in pursuance of these duties.

10. Measures taken by the Assured or the underwriters with the object of saving, protecting or recovering the subject-matter insured shall not be considered as a waiver or acceptance of abandonment or otherwise prejudice the rights of either party.

Waiver
Clause

AVOIDANCE OF DELAY
11. It is a condition of this insurance that the assured shall act with reasonable despatch in all circumstances within their control.

Reasonable
Despatch
Clause

Inland Transit Rail-Road (B)

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RISKS COVERED

1. This insurance covers except as provided in clause 2, 3, 4 and 5 the risks of physical loss or damage to the insured goods caused by

Risks
Clause

(a) (i) fire
(ii) lightning
(iii) breakage of bridges
(b) (i) collision with or by the carrying vehicle
(ii) overturning of the carrying vehicle
(iii) derailment or accidents of like nature to the carrying railway wagon/vehicle.

EXCLUSIONS

2. In no case shall this insurance cover
2.1 loss damage or expense attributable to willful misconduct of the Assured.

General
Average
Clause

2.2 ordinary leakage, ordinary loss in weight or volume, or ordinary wear and tear of the subject-matter insured. loss damage or expense caused by insufficiency or unsuitability of packing or preparation of the subject-matter insured (for the purpose of this
2.3 Clause "packing" shall be deemed to include stowage in a container or liftvan but only when such stowage is carried out prior to attachment of this insurance by the Assured or their servants)
2.4 loss damage or expense proximately caused by delay, even though the delay be caused by a risk insured against.
2.5 loss damage or expense caused by inherent vice or nature of the subject-matter insured.
3. This clause shall be paramount and shall override anything contained in this insurance inconsistent therewith. In no case shall this insurance cover loss, damage, liability or expense directly or indirectly caused by or contributed to by or arising from
3.1 Ionising radiations from or contamination by radioactivity from any nuclear fuel or from any nuclear waste or from the combustion of nuclear fuel.

Nuclear
Radioactive
Exclusion
Clause

3.2 The radioactive toxic explosive or other hazardous or contaminating properties of any nuclear installation, reactor or other nuclear assembly or nuclear component thereof.
3.3 Any weapon of war employing atomic or nuclear fission and/or fusion or other like reaction or radioactive force or matter.

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4. In no case shall this insurance cover loss damage or expense caused by
War
Exclusion
Clause
4.1 war, civil war, revolution, rebellion, insurrection, or civil strike arising therefrom or any hostile act by or against a belligerent power.
4.2 capture, seizure, arrest, restraint or detainment, and the consequences thereof or any attempt thereat.
4.3 derelict, mines, bombs or other derelict weapons of war.
5. In no case shall this insurance cover loss, damage or expense
Strike
Exclusion
Clause

5.1 caused by strikers, locked-out workmen, or persons taking part in labour disturbances, riots or civil commotions
5.2 resulting from strikes, lock-outs, labour disturbances, riots or civil commotions
5.3 caused by any terrorist or any person acting from a political motive.

DURATION
6. This insurance attaches from the time the goods leave the warehouse and/or the store at the place named in the policy for the commencement of transit and continues during the ordinary course of transit including customary transhipment, if

Transit Clause

i) until delivery to the final warehouse at the destination named in the policy or
ii) in respect of transits by Rail only or Rail and Road, until expiry of 7 days after arrival of the railway wagon at the destination railway station or
iii) in respect of transits by Road only on expiry of 7 days after arrival of the vehicle at the destination town named in the policy whichever shall first occur

N.B. : 1. The period of 7 days referred to above shall be reckoned from the midnight of the day of arrival of railway wagon at the destination railway station or vehicle at the destination town named in the policy.
2. Transit by Rail only shall include incidental transit by Road performed by Railway Authorities to or from Railway Out-Agency.

CLAIMS
7.

Insurable
Interest
Clause

7.1 In order to recover under this insurance the Assured must have an insurable interest in the subject-matter insured at the time of loss.

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7.2 Subject to 7.1 above the insured shall be entitled to recover for insured loss occurring during the period covered by this insurance, not withstanding that the loss occurred before the contract of insurance was concluded unless the Assured were aware of the loss and the underwriters were not.

BENEFIT OF INSURANCE

8. This insurance shall not inure to the benefit of the Carrier or other bailees.

Not to
Inure
Clause

MINIMISING LOSSES

9. It is the duty of the Assured and their servants and agents in respect of loss recoverable hereunder.

Duty of
Assured Clause

9.1 to take such measures as may be reasonable for the purpose of averting or minimising such loss and
9.2 to ensure that all rights against carriers, bailees or other third parties are properly preserved and exercised by lodging a monetary claim against
railway/road carriers/ bailees within six months from the date of railway/lorry receipt or as prescribed by the relevant stature and the
underwriters will, in addition to any loss recoverable hereunder, reimburse the Assured for any charges properly and reasonably incurred in
pursuance of these duties.

10. Measures taken by the Assured or the underwriters with the object of saving, protecting or recovering the subject-matter insured shall not be considered as a waiver or acceptance of abandonment or otherwise prejudice the rights of either party.

Waiver
Clause

AVOIDANCE OF DELAY

11. It is a condition of this insurance that the assured shall act with reasonable despatch in all circumstances within their control.
Reasonable
Despatch
Clause

Institute War Cancellation Clause (Cargo)- 1/12/1982 CL 271

The cover against war risks (as defined in the relevant Institute War Clauses) may be cancelled by either the Underwriters or the Assured except in respect of any insurance which shall have attached in accordance with the conditions of the Institute War Clauses before the cancellation becomes effective. Such cancellation shall however

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only become effective on the expiry of 7 days from midnight of the day on which notice of the cancellation is issued by or to the Underwriters

Institute Strike Cancellation Clause

The inclusion in this contract of cover granted against the risks of Strikes and Riots may by cancelled either by the Underwriters or the Assured except in respect of any insurance
against the said risks which shall have attached in accordance with the cover granted under the Policy before the cancellation becomes effective, such cancellation shall however
only becomes effective on the expiration of 48 hours from the midnight of the day on which a notice of cancellation is issued by or to Underwriters.

Cargo Ism Endorsement (1 May1998) JC 98/019

In no case shall this insurance cover loss, damage or expense where the subject matter insured is carried by a vessel that is not ISM Code certified or those owners or operators do not hold an ISM Code Document of Compliance when at the time of loading of the subject matter insured on board the vessel, the Assured were aware or in the ordinary course of business should have been aware:

a) Either that such vessel was not certified in accordance with the ISM Code.
b) Or that a current document of compliance was not held by her owners or operators as required under the SOLAS convention 1974 as amended. This exclusion shall not apply where the insurance has been assigned to the party claiming hereunder who has bought or agreed to buy the subject matter insured in good faith under a binding contract.

Institute Standard Conditions For Cargo Contracts 01.04.82 CL 261

1. This contract is to insure the subject-matter specified for the transits and on the conditions named shipped by or for account of _____ or the
insurance of which is under their control as selling or purchasing agent unless insured elsewhere prior to inception of this contract or to insurable interest being acquired. This contract does not cover the interest of any other person, but this shall not prevent a transfer of the insurance by the Assured or Assignee.
2. It is a condition of this contract that the Assured are bound to declare hereunder every consignment without exception, the Company being bound to accept up to but not exceeding the amount specified in clause 3 below.
3. This contract is for an open amount but the amount declarable may not exceed the following:
₹
in respect of any one vessel and connecting conveyance
₹
in respect of any one aircraft and connecting conveyance
NIL
₹
in respect of anyone road vehicle &/or Road tankers &/or railway wagon
4. Notwithstanding anything to the contrary contained in this contract the Company's liability in respect of any one accident or series of accidents arising from the same event in any one location shall not exceed the sum of ₹
5. In the event of loss accident or arrival before declaration of value it is agreed that the basis of valuation shall be

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Imports : C & F / FOB value
Customs Duty : At Actuals
Tail-End : Landed value + Actual Customs Duty
Domestic Purchases - Purchase Invoice value
Domestic Sales : Sales Invoice value
Exports : C & F / FOB / CIF value + 10%

6. This contract is subject to the Institute Classification Clause.
7. Should the risks of war, strikes, riots and civil commotions be included in the cover granted by this contract, the relevant Institute War Clauses and Institute Strikes Clauses shall apply.
8. This Institute Clauses referred to herein are those current at the inception of this contract but should such clauses be revised during the period of this contract, and provided that the Company Shall have given at least 30 days notice thereof, then the revised Institute Clauses shall apply to risks attaching subsequent to the date of expiry of the said notice.
9. This contract may be cancelled by either the Company or the Assured giving 30 days notice in writing to take effect from the midnight of date of notice but risks covered by Institute War Clauses may be cancelled at seven days notice and risks covered by the Institute Strikes Clauses may be cancelled at seven days notice, or at forty-eight hours notice in respect of shipments to or from the United States of America. Notice shall commence from midnight of the day when it is issued but cancellation shall not apply to any risks which have attached in accordance with the cover granted hereunder before the cancellation becomes effective.

Institute Cargo Clauses (Air) CL 387 01/01/2009

RISKS COVERED
Risks
1. This insurance covers all risks of loss of or damage to the subject-matter insured except as excluded by the provisions of Clauses 3, 4 and 5 below.
Salvage Charges
2. This insurance covers salvage charges incurred to avoid or in connection with the avoidance of loss from any cause except those excluded in Clauses 3, 4 and 5 below.

EXCLUSIONS

3. In no case shall this insurance cover
3.1 loss damage or expense attributable to wilful misconduct of the Assured
3.2 ordinary leakage, ordinary loss in weight or volume, or ordinary wear and tear of the subject-matter insured
3.3 loss damage or expense caused by insufficiency or unsuitability of packing or preparation of the subjectmatter insured to withstand the ordinary incidents of the insured transit where such packing or preparation is carried out by the Assured or their employees or prior to the attachment of this insurance (for the purpose of these Clauses "packing" shall be deemed to include stowage in a container and "employees" shall not include independent contractors)
3.4 loss damage or expense caused by inherent vice or nature of the subject-matter insured
3.5 loss damage or expense arising from unfitness of aircraft conveyance or container for the safe carriage of the subject-matter insured, where loading therein or thereon is carried out prior to attachment of this insurance or by the Assured or their employees and they are privy to such unfitness at the time of loading. This exclusion shall not apply

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where the contract of insurance has been assigned to the party claiming hereunder who has bought or agreed to buy the subject-matter insured in good faith under a binding contract.
3.6 loss damage or expense caused by delay, even though the delay be caused by a risk insured against
3.7 loss damage or expense caused by insolvency or financial default of the owners managers charterers or operators of the aircraft where, at the time of loading of the subject-matter insured on board the aircraft, the Assured are aware, or in the ordinary course of business should be aware, that such insolvency or financial default could prevent the normal prosecution of the transit.
This exclusion shall not apply where the contract of insurance has been assigned to the party claiming hereunder who has bought or agreed to buy the subject-matter insured in good faith under a binding contract.
3.8 loss damage or expense directly or indirectly caused by or arising from the use of any weapon or device employing atomic or nuclear fission and/or fusion or other like reaction or radioactive force or matter.

4. In no case shall this insurance cover loss damage or expense caused by
4.1 war civil war revolution rebellion insurrection, or civil strife arising therefrom, or any hostile act by or against a belligerent power
4.2 capture seizure arrest restraint or detainment (piracy excepted), and the consequences thereof or any attempt thereat
4.3 derelict mines torpedoes bombs or other derelict weapons of war.

5. In no case shall this insurance cover loss damage or expense
5.1 caused by strikers, locked-out workmen, or persons taking part in labour disturbances, riots or civil commotions
5.2 resulting from strikes, lock-outs, labour disturbances, riots or civil commotions
5.3 caused by any act of terrorism being an act of any person acting on behalf of, or in connection with, any organisation which carries out activities directed towards the Overthrowing or influencing, by force or violence, of any government whether or not legally constituted
5.4 caused by any person acting from a political, ideological or religious motive.

DURATION

Transit Clause
6.

6.1 Subject to Clause 9 below, this insurance attaches from the time the subject-matter insured is first moved in the warehouse, premises or at the place of storage (at the place named in the contract of insurance) for the purpose of the immediate loading into or onto the carrying vehicle or other conveyance for the commencement of transit, continues during the ordinary course of transit and terminates either
6.1.1 on completion of unloading from the carrying vehicle or other conveyance in or at the final warehouse, premises or place of storage at the destination named in the contract of insurance,
6.1.2 on completion of unloading from the carrying vehicle or other conveyance in or at any other warehouse, premises or place of storage, whether prior to or at the destination named in the contract of insurance, which the Assured or their employees elect to use either for storage other than in the ordinary course of transit or for allocation or distribution, or
6.1.3 when the Assured or their employees elect to use any carrying vehicle or other conveyance or any container for storage other than in the ordinary course of transit
6.1.4 or on the expiry of 30 days after completion of unloading of the subject-matter insured from the aircraft at the final place of discharge, whichever shall first occur.

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6.2 If, after unloading from the aircraft at the final place of discharge, but prior to termination of this insurance, the subject-matter insured is to be forwarded to a destination other than that to which it is insured, this insurance, whilst remaining subject to termination as provided in Clauses 6.1.1 to 6.1.4, shall not extend beyond the time the subject-matter insured is first moved for the purpose of the commencement of transit to such other destination.
6.3 This insurance shall remain in force (subject to termination as provided for in Clauses 6.1.1 to 6.1.4 above and to the provisions of Clause 7 below) during delay beyond the control of the Assured, any deviation, forced discharge, reshipment or transhipment and during any variation of the adventure arising from the exercise of a liberty granted to the air carriers under the contract of carriage.

Termination of Contract of Carriage

7. If owing to circumstances beyond the control of the Assured either the contract of carriage is terminated at a place other than the destination named therein or the transit is otherwise terminated before unloading of the subject-matter insured as provided for in Clause 6 above, then this insurance shall also terminate unless prompt notice is given to the Insurers and continuation of cover is requested when this insurance shall remain in force, subject to an additional premium if required by the Insurers, either

7.1 until the subject-matter insured is sold and delivered at such place, or, unless otherwise specially agreed, until the expiry of 30 days after arrival of the subject-matter insured at such place, whichever shall first occur,
Or
7.2 if the subject-matter insured is forwarded within the said period of 30 days (or any agreed extension thereof) to the destination named in the contract of insurance or to any other destination, until terminated in accordance with the provisions of Clause 6 above.

Change of Transit

8.

8.1 Where, after attachment of this insurance, the destination is changed by the Assured, this must be notified promptly to Insurers for rates and terms to be agreed. Should a loss occur prior to such agreement being obtained cover may be provided but only if cover would have been available at a reasonable commercial market rate on reasonable market terms.
8.2 Where the subject-matter insured commences the transit contemplated by this insurance (in accordance with Clause 6.1), but, without the knowledge of the Assured or their employees the aircraft leaves for another destination, this insurance will nevertheless be deemed to have attached at commencement of such transit.

CLAIMS
Insurable Interest

9.
9.1 In order to recover under this insurance the Assured must have an insurable interest in the subjectmatter insured at the time of the loss.
9.2 Subject to Clause 9.1 above, the Assured shall be entitled to recover for insured loss occurring during the period covered by this insurance, notwithstanding that the loss occurred before the contract of insurance was concluded, unless the Assured were aware of the loss and the Insurers were not.

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Forwarding Charges

10. Where, as a result of the operation of a risk covered by this insurance, the insured transit is terminated at a place other than that to which the subject-matter insured is covered under this insurance, the Insurers will reimburse the Assured for any extra charges properly and reasonably incurred in unloading storing and forwarding the subject-matter insured to the destination to which it is insured.

This Clause 10, which does not apply to salvage charges, shall be subject to the exclusions contained in Clauses 3, 4 and 5 above, and shall not include charges arising from the fault negligence insolvency or financial default of the Assured or their employees.

Constructive Total Loss

11. No claim for Constructive Total Loss shall be recoverable hereunder unless the subject-matter insured is reasonably abandoned either on account of its actual total loss appearing to be unavoidable or because the cost of recovering, reconditioning and forwarding the subject-matter insured to the destination to which it is insured would exceed its value on arrival.

Increased Value

12.

12.1 If any Increased Value insurance is effected by the Assured on the subject-matter insured under this insurance the agreed value of the subject-matter insured shall be deemed to be increased to the total amount insured under this insurance and all Increased Value insurances covering the loss, and liability under this insurance shall be in such proportion as the sum insured under this insurance bears to such total amount insured.
In the event of claim the Assured shall provide the Insurers with evidence of the amounts insured under all other insurances.

12.2 Where this insurance is on Increased Value the following clause shall apply:

The agreed value of the subject-matter insured shall be deemed to be equal to the total amount insured under the primary insurance and all Increased Value insurances covering the loss and effected on the subject-matter insured by the Assured, and liability under this insurance shall be in such proportion as the sum insured under this insurance bears to such total amount insured.
In the event of claim the Assured shall provide the Insurers with evidence of the amounts insured under all other insurances.

BENEFIT OF INSURANCE

13.

13.1 covers the Assured which includes the person claiming indemnity either as the person by or on whose behalf the contract of insurance was effected or as an assignee,
13.2 shall not extend to or otherwise benefit the carrier or other bailee.

MINIMISING LOSSES

Duty of Assured

14. It is the duty of the Assured and their employees and agents in respect of loss recoverable hereunder

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14.1 to take such measures as may be reasonable for the purpose of averting or minimising such loss, and
14.2 to ensure that all rights against carriers, bailees or other third parties are properly preserved and exercised and the Insurers will, in addition to any loss recoverable hereunder, reimburse the Assured for any charges properly and reasonably incurred in pursuance of these duties.

Waiver

15. Measures taken by the Assured or the Insurers with the object of saving, protecting or recovering the subjectmatter insured shall not be considered as a waiver or acceptance of abandonment or otherwise prejudice the rights of either party.

AVOIDANCE OF DELAY

16. It is a condition of this insurance that the Assured shall act with reasonable despatch in all circumstances within their control.

LAW AND PRACTICE

17. This insurance is subject to English law and practice

NOTE:- Where a reattachment of cover is requested under Clause 7 or a change of destination is notified under Clause 6, there is an obligation to give prompt notice to the Insurers and the right to such cover is dependent upon compliance with this obligation.

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Institute War Clauses (Air Cargo) CL 388 01/01/2009

RISKS COVERED

Risks

1. This insurance covers, except as excluded by the provisions of Clause 3 below, loss of or damage to the subject-matter insured caused by

1.1 war civil war revolution rebellion insurrection, or civil strife arising therefrom, or any hostile act by or against a belligerent power

1.2 capture seizure arrest restraint or detainment, arising from risks covered under 1.1 above, and the consequences thereof or any attempt thereat

1.3 derelict mines torpedoes bombs or other derelict weapons of war.

Salvage Charges

2. This insurance covers salvage charges, incurred to avoid or in connection with the avoidance of loss from any cause except those excluded in Clause 3 below.

EXCLUSIONS

3. In no case shall this insurance cover

3.1 loss damage or expense attributable to wilful misconduct of the Assured

3.2 ordinary leakage, ordinary loss in weight or volume, or ordinary wear and tear of the subject-matter insured

3.3 loss damage or expense caused by insufficiency or unsuitability of packing or preparation of the subject-matter insured to withstand the ordinary incidents of the insured transit where such packing or preparation is carried out by the Assured or their employees or prior to the attachment of this insurance (for the purpose of these Clauses "packing" shall be deemed to include stowage in a container and "employees" shall not include independent contractors)

3.4 loss damage or expense caused by inherent vice or nature of the subject-matter insured

3.5 loss damage or expense arising from unfitness of aircraft conveyance or container for the safe carriage of the subject-matter insured, where loading therein or thereon is carried out prior to attachment of this insurance or by the Assured or their employees and they are privy to such unfitness at the time of loading.

This exclusion shall not apply where the contract of insurance has been assigned to the party claiming hereunder who has bought or agreed to buy the subject-matter insured in good faith under a binding contract.

3.6 loss damage or expense caused by delay, even though the delay be caused by a risk insured against

3.7 loss damage or expense caused by insolvency or financial default of the owners managers charterers or operators of the aircraft where, at the time of loading of the subject-matter insured on board the aircraft, the Assured are aware, or in the ordinary course of business should be aware, that such insolvency or financial default could prevent the normal prosecution of the transit

This exclusion shall not apply where the contract of insurance has been assigned to the party claiming hereunder who has bought or agreed to buy the subject-matter insured in good faith under a binding contract.

3.8 any claim based upon loss of or frustration of the transit or adventure

3.9 loss damage or expense directly or indirectly caused by or arising from any hostile use of any weapon or device employing atomic or nuclear fission and/or fusion or other like reaction or radioactive force or matter.

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DURATION

Transit Clause

4.

4.1 This insurance

4.1.1 attaches only as the subject-matter insured and as to any part as that part is loaded on the aircraft for the commencement of the air transit insured and

4.1.2 terminates, subject to 4.2 and 4.3 below, either as the subject-matter insured and as to any part as that part is discharged from the aircraft at the final place of discharge or on expiry of 15 days counting from midnight of the day of arrival of the aircraft at the final place of discharge, whichever shall first occur; nevertheless, subject to prompt notice to the Insurers and to an additional premium, such insurance

4.1.3 reattaches when, without having discharged the subject-matter insured at the final place of discharge, the aircraft departs therefrom,and

4.1.4 terminates, subject to 4.2 and 4.3 below, either as the subject-matter insured and as to any part as that part is thereafter discharged from the aircraft at the final (or substituted) place of discharge,or on expiry of 15 days counting from midnight of the day of re-arrival of the aircraft at the final place of discharge or arrival of the aircraft at a substituted place of discharge, whichever shall first occur.

4.2 If during the insured transit the aircraft arrives at an intermediate place to discharge the subjectmatter insured for on-carriage by aircraft or oversea vessel, then, subject to below and to an additional premium if required, this insurance continues until the expiry of 15 days counting from midnight of the day of arrival of the aircraft at such place,

but thereafter reattaches as the subject-matter insured and as to any part as that part is loaded on an on-carrying aircraft or oversea vessel. During the period of 15 days the insurance remains in force after discharge only whilst the subject-matter insured and as to any part as that part is at such intermediate place. If the subject-matter insured is on-carried within the said period of 15 days or if the insurance reattaches as provided in this Clause 4.2

4.2.1 where the on-carriage is by aircraft this insurance continues subject to the terms of these Clauses, or

4.2.2 where the on-carriage is by oversea vessel, the current Institute War Clauses (Cargo) shall be deemed to form part of the contract of insurance and shall apply to the on-carriage by se

4.3 If the air transit in the contract of carriage is terminated at a place other than the destination agreed therein, that place shall be deemed to be the final place of discharge and this insurance terminates in accordance with 4.1.2. If the subject-matter insured is subsequently consigned to the original or any other destination, then, provided notice is given to the Insurers before the commencement of such further transit and subject to an additional premium, this insurance reattaches

4.3.1 in the case of the subject-matter insured having been discharged, as the subject-matter insured and as to any part as that part is loaded on the on-carrying aircraft for the transit;

4.3.2 in the case of the subject-matter insured not having been discharged, when the aircraft departs from such deemed final place of discharge; thereafter this insurance terminates in accordance with 4.1.4.

4.4 Subject to prompt notice to Insurers, and to an additional premium if required, this insurance shall remain in force within the provisions of these Clauses during any deviation, or any variation of the adventure arising from the exercise of a liberty granted to the air carriers under the contract of carriage. (For the purpose of Clause 4 "oversea vessel" shall be deemed to mean a vessel carrying the subject-matter from one port or place to another where such voyage involves a sea passage by that

vessel)

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Change of Transit

5.

5.1 Where, after attachment of this insurance, the destination is changed by the Assured, this must be notified promptly to Insurers for rates and terms to be agreed. Should a loss occur prior to such agreement being obtained cover may be provided but only if cover would have been available at a reasonable commercial market rate on reasonable market terms.

5.2 Where the subject-matter insured commences the transit contemplated by this insurance (in accordance with Clause 4.1), but, without the knowledge of the Assured or their employees the aircraft leaves for another destination, this insurance will nevertheless be deemed to have attached at commencement of such transit.

6. Anything contained in this contract which is inconsistent with Clauses 3.8, 3.9 or 4 shall, to the extent of such inconsistency, be null and void.

CLAIMS

Insurable Interest

7.

7.1 In order to recover under this insurance the Assured must have an insurable interest in the subjectmatter insured at the time of the loss.

7.2 Subject to Clause 7.1 above, the Assured shall be entitled to recover for insured loss occurring during the period covered by this insurance, notwithstanding that the loss occurred before the contract of insurance was concluded, unless the Assured were aware of the loss and the Insurers were not.

Increased Value

8.

8.1 If any Increased Value insurance is effected by the Assured on the subject-matter insured under this insurance the agreed value of the subject-matter insured shall be deemed to be increased to the total amount insured under this insurance and all Increased Value insurances covering the loss, and liability under this insurance shall be in such proportion as the sum insured under this insurance bears to such total amount insured.

In the event of claim the Assured shall provide the Insurers with evidence of the amounts insured under all other insurances.

8.2 Where this insurance is on Increased Value the following clause shall apply:

The agreed value of the subject-matter insured shall be deemed to be equal to the total amount insured under the primary insurance and all Increased Value

insurances covering the loss and effected on the subject-matter insured by the Assured, and liability under this insurance shall be in such proportion as the sum insured under this insurance bears to such total amount insured. In the event of claim the Assured shall provide the Insurers with evidence of the amounts insured under all other insurances.

BENEFIT OF INSURANCE

9. This insurance

9.1 covers the Assured which includes the person claiming indemnity either as the person by or on whose behalf the contract of insurance was effected or as an assignee,

9.2 shall not extend to or otherwise benefit the carrier or other bailee.

MINIMISING LOSSES

Duty of Assured

10. It is the duty of the Assured and their employees and agents in respect of loss recoverable hereunder

10.1 to take such measures as may be reasonable for the purpose of averting or minimising such loss,and

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10.2 to ensure that all rights against carriers, bailees or other third parties are properly preserved and exercised and the Insurers will, in addition to any loss recoverable hereunder, reimburse the Assured for any charges properly and reasonably incurred in pursuance of these duties.

Waiver

11. Measures taken by the Assured or the Insurers with the object of saving, protecting or recovering the subject-matter insured shall not be considered as a waiver or acceptance of abandonment or otherwise prejudice the rights of either party.

AVOIDANCE OF DELAY

12. It is a condition of this insurance that the Assured shall act with reasonable despatch in all circumstances within their control.

LAW AND PRACTICE

13. This insurance is subject to English law and practice

NOTE:- Where a reattachment of cover is requested under Clause 4 or a change of destination is notified under Clause 5, there is an obligation to give prompt notice to the
Insurers and the right to such cover is dependent upon compliance with this obligation.

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CL388
01/01/2009

Institute Strike Clauses (Air Cargo) CL 389 01/01/2009

RISKS COVERED

Risks

1. This insurance covers, except as excluded by the provisions of Clause 3 below, loss of or damage to the subject-matter insured caused by

1.1 strikers, locked-out workmen, or persons taking part in labour disturbances, riots or civil commotions

1.2 any act of terrorism being an act of any person acting on behalf of, or in connection with, any organisation which carries out activities directed towards the overthrowing or influencing, by force or violence, of any government whether or not legally constituted

1.3 any person acting from a political, ideological or religious motive.

Salvage Charges

2. This insurance covers salvage charges incurred to avoid or in connection with the avoidance of loss from any cause except those excluded in Clause 3 below.

EXCLUSIONS

3. In no case shall this insurance cover

3.1 loss damage or expense attributable to wilful misconduct of the Assured

3.2 ordinary leakage, ordinary loss in weight or volume, or ordinary wear and tear of the subject-matter insured

3.3 loss damage or expense caused by insufficiency or unsuitability of packing or preparation of the subjectmatter insured to withstand the ordinary incidents of the insured transit where such packing or preparation is carried out by

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the Assured or their employees or prior to the attachment of this insurance (for the purpose of this Clause 3.3 "packing" shall be deemed to include stowage in a container and "employees" shall not include independent contractors)

3.4 loss damage or expense caused by inherent vice or nature of the subject-matter insured

3.5 loss damage or expense arising from unfitness of aircraft conveyance or container for the safe carriage of the subject-matter insured, where loading therein or thereon is carried out prior to attachment of this insurance or by the Assured or their employees and they are privy to such unfitness at the time of loading. This exclusion shall not apply where the contract of insurance has been assigned to the party claiming hereunder who has bought or agreed to buy the subject-matter insured in good faith under a binding contract.

3.6 loss damage or expense caused by delay, even though the delay be caused by a risk insured against

3.7 loss damage or expense caused by insolvency or financial default of the owners managers charterers or operators of the aircraft where, at the time of loading of the subject-matter insured on board the aircraft, the Assured are aware, or in the ordinary course of business should be aware, that such insolvency or financial default could prevent the normal prosecution of the transit

This exclusion shall not apply where the contract of insurance has been assigned to the party claiming hereunder who has bought or agreed to buy the subject-matter insured in good faith under a binding contract

3.8 loss damage or expense arising from the absence shortage or withholding of labour of any description whatsoever resulting from any strike, lockout, labour disturbance, riot or civil commotion

3.9 any claim based upon loss of or frustration of the transit or adventure

3.10 loss damage or expense directly or indirectly caused by or arising from the use of any weapon or device employing atomic or nuclear fission and/or fusion or other like reaction or radioactive force or matter

3.11 loss damage or expense caused by war civil war revolution rebellion insurrection, or civil strife arising therefrom, or any hostile act by or against a belligerent power.

DURATION

Transit Clause

4.

4.1 Subject to Clause 7 below, this insurance attaches from the time the subject-matter insured is first moved in the warehouse, premises or at the place of storage (at the place named in the contract of insurance) for the purpose of the immediate loading into or onto the carrying vehicle or other conveyance for the commencement of transit, continues during the ordinary course of transit and terminates either

4.1.1 on completion of unloading from the carrying vehicle or other conveyance in or at the final warehouse, premises or place of storage at the destination named in the contract of insurance,

4.1.2 on completion of unloading from the carrying vehicle or other conveyance in or at any other warehouse, premises or place of storage, whether prior to or at the destination named in the contract of insurance, which the Assured or their employees elect to use either for storage other than in the ordinary course of transit or for distribution, or

4.1.3 when the Assured or their employees elect to use any carrying vehicle or other conveyance or any container for storage other than in the ordinary course of transit or

4.1.4 on the expiry of 30 days after completion of unloading of the subject-matter insured from the aircraft at the final place of discharge, whichever shall first occur.

4.2 If, after unloading from the aircraft at the final place of discharge, but prior to termination of this insurance, the subject-matter insured is to be forwarded to a destination other than that to which it is insured, this insurance, whilst remaining subject to termination as provided in Clauses 4.1.1 to 4.1.4, shall not extend beyond the time the subject-matter insured is first moved for the purpose of the commencement of transit to such other destination.

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4.3 This insurance shall remain in force (subject to termination as provided for in Clauses 4.1.1 to 4.1.4 above and to the provisions of Clause 5 below) during delay beyond the control of the Assured, any deviation, forced discharge, reshipment or transhipment and during any variation of the adventure arising from the exercise of a liberty granted to the air carriers under the contract of carriage.

Termination of Contract of Carriage

5. If owing to circumstances beyond the control of the Assured either the contract of carriage is terminated at a place other than the destination named therein or the transit is otherwise terminated before unloading of the subject-matter insured as provided for in Clause 4 above, then this insurance shall also terminate unless prompt notice is given to the

Insurers and continuation of cover is requested when this insurance shall remain in force, subject to an additional premium if required by the Insurers, either

5.1 until the subject-matter insured is sold and delivered at such place, or, unless otherwise specially agreed, until the expiry of 30 days after arrival of the subject-matter
insured at such place, whichever shall first occur,
Or
5.2 if the subject-matter insured is forwarded within the said period of 30 days (or any agreed extension thereof) to the destination named in the contract of insurance or to
any other destination, until terminated in accordance with the provisions of Clause 4 above.

Change of Transit
6.
6.1 Where, after attachment of this insurance, the destination is changed by the Assured, this must be notified promptly to Insurers for rates and terms to be agreed. Should a loss occur prior to such agreement being obtained cover may be provided but only if cover would have been available at a reasonable commercial market rate on reasonable market terms
6.2 Where the subject-matter insured commences the transit contemplated by this insurance (in accordance with Clause 4.1), but, without the knowledge of the Assured or their employees the aircraft leaves for another destination, this insurance will nevertheless be deemed to have attached at commencement of such transit.

CLAIMS

Insurable Interest
7.

7.1 In order to recover under this insurance the Assured must have an insurable interest in the subjectmatter insured at the time of the loss.
7.2 Subject to Clause 7.1 above, the Assured shall be entitled to recover for insured loss occurring during the period covered by this insurance, notwithstanding that the loss occurred before the contract of insurance was concluded, unless the Assured were aware of the loss and the Insurers were not.

Increased Value

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8.
8.1 If any Increased Value insurance is effected by the Assured on the subject-matter insured under this insurance the agreed value of the subject-matter insured shall be deemed to be increased to the total amount insured under this insurance and all Increased Value insurances covering the loss, and liability under this insurance shall be in such proportion as the sum insured under this insurance bears to such total amount insured.
In the event of claim the Assured shall provide the Insurers with evidence of the amounts insured under all other insurances.
8.2 Where this insurance is on Increased Value the following clause shall apply:
The agreed value of the subject-matter insured shall be deemed to be equal to the total amount insured under the primary insurance and all Increased Value insurances
covering the loss and effected on the subject-matter insured by the Assured, and liability under this insurance shall be in such proportion as the sum insured under this
insurance bears to such total amount insured.
In the event of claim the Assured shall provide the Insurers with evidence of the amounts insured under all other insurances.

BENEFIT OF INSURANCE
9. This insurance
9.1 covers the Assured which includes the person claiming indemnity either as the person by or on whose behalf the contract of insurance was effected or as an assignee,
9.2 shall not extend to or otherwise benefit the carrier or other bailee.

MINIMISING LOSSES
Duty of Assured
10. It is the duty of the Assured and their employees and agents in respect of loss recoverable hereunder
10.1 to take such measures as may be reasonable for the purpose of averting or minimising such loss, and
10.2 to ensure that all rights against carriers, bailees or other third parties are properly preserved and exercised and the Insurers will, in addition to any loss recoverable hereunder, reimburse the Assured for any charges properly and reasonably incurred in pursuance of these duties.

Waiver

11. Measures taken by the Assured or the Insurers with the object of saving, protecting or recovering the subjectmatter insured shall not be considered as a waiver or acceptance of abandonment or otherwise prejudice the rights of either party.

AVOIDANCE OF DELAY
12. It is a condition of this insurance that the Assured shall act with reasonable despatch in all circumstances within their control.

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LAW AND PRACTICE

13. This insurance is subject to English law and practice.

NOTE:- Where a continuation of cover is requested under Clause 5, or a change of destination is notified under Clause 6, there is an obligation to give prompt notice to the Insurers
and the right to such cover is dependent upon compliance with this obligation.

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CL389
01/01/2009

SRCC Clause (Inland Transit)

RISKS COVERED

1. Subject otherwise to the terms, conditions and warranties of the Policy on goods against transit risk, this insurance covers, except as provided in clause 2 below of or damage to the subject matter insured caused by

1.1 strikes, Locked-out workmen, or persons taking part in labour disturbances, riots or civil commotions.

1.2 any terrorist or any person acting from a political motive.

1.3 persons acting maliciously.

EXCLUSIONS

2. In no case shall this insurance cover

2.1 loss damage or expense proximately caused by delay inherent vice or nature of the subject matter insured.

2.2 loss damage or expense proximately caused by absence, shortage or withholding of labour of any description whatsoever during any strike, lockout, labour disturbances, riot or civil commotion

2.3 any claim for expenses arising from delay or other consequential or indirect loss or damage of any kind

2.4 loss damage or expenses caused by war, civil war, revolution, rebellion, insurrection or civil strike arising therefrom, or any hostile act by or against a belligerent power.

DESPATCH BY PRIVATE CARRIER CLAUSE
(INLAND TRANSIT)

The liability of the Company shall be limited to 75% of the assessed loss where the consignment note is issued limiting the liability of the Carriers in any respect by a special contract duly signed by the consignor, consignee or by the duly authorised representative, agents or where the consignment note is issued by a Private Carrier (other than the Vehicle belonging to the owner of goods) or freight Broker. This warranty would not apply where loss or damage has occurred whilst the goods are not in the custody of the

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Institute Replacement Clause 01 01 1934 CL 161

In the event of loss of or damage to any part or parts of an insured machine caused by a peril covered by the Policy the sum recoverable shall not exceed the cost of replacement or repair of such part or parts plus charges for forwarding and refitting, if incurred but excluding duty unless the full duty is included in the amount insured, in which case loss, if any, sustained by payment of additional duty shall also be recoverable.

Provided always that in no case shall the liability of Underwriters exceed the insured value of the complete machine.

Duty Insurance Clause

This insurance is on increased value of cargo by reason of payment of customs duty at the port or place of destination and is subject to the same clauses and conditions as the
insurance of cargo and to pay the same percentage of duty payable (excluding charges and expenses) as may be paid thereon, but excluding claims in respect of:

a. Total loss of whole or part of cargo prior to the duty becoming payable
b. General Average, Salvage and/or Salvage Charges arising from any casualty occurring prior to the duty becoming payable.

In ascertaining the amount of the claim recoverable thereunder credit shall be given for any rebates or refund of duty which may become
allowable.
This insurance shall not be valid if effected after the arrival of the vessel at the destination port.
Warranted that:
1. The Assured is the holder or assignee of the Import Licence, or is the actual user who has purchased goods from recognised Export House/ Channelising Agency
2. This Policy is not assignable.
3. No Claim shall be paid for Duty until the claim under the C.I.F. value insurance policy is payable and proof of liability for loss under the policy shall be furnished to the Company. This provision need not apply to cases where CIF is insured overseas due to contractual obligation.
4. This is not a valued policy as defined in the Marine Insurance Act. Claims under this policy are payable on the basis of actual duty paid or on the basis of the sum insured whichever is less.
5. In the event of a claim under this policy, immediately notice of loss shall be given to the Company and a reasonable opportunity given to the Company to survey and assess the loss. The Assured shall co-operate with the Company and take all reasonable measures to minimise or
6. prevent loss. The Assured shall also lodge a claim with the Customs Authorities within the stipulated time for refund of duty where admissible, and with the carriers or others for recovery for the duty paid in respect of such damaged or lost cargo and any recovery relating to the duty paid shall be credited to the Company.

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ANNEXURE –XIII

TO

SPECIAL PURCHASE CONDITIONS

VULNERABILITY ATLAS OF INDIA

Vulnerability Atlas of India.

Vulnerability Atlas of India (VAI) is a comprehensive document which provides existing hazard scenario for the entire country and presents the digitized State/UT-wise hazard, maps with respect to earthquakes, winds and floods for district-wise identification of vulnerable areas. It also includes additional digitized maps for thunderstorms, cyclones and landslides. The main purpose of this Atlas is its use for disaster preparedness and mitigation at policy planning and project formulation stage.

This Atlas is one of its kind single point source for the various stakeholders including policy makers, administrators, municipal commissioners, urban managers, engineers, architects, planners, public etc. to ascertain proneness of any city/location/site to multi-hazard which includes earthquakes, winds, floods, thunderstorms, cyclones and landslides. While project formulation, approvals and implementation of various urban housing, buildings and infrastructures schemes, this Atlas provides necessary information for risk analysis and hazard assessment.

The Vulnerability Atlas of India has been prepared by Building Materials and Technology Promotion Council under Ministry of Housing and Urban Affairs, Government of India and available at their website www.bmtpc.org.

It is mandatory for the bidders to refer Vulnerability Atlas of India for multi-hazard risk assessment and include the relevant hazard proneness specific to project location while planning and designing the project in terms of:

i) Seismic zone (II of V) for earthquakes
ii) Wind velocity (Basic Wind Velocity: 55, 50, 47, 44, 39 & 33 m/s)
iii) Area liable to floods and Probable max. surge height
iv) Thunderstorms history
v) Number of cyclonic storms / severe cyclonic storms and max sustained wind specific to coastal region
vi) Landslides incidences with Annual rainfall normal
vii) District wise Probable Max. Precipitation.

ANNEXURE XIV TO SPC

FORMAT OF UNCONDITIONAL AND IRREVOCABLE INSURANCE SURETY BOND TOWARDS CONTRACT PERFORMANCE SECURITY

(To be submitted on non-judicial stamp paper of appropriate value to be purchased in the name of the issuing Insurance Company)

Beneficiary: Engineers India Limited

Insurance Surety Bond No. [……] (hereinafter referred to as the "Surety Bond")

THIS SURETY BOND is executed on this […….insert day] day of [……insert month and year] at [……insert place] by [……**INSERT NAME OF INSURANCE COMPANY**], a company registered under the Insurance Act, 1938 and licensed by the Insurance Regulatory and Development Authority of India (IRDAI) to carry on the business of general insurance in India, having its head/registered office at [……insert address], (hereinafter referred to as the "Insurer", which expression shall unless it is repugnant to the subject or context thereof Include successors and assigns)

IN FAVOUR OF:

ENGINEERS INDIA LIMITED, a public limited company incorporated under the Indian Companies Act, 1956, having its registered office at [……], (hereinafter referred to as the "EIL", which expression shall unless it is repugnant to the subject or context thereof include successors and assigns).

WHEREAS

I. EIL has entered into a Contract vide Purchase Order/Letter of Acceptance / Fax of Acceptance no…….. dated…….. **(the "Contract")** with …….. **[Insert name of Contractor]** (the **"Contractor"**) having its registered office at …… (the "Contractor", which expression shall, unless it be repugnant to the context or meaning thereof, include its successors-in-title and permitted assigns), for the project.

II. In terms of the Contract, the Contractor is required to furnish to EIL, an unconditional, irrevocable, on demand Surety Bond for an amount …… **[insert amount in figures & words]** (the **"Bond Amount"**) which is equal to .....% of the Contract Price, as security for due and punctual performance/discharge of the Contractor's obligations under the Contract.

III. At the request of Contractor, the Insurer has agreed to provide an unconditional, irrevocable and on-demand Surety Bond, for the due and punctual

performance/discharge by the Contractor of its obligations under the Contract during the Contract Validity Period.

NOW THEREFORE THIS BOND WITNESSETH AS FOLLOWS:

1. The Insurer hereby irrevocably and unconditionally guarantees and secures (as primary obligor and not merely as Insurer) to EIL (as beneficiary) the payment in full of all amounts at any time that may be due, owing or payable to EIL from the Contractor for the failure of the Contractor to duly and punctually perform all of its obligations under the Contract (the "Bond Obligation"), without any demur, reservation, protest or recourse, immediately on receipt of a demand from EIL.

   The Insurer further agrees that this Surety Bond does not limit the number of claims that may be made by EIL against the Insurer up to the value of Bond Amount.

   Payment made hereunder shall be made free and clear of and without any deductions so that EIL receives the full Bond Amount due hereunder.

2. The Insurer's liability under this Surety Bond shall not exceed…….. (Bond Amount in figures & words) and this Surety Bond shall be valid upto. .....(expiry date). Insurer is liable to pay to EIL the demanded amount only upon receipt of written claim or demand from EIL on or before …… (not less than 2 months from expiry date).

3. The Insurer shall, pay to EIL sums not exceeding the Bond Amount, within 5 (five) Business Days of receipt of a written demand from EIL stating that the Contractor has failed to meet its performance obligations under the Contract. The Insurer shall not be required to go into the veracity of any breach or failure on the part of the Contractor or status /stage of the contract or validity of demand so made by EIL and shall pay the amount specified in the demand notwithstanding any direction to the contrary given or any dispute whatsoever raised by the Contractor or any other Person. The Insurer's obligations hereunder shall subsist until all such demands are duly met and discharged in accordance with the provisions hereof.

4. The obligations of the Insurer herein are absolute and unconditional, irrespective of the value, genuineness, validity, regularity or enforceability of the Contract or the insolvency, bankruptcy, reorganization, dissolution or liquidation of the Contractor or any sanctions on the Contractor or any change in ownership of the Contractor, or the pendency of any suit or other legal proceedings including arbitration or conciliation pending before any court, tribunal or arbitrator or conciliator(s) relating thereto or any purported assignment by the Contractor or any other circumstance whatsoever which might otherwise constitute a discharge or defence of a Insurer or a surety.

   Further, this Surety Bond is in no way conditional upon any requirement that EIL first attempt to procure the Bond Amount from the Contractor, or any other Person, or resort

to any other means of obtaining payment of the Bond Amount, prior to make any recourse to this Surety Bond.

5. EIL shall be entitled to treat the Insurer as the principal debtor. The obligations of the Insurer under this Surety Bond shall not be affected by any act, omission, matter or thing which would reduce, release or prejudice the Insurer from any of the Bond Amount or prejudice or diminish the Bond Amount in whole or in part, including (whether or not known to it, or EIL):

(a) any time or waiver granted to, the Contractor or any other Person;

(b) any incapacity or lack of powers, of the Contractor or any other Person;

(c) any variation of the Contract

(d) any unenforceability or illegality or invalidity of any obligation of any Person under the Contract or of the Insurer under this Surety Bond or of any Person under any other document or Surety Bond, to the extent that each obligation under this Surety Bond shall remain in full force as a separate, continuing and primary obligation, and its obligations be construed accordingly, as if there were no unenforceability or illegality or invalidity;

(e) the partial or entire release of any Insurer or other Person primarily or secondarily liable or responsible for the performance, payment or observance of any of the Contractor's obligations during the Contract Period; or by any extension, waiver, or amendment whatsoever which may release the Insurer or

(f) any part performance of the Contract by the Contractor or by any failure by EIL to timely pay or perform any of its obligations under the Contract.

6. If, and to the extent that, for any reason the Contractor enters or threatens to enter into any proceedings in bankruptcy or reorganization or otherwise, or if, for any other reason whatsoever, the performance or payment by the Contractor of the Bond Amount becomes or may reasonably be expected to become impossible, then the Bond Amount shall be promptly paid by the Insurer to EIL on demand.

7. The Insurer further represents and warrants to EIL that:

(a) it has the power to execute, deliver and perform the terms and provisions of this Surety Bond and has taken all necessary action to authorize the execution, delivery and performance by it of this Surety Bond;

(b) No actions / omissions of the Insurer shall affect the legality, validity, binding effect or enforceability of this Surety Bond.

(c) the Insurer has duly executed and delivered this Surety Bond, and this Surety Bond constitutes its legal, valid and binding obligation enforceable in accordance with its terms

8. If any one or more of the provisions contained in this Surety Bond are or become invalid or unenforceable in any respect, the validity and enforceability of the remaining provisions shall not in any way be affected or impaired thereby, and the Insurer shall enter into good faith negotiations with EIL to replace the invalid or unenforceable provision.

9. The Insurer further agrees that to fulfill the Contractor's liability during the contract period, if requested by the Contractor in writing, the insurer shall issue Amendment to this Surety Bond, as and when required, incorporating the extended date of validity and/or other amendment.

10. Any notice, request, demand or claim or other communication to be given or made under this Surety Bond shall be in writing addressed to the Insurer and may be transmitted to the insurer either by post or by email address as set opposite its signature hereunder. The Insurer shall pay the amount immediately upon receipt of such written demand from EIL which suffices all requirements for payment to EIL under this Surety Bond.

11. This Surety Bond shall be governed by, and construed in accordance with, the laws of India. The Insurer irrevocably agrees that any legal action, suit or proceeding arising out of or relating to this Surety Bond may be brought in the courts in Delhi.

12. Neither party shall assign or transfer any or all parts of its interest herein to any other person without express written consent of the other party.

13. All related parties have agreed to the terms and conditions of this Insurance Surety Bond which conform with the principle of utmost good faith.

IN WITNESS WHEREOF the **Insurer** has set its hand hereunto on the day, month and year first hereinabove written.
Signed and delivered by its constituted attorney
(Signature of a person authorized to sign on behalf of the Insurer)
insert name of Insurance Company] Insurer by hand

Name:

Designation;

Address:

Email:

INSTRUCTIONS FOR FURNISHING UNCONDITIONAL AND IRREVOCABLE INSURANCE SURETY BOND TOWARDS SECURITY DEPOSIT

1. The Unconditional Insurance Surety Bond shall be from an Indian Insurance Company (Insurer) registered with Insurance Regulatory and Development Authority of India (IRDAI).
2. The Insurance Surety Bond by Indian Bidders will be given on non-judicial stamp paper of appropriate value to be purchased in the name of the issuing insurance Company.
3. Insurance Surety Bond is not applicable for Foreign Bidders.
4. Insurance Surety Bond required to submit in Indian Currency only.
5. Matter to be mentioned in covering letter to be submitted by vendor along with insurance surety bond.

1	Insurance Surety Bond No			
2	Insurance Surety Bond Amount			
3	Date of execution of Insurance Surety Bond			
4	Expiry date of Insurance Surety bond			
5	Expiry date of claim period of Insurance Surety			
6	Bidder Name			
7	Tender No.			
8	Nature of Insurance Surety Bond	Earnest Money Deposit / Security Deposit		
9	Insurer Details	A	Insurer Name:	
		B	Address:	
		C	Email Id:	
		D	Phone No:	

ENGINEERS INDIA LIMITED

GENERAL PURCHASE CONDITIONS

(INDIGENOUS)

Regd. Office : Engineers India Bhawan, 1, Bhikaiji Cama Place, New Delhi - 110066

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1.0 DEFINITIONS

1.1 The following expressions used in these General Purchase Conditions (GPC) and the Purchase shall have the meaning indicated against each of these:

The **PURCHASER / OWNER** means Engineers India Limited, a company incorporated in India having its registered office at Engineers India Bhawan, 1, BhikaijiCama Place, RK Puram, New Delhi-110066 and shall include its successors and assignees.

"GOODS/MATERIALS": Goods and/or materials shall mean any of the Articles, Materials, Machinery, Equipment, Supplies, Drawings, Data and other property and all services including but not limited to design, delivery, installation, inspection, testing and commissioning specified to complete the order.

"SELLER": Seller shall mean the Person, Firm or Corporation to whom the Fax of Acceptance / Purchase Order is issued.

"Purchase Order": **Purchase Order**shall mean the Order placed on the Seller for supply of material/services and shall include the general conditions, bidding conditions, specific conditions, material requisition/Purchase requisition, drawings, Price schedule and subsequent amendments mutually agreed upon. It may also be referred as **order** or **contract.**

Contractual Delivery Date": Contractual Delivery Date is the date on which goods shall be delivered F.O.T dispatching point/destination in accordance with the terms of the Purchase Order. The contractual delivery date/period is inclusive of all the lead time for engineering, procurement of raw materials, manufacturing, inspection, testing packing and any other activities whatsoever required to be accomplished for effecting the delivery at the agreed delivery point.

"Procurement co-coordinators / Managers": Purchaser's authorized representative appointed as procurement coordinators / manager.

"INSPECTORS": Inspectors deputed / authorized by Purchaser including Third Party Inspection Agency.

CLIENT: Client means Project Owner.

2.0 REFERENCE FOR DOCUMENTATION

2.1 Purchase Order / Purchase Requisition number must appear on order confirmation, correspondence, drawings, and invoices, shipping notes, packing and / or any documents or paper connected with the Order.

3.0 CONFIRMATION OF ORDER

3.1 The Seller shall acknowledge the receipt of the Fax of Acceptance (FOA) / Purchase Order (PO) within seven days following the date of the FOA / Purchase Order and shall thereby confirm his acceptance of the FOA / Purchase Order without any exceptions. This acknowledgment will bear on both FOA / Purchase Order and General Purchase Conditions.

4.0 SALES CONDITIONS

4.1 With Seller's acceptance of provision of the Purchase Order, he waives and considers as

cancelled any of his general sales conditions.

5.0 COMPLETE AGREEMENT

5.1 The terms and conditions of the Purchase Order shall constitute the entire Agreement between the parties hereto. Changes will be binding only if the amendments are made in writing and signed by an authorized representative of the Purchaser.

6.0 INSPECTION-CHECKING-TESTING

6.1 The equipment, materials and workmanship covered by the Purchase Order are subject to inspection and testing at any time prior to shipment and/or despatch and to final inspection within a reasonable time after arrival at the place of delivery. Inspectors shall have the right to carry out the inspection and testing which will include the raw materials at manufacturer's shop, at fabricator's shop and at the time of actual despatch before and after completion of packing.

6.2 All tests, mechanical and others as specified in the Purchase Requisition and particularly those required by codes will be performed at Seller's expenses and in accordance with Inspector's instructions. The Seller will also bear the expenses concerning preparation and rendering of tests required by Boiler Inspectorate or such other statutory testing agencies or by Lloyds Register of Shipping and Industrial Services as may be required.

6.3 The salaries and fees of Inspectors and their travelling, lodging and boarding expenses will not be borne by the Seller unless inspection becomes anfractuous due to any omission or commission on the part of the Seller. Before shipping or despatch, the equipment and/or materials will have to be checked and stamped by Inspectors who are authorized also to forbid the use and despatch of any equipment and/or materials which during tests and inspection fail to comply with the specification, codes and testing requirements.

6.4 The Seller shall:

a) Inform Procurement Coordinator/Managers at least eight days in advance of the exact place, date and time of rendering the equipment or materials for required inspection.

b) Provide free access as required to Inspectors during normal and / or extended working hours to Seller's or his/its sub-Supplier's works and place at their disposal all useful means of performing, checking, marking, testing, inspection and final stamping.

6.5 Even if the Inspections and tests are fully carried out, Seller would not be absolved to any degree from his responsibilities to ensure that all equipment and material supplied comply strictly with requirements as per agreement both during manufacturing, at the time of delivery, inspection, on arrival at site and after its erection or start-up and guarantee period as stipulated in Clause 22 (GUARANTEE).

6.6 The Seller's responsibility will not be lessened to any degree due to any comments made by Procurement Coordinators/Managers and Inspectors on the Seller's drawings or specifications or by inspectors witnessing any chemical or physical tests. In any case, the equipment must be in strict accordance with the Purchase Order and/or its attachments failing which the Purchaser shall have the right to reject the goods and hold the Seller liable for non-performance of contract.

7.0 OFFICIAL INSTITUTIONAL TESTING

7.1 In addition to testing and inspection by Inspectors mentioned above, Lloyds register Industrial services or similar institutional agencies like Boiler-Inspectorate may be

assigned for official testing of all coded equipment. The Seller shall ensure that all Procedures for preparation and Performance of test prescribed by such institution shall be complied scrupulously.

7.2 The Seller is required to send to such institutions as may be designed by the Purchaser at least three sets of fabricated / manufactured drawings for each equipment and calculations. All manufacturer's mill test certificates and analytical reports from material laboratories in respect of all raw material and components employed shall have to be presented to such Institution's Inspectors in the number of copies required. Seller shall be responsible for any delay in submission of necessary certificates. The Seller shall maintain close liaison with procurement co-ordinators and Institution's Inspectors to maintain Schedule and delay, if any, in this process will not be taken into consideration as a cause of Force Majeure.

8.0 TRANSIT RISK INSURANCE

8.1 The Purchaser against its/ Client's Open General Policy (The name of the Insurance Co. will be conveyed subsequently) shall cover transit Risk Insurance. The Seller shall advise the dispatch particulars to the Insurance Company under advice to the Procurement Coordinators / Managers before shipment.

9.0 DELIVERY DATES

9.1 Time of delivery as mentioned in the Purchase Order shall be the essence of the agreement and no variation shall be permitted except with prior authorization in writing from the Purchaser. Goods should be delivered securely packed and in good order and condition at the place and within the time specified in the Purchase Order for their delivery. The Purchaser reserves the right to defer the period of delivery in writing.

10.0 DELAYED DELIVERY

10.1 The time and date of delivery of materials/ equipment as stipulated in the Purchase Order shall be deemed to be the essence of the agreement. For any delay in delivery of equipment / materials or part thereof beyond the delivery date stipulated, the Purchaser may:

a) **FOR BUILK ITEMS**: Accept delayed delivery at prices reduced by a sum equivalent to one half of one percent (1/2%) of the total value of delayed item/quantity for every week of delay or part thereof, limited to a maximum of five percent (5%) of the total order value.

b) **FOR ITEMS OTHER THAN BULK ITEMS(WITH OR WITHOUT SITE WORK)**: Accept delayed delivery at prices reduced by a sum equivalent to one half of one percent (1/2%) of the total order value for every week of delay or part thereof, limited to a maximum of five percent (5%) of the total order value.

10.2 The invoice shall be raised after equivalent reduction in the Invoice value before presenting to Purchaser/ Bank for payment. The acceptance of delayed delivery is without prejudice to Purchaser's right of cancelling the purchase order wholly or in part for any delay exceeding the period of maximum price reduction and the Seller shall be liable for all consequences thereof.

11.0 DELAYS DUE TO FORCE MAJEURE

11.1 In the event of causes of Force Majeure occurring within the agreed delivery terms, the

delivery dates can be extended by the Purchaser on receipt of application from the Seller without imposition of price reduction. Only the following shall be considered as force majeure:

a) Act of terrorism;

b) Riot, war, invasion, act of foreign enemies, hostilities (whether war be declared or not), civil war, rebellion, revolution, insurrection of military or usurped power;

c) Ionizing, radiation or contamination, radio activity from any nuclear fuel or from any nuclear waste from the combustion of nuclear fuel, radioactive toxic explosive or other hazardous properties of any explosive assembly or nuclear component;

d) Epidemics, earthquakes, flood, fire, hurricanes, typhoons or other physical natural disaster, but excluding weather conditions regardless of severity; and

e) Freight embargoes, strikes at national or state-wide level or industrial disputes at a national or state-wide level in any country where Works are performed, and which affect an essential portion of the Works but excluding any industrial dispute which is specific to the performance of the Purchase Order.

11.2 For the avoidance of doubt, inclement weather, third party breach, delay in supply of materials (other than due to a nationwide transporters' strike) or commercial hardship shall not constitute a Force Majeure event.

11.3 The Seller must advise the Purchaser by a registered letter duly certified by a statutory authorities, the beginning and the end of the delay immediately, but in no case later than 10 days of the beginning and end of each cause of Force Majeure condition as defined above.

11.4 The extension of time shall be the sole remedy of the Seller for any delay under this clause and the Seller shall not be entitled in addition to or in lieu of such extension to claim any damages or compensation on any account whatsoever whether under the law governing contracts or any other law in force, and the Seller hereby waives and disclaims any and all contrary rights.

11.5 In case force majeure conditions persists for period exceeding 02 (Two) Months, the Purchaser reserves the right to cancel the Purchase order or part of it.

12.0 REJECTION, REMOVAL OF REJECTED GOODS AND REPLACEMENT

12.1 In case the testing and inspection at any stage by Inspectors reveal that the equipment, material and workmanship do not comply with the specification and requirements, the Seller at his/its own expense and risk shall remove the same within the time allowed by the Purchaser. The Purchaser shall be at liberty to dispose of such rejected goods in such a manner, as he may think appropriate. In the event the Seller fails to remove the rejected goods within the period as aforesaid, all expenses incurred by the Purchaser for such disposal shall be to the account of the Seller. The freight paid by the Purchaser, if any, on the inward journey of the rejected materials shall be reimbursed by the Seller to the Purchaser before the rejected materials are removed by the Seller.

12.2 The Seller shall have to proceed with the replacement of that equipment or part of the equipment at Purchaser's stores / site, if so required by the Purchaser, without claiming any extra payment. The time taken for replacement in such event will not be added to the contractual delivery period.

12.3 Any rejection, removal of rejected goods/material and replacement shall be applicable

only up to guarantee period or extended guarantee period as applicable.

13.0 TRANSFER OF PROPERTY FROM THE SELLER TO THE PURCHASER

13.1 The transfer of property shall be deemed to have taken place as follows subject to the provisions herein contained:

a) F.O.T. despatch point: On handing over the equipment to the carrier against receipt and such receipt having been passed over to the Purchaser.
b) F.O.T. Project Site: on receipt of material at Project site.
c) Equipment sent freight/ carriage paid to the Refinery site: On receipt of goods at site.
d) Equipment erected by the Seller: on acceptance at job site.
e) Equipment commissioned by the Seller: On taking over by the Purchaser for regular operation after test run at maximum capacity for specified period satisfactorily performed.

However, where the sale to or purchase by the Seller is deemed to take place in the course of inter-state trade or commerce or by endorsement/transfer of Railway receipt or Truck/Lorry or any receipt during transit, the sale to the OWNER of the same material shall similarly be deemed to take place by endorsement/transfer during transit in the course of inter-state trade or commerce in respect of which the OWNER will furnish the Seller/Supplier, wherever applicable, Form “C” to qualify to concessional rate of tax.

14.0 PRICE

14.1 Unless otherwise agreed to in the terms of the Purchase Order, the price shall be:

a) Firm and not subject to escalation for any reasons whatsoever till the execution of entire order even though it might be necessary for the order execution to take longer than the delivery period specified in the order.
b) Inclusive of adequate road worthy packing and forwarding charges upto effecting delivery at F.O.T. despatch point in all cases whenever F.O.T destination delivery terms are agreed to but exclusive of transit insurance.

14.2 Exclusive of Central/State Sales Tax, Excise Duty and or such imposts which are leviable by law on sales of finished goods to Purchaser and/or Octroi duty, if any, leviable at destination/ project site. The nature and extent of such levies shall be shown separately.

15.0 TERMS OF PAYMENT

15.1 Payment terms shall be as specified in the Enquiry / Purchase Order.

16.0 RECOVERY OF SUMS DUE

16.1 Whenever any claim against the Seller for payment of sum of money arises out of or under the contract, the Purchaser shall be entitled to recover such sums from any sum then due or which at any time thereafter may become due from the Seller under this or any other contract with the Purchaser including right to en-cash the PBG. In the event of encashment of PBG, the same shall be re-stored to its original amount by the Seller and should this sum be not sufficient to cover the recoverable amount, the Seller shall pay to the Purchaser on demand the balance remaining due.

17.0 CHANGES

17.1 The Purchaser has the option at any time to make changes in quantities ordered or in specifications and drawings. If such changes cause an increase or decrease in the price or in the time required for supply, a claim under this provision must be raised by Seller with documentary evidence/back-up documents/calculations within 7 days from the date the intimation for change is received from Purchaser. Seller shall execute the change only after receipt of change order.

18.0 CANCELLATION

18.1 CANCELLATION FOR DEFAULT

18.1.1 The Purchaser reserves the right to cancel the Purchase Order or any part thereof and shall be entitled to rescind the Purchase Order wholly or in part by a written notice of 10 days to the Seller if:

a) The Seller fails to comply with the terms of the Purchase Order.

b) The Seller fails to adhere to delivery schedule of manufacturing and fails to deliver the goods on time and/or replace the rejected goods promptly.

c) The Seller becomes bankrupt or goes into liquidation.

d) The Seller makes a general assignment for the benefit of creditors.

e) A receiver is appointed for any of the property owned by the Seller.

18.1.2 Upon receipt of the said cancellation notice, the Seller shall discontinue all work on the Purchase Order and matters connected with it.

18.1.3 The Purchaser in that event will be entitled to procure the material in the open market and recover excess payment over the Seller's agreed price, if any, from the Seller reserving to itself the right to forfeit the /Contract Performance Bank Guarantee (CPBG), if any.

18.2 CANCELLATION FOR CONVENIENCE

18.2.1 The PURCHASER may, by written notice of 10 days sent to the SELLER, Cancel the CONTRACT, in whole or part, at any time for his convenience. The notice of cancellation shall specify that cancellation is for the PURCHASER's convenience, the extent to which performance of work under the CONTRACT is cancelled and the date upon which such cancellation becomes effective.

18.2.2 The GOODS that are complete and ready for shipment within 30 days after the SELLER's receipt of notice of cancellation shall be purchased by the PURCHASER at the CONTRACT terms and prices. For the remaining GOODS, the PURCHASER may opt:

a) to have any portion completed and delivered at the CONTRACT terms and prices, and /or

b) to cancel the remainder and pay to the SELLER an agreed amount for partially completed GOODS and for materials and parts previously procured by the SELLER.

19.0 PATENTS AND ROYALTIES

19.1 On acceptance of this order, the Seller will be deemed to have entirely indemnified the Purchaser and Procurement Coordinators/Managers from any legal action or claims

regarding compensation for breach of patent rights which the Seller deems necessary to apply for manufacturing the ordered equipment and/or materials or which can in any way be connected in the manufacture.

20.0 CONTROL REGUALTIONS

20.1 The supply, despatch and delivery of goods shall be arranged by the Seller in strict conformity with the statutory regulations including provision of Industries (Development and Regulation) Act, 1951 and any amendment thereof as applicable from time to time. The Purchaser disowns any responsibility for any irregularity or contravention of any of the statutory regulations in manufacture or supply of his stores covered by this order.

21.0 CONTRACT *CUM PERFORMANCE BANK GUARANTEE (CPBG)*

21.1 Within 30 days from the date of issue of Purchase order, the Seller shall furnish Contracts cum performance guarantee in the form of Bank Guarantee as per the purchaser's proforma for an amount equivalent to 10% of the order value. This shall be 5% in case of bulk items (as listed in Annexure 1 to GPC).

21.2 The proceeds of the CPBG shall be appropriated by the Purchaser as compensation for any loss resulting from the Seller's failure to complete his obligations under the Contract without prejudice to any of the rights or remedies the PURCHASER may be entitled to as per terms and conditions of CONTRACT.

21.3 This CPBG shall also govern the successful performance of Goods and Services during the entire period of Contractual Warrantee/Guarantee.

21.4 The CPBG shall be denominated in the currency of the CONTRACT.

21.5 The Contracts cum Performance Guarantee shall be valid for the duration of 2 months beyond the expiry of Warrantee/Guarantee period. The Bank Guarantee will be discharged by PURCHASER not later than 2 months from the date of expiration of the Seller's entire obligations, including any warrantee obligations, under the CONTRACT.

21.6 In case of Reinforcement Bar, Structural steel, CPBG will be required for 5% of order value having validity up to Contractual delivery period + 2 months claim period.

21.7 In case of limited enquiries, CPBG shall not be required for orders up to Rs. Twenty Five (25) Lakhs in case of Pipes, Fittings, Flanges, Gaskets and Fasteners and for orders up to Rs. Ten (10) Lakhs for all other items. However, in case of NIT, CPBG shall be required for all orders irrespective of order value.

21.8 Bank Guarantee(s) shall be issued through Indian Nationalized Bank/ Indian Scheduled bank (other than Co-operative Banks) / Indian branches of foreign banks registered with Reserve Bank of India as a scheduled foreign bank.

21.9 It will be the responsibility of the Seller to keep the Bank Guarantee fully subscribed. Any shortfall in the value of the Bank Guarantee as a result of encashment by the Purchaser either in full or in part in terms of Seller's Performance shall be replenished by the Seller within two weeks thereof.

22.0 GUARANTEE

22.1 The Seller shall guarantee that any and all materials used in execution of the Purchase Order shall be in strict compliance with characteristics, requirements and specifications and that the same shall be free from any defects. Checking of the Seller's drawings by the Purchaser/Purchaser's representatives and their approval and permission to ship or

despatch the equipment and materials granted by Inspectors shall not relieve the Seller from any part of his/its responsibilities of proper fulfilment of the requirements.

22.2 The Seller will guarantee that all materials and equipments shall be repaired or replaced as the case may be, at his own expense, in case the same have been found to be defective in respect of material, workmanship or smooth and rated operation within a period 15 months after the equipment/ material have been put in service or 30 months from the date of shipment, whichever is earlier. Repaired or replaced equipment/ materials shall be similarly guaranteed by the SELLER for a period of fifteen (15) months from the date of replacement/ repair subject to a maximum of 30 months from the date,the main equipment/ material have been put in service. All expenses for such replacement/ repair of equipment/ material shall be to the account of the Seller including freight, if any.

22.3 Acceptance by the Purchaser or its Inspectors of any equipment and materials or its replacement will not relieve the Seller of its responsibility of supplying the equipment/materials strictly according to the specification and according to the guarantees agreed by the Seller.

23.0 NON-WAIVER

23.1 Failure of the Purchaser / Procurement Coordinators/ Managers to insist upon any of the terms or conditions incorporated in the Purchase Order or failure or delay to exercise any rights or remedies herein or by law or failure to properly notify Seller in the event of breach, or the acceptance of or payment of any goods hereunder or approval of design shall not release the Seller and shall not be deemed a waiver of any right of the Purchaser / Procurement Coordinators/Managers to insist upon the strict performance thereof or any of his or their rights or remedies as to any such goods regardless of when goods are shipped received or accepted nor shall any purported oral modification or revisions of the order by Purchaser/ Procurement Coordinators/Managers act as waiver of the terms hereof.

24.0 NON ASSIGNMENT

24.1 The Seller without obtaining prior written consent of the Purchaser shall not assign the Purchase Order to any other agency.

25.0 SELLER'S DRAWING AND DATA REQUIREMENT

25.1 The Seller shall submit drawings, data and documentation in accordance with but not limited to what is specified in the requisition and/or in the Seller drawings and data form attached to the Purchase Requisition and as called for in Clause 26 *(*PROGRESS SCHEDULE & EXPEDITING). Types, quantities and time limits of submitting this must be respected in its entirety failing which the Purchase Order shall not be deemed to have been executed for all purposes including settlement of payment since the said submission is an integral part of Purchase Order execution.

26.0 TECHNICAL INFORMATION

26.1 Drawings, specifications and details shall be the property of the Purchaser and shall be returned by the Seller on demand. The Seller shall not make use of drawings and specifications for any purpose at any time save and except for the purpose of the Purchaser.

26.2 The Seller shall not disclose the technical information furnished to or gained by the Seller

under or by virtue of or as a result of the implementation of the Purchase Order to any person, firm or body or Corporate authority and shall make all endeavors to ensure that the technical information is kept CONFIDENTIAL. The technical information imparted and supplied to the Seller by the Purchaser shall at all times remain the absolute property of the Purchaser.

27.0 PROGRESS SCHEDULE & EXPEDITING

27.1 Template for progress reporting is available on EIL eDMS portal. SELLER within 2 weeks of award shall submit to PURCHASER, his Delivery schedule regarding the documentation, manufacture, testing, supply, erection and commissioning of the GOODS.

27.2 For items other than bulk, the Delivery schedule will be in the form of a network or a bar chart clearly indicating all main or key events regarding documentation, supply of raw materials, manufacturing, testing, delivery, erection and commissioning.

27.3 SELLER shall update the template online on monthly basis to keep PURCHASER updated on the progress of the execution of Order and achievement of targets set out in time bar chart.

27.4 The Procurement Co-coordinator/ Managers shall have the right to inspect SELLER's premises with a view to evaluating the actual progress of work on the basis of SELLER's Delivery schedule.

27.5 The Procurement Co-coordinator/ Managers shall have free access to Seller's shop and/or sub-Supplier's shop at any time and they shall be provided all the necessary assistance and information to help them perform their job.

27.6 Irrespective of such inspection, in case of any delay, Purchaser cannot be held responsible. However, if delay is expected, at the earliest possible date, SELLER shall advise Purchaser, of anticipated delay in the progress.

27.7 Notwithstanding the above, in case progress on the execution of order at various stages is not as per phased Delivery schedule and is not satisfactory in the opinion of the PURCHASER which shall be conclusive or SELLER shall neglect to execute the order with due diligence and expedition or shall contravene the provisions of the order, PURCHASER shall be entitled to take action in accordance with the provisions of the Order.

28.0 SELLER'S LIABILITIES

28.1 The Seller's workmen or employees shall under no circumstances be deemed to be in Purchaser's employment and the Seller shall hold himself responsible for any claims which they or their heirs, dependents or personal representatives may have or make for damages or compensation for anything done or committed to be done in the course of carrying out of the work covered by this Purchase Order, whether arising on Purchaser's premises or elsewhere and agrees to Indemnify the Purchaser against any such claim or claims if made against the Purchaser and all cost (as between attorney and client) of proceedings, suits or action which the Purchaser may incur or sustain in respect of the same. The Seller shall also procure and keep in force at his own cost comprehensive automobile Liability insurance for adequate coverage in respect of all his vehicle/s visiting or plying in project premises. The Seller shall also be responsible for compliance of existing laws in respect of their workmen and employees.

29.0 PURCHASER'S MATERIAL

29.1 Purchaser's materials shall be delivered to the Seller after the Seller submits the Bank Guarantee for Indemnifying the full value thereof strictly in the manner and as per Performa of Bank Guarantee approved by the Purchaser.

29.2 Wherever possible, the material shall be consigned to goods depot to be specifically confirmed by Seller. The Seller at his responsibility and cost shall arrange Loading/Unloading and any handling from the destination.

29.3 The Seller shall give a firm and binding list of Purchasers issue of materials which shall be duly reviewed & approved by EIL and the desired schedule of its delivery to shop floor strictly in accordance with the sequence of fabrication vis-a-vis the contractual delivery period.

29.4 Unused materials or scrap from material supplied by the Purchaser to the Seller shall be returned by the Seller to the Purchaser or if the Purchaser so directs the Seller may dispose of the same by sale or otherwise on such terms and conditions as the Purchaser may stipulate and the Seller shall pay to the Purchaser the sale proceeds of the material so disposed off by sale deducting there from expenses incurred by the Seller on such sale, the quantum of such deduction to be mutually agreed upon in advance between the Purchaser and the Seller.

30.0 HEADINGS

30.1 The headings of the conditions hereof shall not affect construction thereof.

31.0 ARBITRATION

31.1 Any dispute or difference between the parties hereof arising out of any notified claim of the SELLER included in his final bill and /or arising out of any amount claimed by the OWNER (whether or not the amount claimed by the OWNER or any part thereof shall have been deducted from the Final bill of the supplier or any amount paid by the OWNER to the SELLER in respect of the work) shall be referred to arbitration in accordance with the UNCITRAL Rules as adopted in India by the Arbitration & Conciliation Act, 1996.

31.2 The venue of the arbitration shall be New Delhi.

31.3 Notwithstanding the existence of any dispute or arbitration in terms hereof or otherwise, the Seller shall continue and be bound to continue and perform the works to completion in all respects according to the

31.4 Contract (unless the Contract or works be determined by the Owner or by the Seller under the provisions of the Contract), and the Seller shall remain liable and bound in all respects under the Contract.

32.0 JURISDICTION

32.1 The Seller hereby agrees that the Court situated at New Delhi alone shall have the jurisdiction to hear and determine all action and proceedings arising out of this contract.

33.0 LIMITATION TO LIABILITY

33.1 Notwithstanding anything contrary contained herein, the aggregate total liability of Seller, excluding his liability towards infringement of patent, trade mark or industrial design rights, breach of Confidentiality, Anti-Bribery, Corruption and Conflicts of Interest, under the contract or otherwise shall be limited to 100% of value of Purchase order. However,

neither party shall be liable to the other party for any indirect and consequential damages, loss of profits or loss of production.

34.0 SETTLEMENT OF DISPUTE BETWEEN GOVERNMENT DEPARTMENT/ PUBLIC SECTOR UNDERTAKING

34.1 In the event of any dispute or difference relating to the interpretation and application of the provisions of the contracts, such dispute or difference shall be referred by either party for Arbitration to the sole Arbitrator in the Department of Public Enterprises to be nominated by the Secretary to the Government of India in-charge of the Department of Public Enterprises. The Arbitration and Conciliation Act, 1996 shall not be applicable to arbitration under this clause. The award of the Arbitrator shall be binding upon the parties to the dispute, provided, however, any party aggrieved by such award may make a further reference for setting aside or revision of the award to the Law Secretary, Department of Legal Affairs, Ministry of Law & Justice, Government of India. Upon such reference the dispute shall be decided by the Law Secretary or the Special Secretary/Additional Secretary, when so authorized by the Law Secretary, whose decision shall bind the Parties finally and conclusively. The Parties to the dispute will share equally the cost of arbitration as intimated by the Arbitrator.

ANNEXURE- I TO GPC
(LIST OF BULK ITEMS)

LIST OF BULK ITEMS

A. PIPING

1. Pipes
2. Fittings
3. Flanges (all kinds / types)
4. Gaskets
5. Bolts/Nuts
6. Strainers
7. Spring Hangers
8. Sample Cooler
9. Gate, Globe, Check Valves (Std Valves)
10. Steam Traps
11. SS/CR Manifold
12. Piston Valve (Steam Tracing)
13. Ball/Plug/Needle/Butterfly valves (Except high performance butterfly valve)
14. Static mixers
15. High Performance Butterfly Valves
16. Motor Operated Valves; Gate, Ball, Butterfly, Plug Vales
17. Hose Pipe
18. O-Lets
19. Dual Plate Check Valves
20. Cryo-LTCS: Gate, Globe, Check, Ball Valves
21. Diaphragm Valves
22. Sight Glass

B. PIPELINE ENGINEERING

1. Assorted Pipes
2. Flanges
3. Fittings
4. Hose & Hose Coupling

C. ELECTRICAL

1. LT Cable
2. FLP Lighting Fixtures and Control Gears
3. Communication Cables
4. Junction Box

D. INSTRUMENTATION

1. Pressure Gauges
2. Draft Pressure Gauges

3. Differential Pressure Gauges
4. Orifices Plates and Flanges
5. RTD, Temperature Gauges & Thermo-wells (Bimatellic, Filled System)
6. Temperature Elements & Thermo-wells
7. Copper Tubes (Bare, Coated)
8. SS Tubes
9. Instrument Tubing
10. Instrument Valves and Manifolds
11. Junction Boxes and Cable Glands
12. Signal Cable
13. Thermocouple Extension Cables
14. Tank Level Inst. (Float Operated)
15. Gauge Glass Cocks
16. Tube Fittings (SS & Brass)
17. Magnetic Level Gauges
18. Optical Fiber Cables and associated items
19. Pressure Relief Valves (Thermal Relief)
20. Variable Area Flowmeter (Indicator)
21. Rupture disc
22. Solenoid Valves
23. Displacer Level Instrument

Annexure-II to Commercial Amendment

SECURITY ESTABLISHMENT: HEF

(NO 6111/SE/MISC/HEF DT 09/05/2024)

SUB:- TURNKEY EXECUTION OF TNT PLANT AT HEF ON OBE BASIS

Ref :- EO Office letter No 21-CAPEX(A)/TNT/23-24/EO dt 09/05/2024.

1. With reference to the above subject, the comments sought for SL. No 38 (c) and Sl No- 74 are as below.:

2. **Point No - 38 (c)** :-

(a) Though the detail of equipment that will be utilized is not available with this section, it is recommended that any equipment with GPS tracking / requiring internet connectivity may not be permitted for eg Quadcopter (drone), Smart Phones and Laptops etc.

(b) Further, our letter No 6111/SE/MISC/HEF dt 29/04/2024 may also be referred to in this regard.

3. **Point No - 74** :-

(a) Latest format of seeking permission for visit of Foreign National has been forwarded vide MIL letter MILCO/CSO/Gen/2024 dt 07/05/2024 (copy attached).

(b) Permission of MIL & copies of documents as mentioned below be provided to this office min 48hrs in advance:-

(i) Copy of Passport incl validity
(ii) Details of visa
(iii) Address of stay in India
(iv) Details of accompanying staff (Indian)
(v) Date & duration of visit to the fy with specific purpose
(vi) Permission of CGM HEF

4. For info and necessary action please.

Security Officer **OIC/SE**

To :-

WM/EO

50

Appendix

FORMAT FOR SEEKING CLEARANCE FOR FOREGINERS VISITING MIL GROUP OF ORDNANCE FACTORY

S.No	Details	
1.	Full name and Sex of Visitor	
2.	Nationality of Visitor	
3.	Date of Birth	
4.	Parentage of Visitor	
5.	Permanent and Present Address of Visitor	
6.	Passport No and Date & Place of Issue	
7.	Validity of Passport	
8.	Occupation & Name of Firm/Organisation which the Visitor is representing	
9.	Specific Purpose of Visit	
10.	If Visitor has Visited the Establishment earlier, full details of same to be furnished	
11.	Details of Escort being provided for conducting the visit of the Visitor-	
12.	Address of Hotel/Accomodation where the Visitor is staying in India during the Visit	
13.	Address of Indian Company with which the Visitor is having Partnership/Alliance.	
14.	Date & Time of Visit	
15.	Area to be Visited.	
16.	Certificate that No Classified Document will be Shared with the Visitor.	

Recommended for Security Clearance
Chief General Manager :
Name of Ordnance Factory:

SECURITY ESTABLISHMENT: HEF

(NO 6111/SE/MISC/HEF DT 29/04/2024)

SUB:- TURNKEY EXECUTION OF TNT PLANT AT HEF ON OBE BASIS

1. Ref your letter No 8355/21-CAPEX(A)/TNT/23-24/EO dt 25/04/2024.

2. The following is recommended to be included :-

   (a) Mobile phones with cameras will not be permitted inside the company.

   (b) Details of vehicles (Trucks) including Register No & driver details etc and material being dumped to be provided in 48 Hrs in advance.

   (c) Details of Aadhaar & PVR be provided to SE office in hard & soft copy both.

   (d) One PC with printer be provided by contractor for preparing passes of the persons hired employed by the contractor, at the Main Gate.

3. Further, it is strongly recommended a separate Entry / Exit point (incl a separate gate) be made available for the employees of the firm. Suggested location for the same will be intimated on approval of competent authority.

29/04/24
Security Officer

29/04
OIC/SE

To :-

DO/EO

Copy to :-

DETAILS OF VEHICLES ENTERING AT HEF

DATE:-.....

Sl NO.	Vehicle Reg. No. with Validity	Permit with validity	Driver Name	Licence No with Validity & Issuing Authority	Driver PVR	REMAR

Stamp/Seal of Comp.

Contractorn Name & Sign.

Note:- All above documents to be produce at the HEF gate for Security purpose.

WM/ED

Standard Work Permit Format

Part - I

(Before Commencement of the Work)

Ordinance Factory/Unit Name : HIGH EXPLOSIVES FACTORY

Work Permit No.: ..... **Date & Time of Issue: .....**

Permit Duration : from ..... **to .....**

1. Detail of the Work: .....
2. Exact Location of Work Site: .....
3. Name of Contractor / Firm: .....
4. Name & Designation and Signature of Site In Charge:
   .....
5. Name, Designation & Signature of Work Site Nominated Person:
   .....
6. Name & Signature of Contractor's Supervisor / Supervisors
   .....
7. Assessment of general requirements before issue of Permit

SI. NO	Required	Condition	Remark of safety officer where not Specified
1	Electrical Shut down	YES/NO	Name Designation and signature of Concerned EM Staff
2	Ladder	YES/NO	
3	Full Body Harness Double lanyard ad per IS 1531	YES/NO	
4	Safety helmet as per IS 2925	YES/NO	
5	Hand Gloves	YES/NO	
6	Safety shoes	YES/NO	
7	Safety net as per IS 11057	YES/NO	
8	Safe walk/Crawling ladder	YES/NO	
9	Oxygen cylinder and other emergency arrangements	YES/NO	Please Specify
10	Safe Working Instructions are Known to Contractor's Supervisor	YES/NO	
11	Medical certificate of Worker	YES/NO	
12	Others	YES/NO	

8 Workers Authorized to Work Requiring Permit:

SI NO	Name of Workers	Age in completed years	Medical Certificate Date	Signature

This work permit will be considered valid only if the associated part II and III are adhered to

Permit Raised By	Site clearance Given By HOS/Concerned Section	Permit Issued By Safety Officer	Permit Received By Contractor
(Name & Designation)	(Name & Designation)	(Name & Designation)	(Name & Designation)

Part - II

(Report on daily basis before start of work during the Permit Period)

Work Permit No. :……..…. Permit Issue Date: ……..

Date of Work. :……

A. Daily Safety / Safe Practice Checklist:

SI No.	Items	Yes /No	Remarks of site in charge if any
1	Site is cleared for working with compliance off all safety instructions. If roof working is involved then there is no rain, thundershowers or excessive heat.		
2	Electrical shut down required		
3	Ladder is sound and being used safely (single ladder up to 30 feet)		
4	Body harness double lanyard is being and tied properly		
5	Safety Helmet is being used		
6	Hand gloves are being used		
7	Safety belt is being used		
8	Safety net is being used and fixed properly		
9	Safe walk ladder is placed and fixed properly		
10	Contractor's supervisor is available and well aware about the safety instructions (OFB instructions for working at height)		
11	Safe working instructions are given to the workmen in the local language by Contractor's supervisor before commencement of work		

B. Workers actually engaged from the list authorized in part -1:

SI No.	Name of workers	Age in Completed years	Medical Certificate Date	Insurance Certificate No.	Signature
1					
2					
3					

It is hereby ensured that the contract men are wearing safety gadgets and following safety norms.

Contractor Supervisor (Name & Seal)

Section Nominated staff (Name & Designation)

Site in Charge (Name & Designation)

Part-III

(Monitoring of work during permit duration)

Work Permit No: .....

Permit Issue Date: .....

Surprise Visit Details

SI. NO.	Visit Date & Time	Visit Conducted By (SO/CSO)	Action taken details (in case deviation if any)
1			
2			
3			

Work Permit Closure Date & Time: .....

Safety Officer
(Name & Designation)

Chief Safety Officer
(Name & Designation)

ANNEXURE - I

SAFETY SECTION
NO.5/SF/ESO/HEF/2013
DATE:-

SUB:- TEMPORARY ELECTRICAL CONNECTION PERMISSION FOR

Ref:- Your letter No/HEF -18 No.
Location :-

Period :-

Nature of work:-

Name of contractor/Action by (section name) :-

The following conditions / guidelines to be followed while giving the temporary Electrical connection .

1. *Connection must be given as per IE RULES / SI for Electrical Safety of OFB Directives*
2. *Four-core Armored stranded conductor cable of suitable size/capacity must be connected. One end of armoured of cable must be connected to earthing of, switch / MCB/MCCB & other end of same armoured connected to welding machine/portable pump motor, metal cutter ---etc.*
3. *Double earthing of suitable size/capacity of earth wire must be connected/ provided to Welding Machine/ Portable pump motor/ Cutter/Rock drill machine/concrete breaker, metal cutter --- etc.*
4. *Temp. Electrical connection supply must be disconnect at the end of days work / exhaust of work.*
5. *Supply cable & welding machine/ portable pump motor/cutter/Rock Drill machine/ concrete breaker/ Dewatering Pump , must be protected from Vehicle / Tress passers / Rain water. Welding/ Concrete breaker ---etc (out door) work should be stopped during rain water/ thunderstorm / lightning .*
6. *Separate switch/MCCB/MCB of suitable size / capacity with double earthing of suitable size/capacity should be connected for electrical supply/connection.*
7. *Welding machine/ portable pump motor/cutter/Drill machine/ Dewatering Pump ,---etc. kept away from the process building / Acid tanks/ Acid pipe line, Steam line, water pipe line.*
8. *Separate MCCB/MCB of suitable size / capacity with double earthing of suitable size / capacity should be connected for the welding machine/ portable pump motor/cutter/Rock Drill machine/ concrete breaker, Dewatering Pump , metal cutter ---etc.*
9. *The flexible cables of suitable size/ capacity used with the portable appliances should have thick insulation /heavily insulated and adequately protected from mechanical injury. The cable must have an additional core of earth connection (Double earthing required).*
10. *Water and foam type fire extinguishers should not be used for electrical fire.*
11. *Dry sand , Dry powder , CO_2 (gas) fire extinguisher should be used for electrical fire.*
12. *Work/Job to be supervised/n the presence of the staff of ME/EM/EO/CW/FB & Concern section's staff & fire brigade men to be present at the time of work/works spot along with fire fighting extinguishers / arrangements.*
13. *Work/Job to be done by the consents of JWM/HOS of ME/EM/EO/CW/FB & Concern section's JWM / HOS.*
14. *Permission is valid from 8.00 A.M. TO 4.30 P.M. Except Sunday & holidays.*
15. *Personal protective equipments like, insulated safety shoes, hand gloves, ladder safety goggles Safety Glasses, helmet, Safety belt face shield , welding helmet , nose (gas) masks , apron etc. to be used by the personals.*
16. *Electrical Switch/ the insulation of wire / cable/ earthing wire, to be checked at every time while changing the position/Area of the, welding/ grinding/Drilling/Concrete breaking. etc*
17. *Only one work like ,welding/grinding/drilling or concrete breaking & etc. may be done on same spot at a time.*
18. *All portable appliances (Drill Machine...etc.) should be connected through a plug socket of appropriate capacity with an earth connection & controlled by appropriate capacity of switch/ M.C.B..*

ESO / SAFETY

PERMISSION FOR IGNITION / USE OF FIRE / FLAME INSIDE THE FACTORY.

1	*Name of the firm / Contractor*			
2	*Supply Order No. / CPO No.*			
3	*Section / Bldg. No. / location where use of Fire / flame*			
4	*Period/Time for use of Fire/ Flame*		*From*	*To*
		Date		
		Time		
5	*Whether Permission required including Sunday / Holiday*			
6	*Reason for use of fire / Flame*			

Permitted / Not permitted

AGM / E **GPO / Dy. GPO** **DVO / HOS /**

To

Section Safety
Fire Brigade } *For necessary action*

Remarks of Safety Staff :

CHIEF SAFETY OFFICER ***HOS / SF***

To

M/s

Copy to :

DVO / FB , CO , EO :- *For information and necessary co- ordination.*

MASTER COPY

STANDING INSTRUCTIONS

FOR

ELECTRICAL SAFETY

IN

ORDNANCE FACTORIES

2019

FOREWORD

As per CEA Regulations, all electrical installations shall be designed, erected, installed, operated and maintained in such a way as to prevent danger to human being, animal and property. The Central Electricity Authority, as mandated by the Electricity Act' 2003, has framed different regulations in the field of generation, transmission, distribution and use of electricity. These are further supplemented by other governmental rules and departmental safety instructions of OFB issued from time to time.

2. The departmental instructions on Electrical Safety issued in 1978 were superseded in 1985 and subsequently amended in 1993 and lastly in 2000. These earlier instructions were mainly based on The IE Rules' 1956 and The Electricity (Supply) Act' 1948. Since then several instructions were issued by Ordnance Factory Board regarding various aspects of Electrical Safety. Large scale increase in generation, transmission and use of electricity necessitated major changes in the Electricity Act and hence the Indian Electricity Act' 2003 was promulgated. Section 177 of this Act authorised the Central Electricity Authority to make regulations consistent with this Act to carry out the provisions of the Act. This Standing Instruction is mainly based on the CEA regulations-2010 (amended in 2015 & 2018). The comparative chart of the IE Rules' 1956 and the CEA Regulations-2010 is available at the end of this compilation.

3. The enclosed Standing Instructions supersede the old Standing Instructions-2000. Provision of Chartered Electrical Safety Officer, certain changes in experience, qualification and nomination criteria of ESO and HOS/EM have been incorporated. Reference numbers of the CEA Regulations and OFB letters have been given wherever found feasible. Terms low, medium, high and extra high voltage have been replaced with 250V, 650V, 11kV & 33 kV voltage and above.

4. With the increase in use of electrical equipments and gadgets in our daily life, both professional and personal, the importance of the knowledge of safety precautions and DOs and DON'Ts during use of electricity has increased many folds. The impression created in the minds of persons working in the factories that electrical safety is the responsibility of electrical section alone, which is not correct. Investigations into electrical accidents have revealed that accidents occur by wrong handling of equipments, improper up-keep of shop floor particularly the cable trenches and control rooms / panels. It is the responsibility of the user sections to ensure that all equipments in the area are maintained / worked properly and that cable trenches and shop floor electrical control kiosks are kept clean and not misused.

5. It is needless to emphasize the role of RCS, REI and ESO to assist the Sr. GMs / GMs in operating and maintaining the electrical installations in the factory in a safe manner. The inspecting officers shall check the system thoroughly and critically and bring out the non-conformities / defects to the notice of the factory. The factory shall take the observations seriously and all efforts should be made to rectify the defects pointed out by them on priority basis.

6. Periodical inspection and maintenance should be given due importance. Shut downs necessary for carrying out inspection / testing / maintenance should not generally be refused or postponed.

7. All officers and staff with electrical background must go through these instructions and those who are responsible for electrical maintenance must become thorough with these instructions and implement the same. Effective measures should also be taken by Sr. GMs / GMs to curb any tendency on the part of their staff / workers to disregard / neglect compliance with this Standing Instructions.

V. S. Verma
Member / M&C, TS & Engg.

Ordnance Factory Board,
10-A, S. K. Bose Marg, Kolkata – 700 001
Date: 23.05.2019

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(STANDING INSTRUCTIONS TO BE REVIEWED EVERY 5 YEARS)

CHAPTER-I

General Instructions

1.1 All electrical installations shall be constructed, installed, protected, worked and maintained in such a manner as to ensure safety of human beings, animals and property.{the CEA Reg. 12(1)}

1.2 All installations, lines and apparatus shall be of sufficient rating for power, insulation and estimated fault current and of sufficient mechanical strength for the duty cycle which they may be required to perform.

1.3 Save as otherwise provided in the CEA Regulations (CEA Regulations-2010 & its amendments), the relevant code of practice of BIS or National Electricity Code (NEC), if any,are to be followed. In the event of any inconsistency, the provisions of the CEA Regulations shall prevail.

1.4 Certain safety measures have been prescribed by *Storage & Transportation of Explosive committee* (STEC- latest issue in 2017) for electrical installations connected with explosive handling process and specific type of installations, these should be followed.

1.5 Where some equipmentsare to be installed in any basement, it shall be ensured that the design of the basement should be such that there is no seepage or leakage or logging of water in the basement. [CEA Reg. 12(4)]

1.6 These standing instructions shall be read by all the Staff of electrical section and electrical staff attached to production and maintenance sections (at least once in a year and at the time of induction of a staff) who should sign after each reading. A register shall be maintained by the HOS of the Ordnance Factory /Unit for the purpose.

1.7 Ignorance of the contents of the Standing Instructions will not be accepted as an excuse and any person violating the provisions of the Standing Instructions will render himself liable for disciplinary action (under wilful negligence of duties).

1.8 Relevant extracts of Para No. 6.21.1, 6.21.2, 6.21.3, 6.21.4, 6.21.9& 6.21.10 from the S.I. should also be given wide publicity in Factory and Estate through periodical circulars minimum once in a year to ensure

Safety of all Electrical Installations & personnel in factory and factory estate (if any).

1.9 Relevant parts of these instructions should also be explained and read once in three months to industrial employees of the electrical section by respective Electrical Maintenance Group In-charge and they shall render a certificate in this regard to the D.O. of the Electrical section through Head of Section.

1.10 It should be ensured that all future planning for new erections, extensions and projects comply with the CEA Regulations and other Govt. rules/regulations / codes of practice and DGOF Standing Instructions.

1.11 In case of ambiguity, recommendations/approval of REI shall be sought.

1.12 Electrical installations in factories and estate area (if any) will be inspected periodicallyfrom Electrical Safety point of view by the following:-

a) Electrical Safety Staff, ESO (Monthly)

b) Regional Electrical Inspector, REI (half yearly)

Besides that, RCS of the region & COS of OFB headquarters may also visit the factories from time to time.

1.13 Each of the visits mentioned above will generate a report bringing to the notice of the General Manager the various unsafe electrical features and their locations as noticed by them during the visit.

1.14 It is the responsibility of the General Manager to take steps to rectify these unsafe features on priority basis in the shortest time and within the period given for rectification in the inspection report and forward a rectification report to the Inspecting Officer with copy to RCS & COS/OFB.

1.15 The unsafe features can be of two kinds:-

A. Those which can be rectified easily within the resources of the factory (like temporary wiring, loose wiring, live parts exposed etc.).

B. Defects for which certain procurement action and long term planning is involved.

1.16 (a) Defects of category ‘A’ above:–

These defects should be rectified immediately. If defects of the same type are existing elsewhere in the factory & estate, those should also be rectified. Suitable steps / directives should be given to prevent recurrence of such defect in future.

(b) Defect of category ‘B’ above.

PDCs for all the defects noticed will be given by REI.

(c) In case factory is not able to rectify any defect within PDC, action plan should be clearly defined and progress in each month to be intimated to REI and COS through format 1A (summarised Position), Format 1B (Completion Report for the month of …….) and Format 1C (List of pending observations / Objections).

(As per OFB letter No. 411/CEI//COS, Dated: 20/08/2014 – Different annexures, Formats and forms applicable are given in the last.)

(d) Meanwhile steps must be taken to guard the personnel & installation against the unsafe features in consultation with Regional Electrical Inspection, RCS & COS.

(e) The details of defects, their location and date of rectification should be recorded. A monthly review should be carried out by the General Manager / AGM (Electrical Maintenance) to monitor the progress.

(f) Rectification done by the factory of each & every defect and with its location should be recorded & reported to the REI and COS / OFB through their monthly reports.

1.17 In case of defects of serious nature e.g. non-operation or non-functioning of protective devices / Tripping batteries, live parts exposed etc. not rectified within the specific time intimated to them, the REI, Officers of COS / RCS may order immediate disconnection of the portions of the installations till rectifications are completed.

1.18 General Manager should initiate action against persons indulging in unsafe practices.

1.19 ESO should ensure observance of Safety provisions laid down under the Electricity Act, 2003 and the CEA Regulations made there under and shall periodically inspect electrical installations and keep a record thereof which shall be made available to the REI, Officers of COS / RCS during their visit.

CHAPTER-II

Responsibilities

2.1 General Manager:-

It is the statutory responsibility of the General Manager of the Factory as the administrative head to ensure the statutory compliance of the Electricity Act and the CEA Regulations in regard to Electrical installations under his jurisdiction. It shall be ensured that the installations are installed, operated and maintained in such a way as to ensure safety of human beings, animals and property.

2.2 Divisional Officer of Electrical Section:-

(i) As an execution officer he/she is responsible to the General Manager to see that Rules/Regulations/departmental instructions pertaining to safety and other statutory compliances are followed and complied with.

(ii) In a factory having more than one Electrical JWM or electrical group functioning independent of each other, it is the responsibility of Divisional / Group Officer controlling all these groups to effect co-ordination between the different groups to ensure that there are no loop holes in implementation of the instructions in regard to electrical safety and the instructions contained in this S.I. are complied.

2.3 HOS Electrical Section:-

(i) An officer from Electrical stream and with reasonable experience in operation and maintenance of electric plants shall be made HOS of the Electrical Section.

(ii) Ensure compliance of the instructions contained in this S.I. by all persons under his control and working under him and bring to the notice of production / maintenance / other section any lapses (in the compliance of this SI) on their part.

(iii) The electrical installations in the factory and estate are installed, maintained and repaired in such a way as to be free from danger. Any unsafe act detected or noticed by him should be brought to the notice of the head of the section / occupant through the officer of the concerned department for rectification.

(iv) Hewill be answerable to the Divisional Officer and the General Manager of the factory for any lapse in the compliance of any of

the provisions of the S.I. or Rules of Central / State Government or the CEA regulations etc.

(v) To report Electrical accidents to the Regional Electrical Inspector and COS/OFB, in terms of CEA Regulations.

(vi) He will ensure that every person working on an electric supply line or apparatus or both shall be provided with tools and devices such as gloves, rubber shoes, safety belts, ladder, earthing device, helmets, line tester, test lamps and the like for protecting him from mechanical or electrical injury. Such tools and devices shall always be maintained in sound and efficient working condition.

(vii) He will submit progress of compliance of electrical safety observations raised by the Electrical Safety Officer (ESO) to concerned RCS forwarding a copy to ESO in **Proforma 20B.**

2.4 Electrical Safety Officer (ESO):-

General Manager of the factory will nominate an Electrical Safety Officer for ensuring observance for ensuring safety measures with respect to use of electricity, under intimation to RCS & COS/OFB.The ESO shall be an Electrical Engineer degree holder with at least 5 years of experience in operation and maintenance of electrical installations or an Electric Engineering Diploma holder with at least 10 years of experience in operation and maintenance of Electric installations. [CEA Reg. 5(2) with Amendment in 2018].

The ESO shall:-

(i) function independent of Electrical Maintenance Section.

(ii) Inspect the installations from time to time and point out unsafe features noticed, to the General Manager and watch the rectification.

(iii) Submit a monthly inspection report of the factory and estate in **Proforma 20A**to the Sr. General Manager/General Manager and shall forward a copy of this report to the concerned RCS.

(iv) Assist Regional Electrical Inspector, RCS & COS/OFB during their inspection visits.

(v) Visit the accident spot immediately (after an electrical accident and advice the GM regarding the evidences to be preserved / photographed).

(vi) ESO will function under the technical guidance of the REI and may seek clarification on any point from him.

(vii) ESO will inspect that all tools and devices used by persons such as gloves, rubber shoes, safety belts, ladders, earthing devices, helmet, line testers, test lamps and the like for protecting persons are in sound and efficient working condition, once in three months and send a report to REI.

(viii) All rectifications carried out by the factory of deviations pointed out by REI / RCS / COS are to be checked by ESO and countersigned for the correctness.

(ix) Changes in nomination of ESO will be intimated to RCS & COS / OFB.

**** Sr. General Manager / General Manager / HOD may get assistance of any Chartered Electrical Inspector if found extremely necessary for any specific electrical installation testing job.***

(the CEA Reg. 5A, 30 & 43)

2.5 Electrical Section:-

2.5.1 Electrical Section shall at all times be solely responsible for the maintenance and upkeep (at the required level) of all the electrical installations in the factory and estate in such a condition as to be free from danger.

2.5.2 Proper and safe operation of power supply equipment and installation in the factory and estate.

2.5.3 The Staff and IEs executing any electrical work would ensure that the work is done in the manner prescribed in the S.I.

2.5.4 They should bring to the notice of the JWM In-charge, Electrical Section & in his absence Divisional Officer / Electrical or any person acting on his behalf any unsafe features likely to expose persons to the risk of electrical shock, mechanical injury or fire, noticed by him and it is the responsibility of the officer or JWM to whom the matter is reported to take steps to eliminate the danger involved in it.

2.6 Maintenance Sections:-

The In-charge of the Maintenance Section should ensure that,

2.6.1 No connection for their electrical appliances is taken from other than from a plug socket outlet or standard accessory outlet.

2.6.2 Tampering or making any alteration or adjustment of setting or replacement of fuses of any electrical apparatus or machinery or wiring installation is not carried out by persons working under him. All such

connections, reconnections, additions or alterations etc. shall be done by Electrical Staff and workmen deputed by them.

2.6.3 Portable appliances are to be connected only with proper plug tops to plug sockets.

2.6.4 Apparatus are never connected by inserting wires into the plug sockets.

2.6.5 The flexible cable is provided with an earth wire and is connected to earth point in the plug at one end and the body of the portable appliances at the other end.

2.6.6 All portable appliances and Inspection Lamps under their custody are in sound working order. They should be got checked by the Electrical Section periodically and records maintained for them having been inspected and found satisfactory. No unauthorised / improvised portable apparatus should be permitted to be utilised in their section.

2.6.7 Malfunctioning of the plug point or any abnormal features (like sparking, heating up of plug point or wire, apparatus) are reported to electrical section and the apparatus is not used till the fault is cleared by them.

2.6.8 The cable trenches are kept clean, covered and free from oil / water or shop sweepings.

2.6.9 They are not used for laying or running pipes or process lines or for any other purposes.

2.6.10 Electrical Section should be consulted before any excavation is done for water / sewage line in the area where cables are passing or suspected to be passing and their written clearance obtained before starting the work.

2.6.11 New works pertaining to water and sewage line should not be planned close to electric cable. Where such passing or crossing is unavoidable, the power lines should be protected by cast iron or Hume pipes. Electrical section should always be involved in such planning.

2.6.12 Water / air / steam lines should not be erected over / close to an electrical installation. Electrical section should be consulted before laying these lines so that leakage of water / steam does not affect the electrical installation or its accessories.

2.6.13 It should be ensured that water leaking through roofs of the buildings or leakage from any pipe like (steam / water / process line) does not fall on the electrical installation. They should also ensure that pipelines do not cause any obstruction to the operation & maintenance of any part of the electrical installation.

2.6.14 The space in front and rear of electrical controls are kept clear upto 1 meter distance and be easily approachable. No heater or sundry stores should be kept in these areas.

2.6.15 Space near power panels should not be used as a rest shed, store room or site workshop / shift office.

2.6.16 Enclosures to control panel are kept closed properly with screws intact.

2.6.17 Metallic scrap is not allowed to go into the power / control panel or fall on or near it.

2.6.18 It should be ensured that extensions / new constructions (buildings / roads) do not come over earth pits or over a cable route.

2.6.19 Apparatus / machinery and its controls are used in the manner prescribed by the machinery manufacturer.

2.6.20 He should obtain written clearance of Electrical Section in the following cases:-

(i) Whenever work has to be done on an EOT Crane or any other crane where live wires are within accessible distance and the person is required to go up to attend to it.

(ii) Work has to be done on the roof top of a bldg. or walls (inside or outside) with O.H. lines going over or passing close to the building.

(iii) Work has to be done on a structure (metallic)close to O.H. line.

(iv) Work on any machinery with bare live wires within accessible distance.

2.7 User Sections and Users in Residential Areas:-

2.7.1 Instructions listed under paragraphs 2.5 and 2.6 shall also apply to the extent relevant.

2.7.2 Switching Stations, power control panels, control rooms of plants, sub-distribution panels etc. should have a clear passage free from obstacles for ready approach, easy operation in the event of any emergency. Articles should not be dumped on its passage.

2.7.3 A space of 1 meter all around powder control panel, sub-power panel and control panels should be kept free from encroachment and nothing should be kept inside the area. This space should not be utilised as storeroom, site workshop, shift room, resting place or for any other purpose.

2.8 Cables and cable trenches:-

2.8.1 Cable trenches inside the production buildings should be kept free from cotton waste, oil, water any other articles (production material and scrap, shop sweeping etc.). The trenches should be kept closed and no gaps should be allowed to exist in the trench covering.

2.8.2 No rainwater should be allowed to collect in the cable trench. The source of flow of rainwater into the cable trench should be located and rectified. Any water accumulated in the trench should be pumped out.

2.8.2 Pipelines (water, steam, air etc.) should not run along with cables in cable trenches.

2.8.4 No digging in places where cables have been laid should be commenced without intimating electrical section and obtaining their clearance in writing.

2.8.5 Digging should be stopped at the stage where cables are seen and should be commenced only after the electrical section representative visits the spot and gives the clearance to go ahead or stands there to supervise the work.

2.8.6 While planning new construction, suitable clauses should be incorporated in the siting board stage itself to ensure that (1) cables do not come under a bldg. and (2) cables crossing proposed roads / drains are adequately protected from mechanical damage or suitably diverted.

2.9 O. H. lines:-

2.9.1 As far as possible no buildings or sheds should be planned or constructed below an O. H. line. If the construction is unavoidable, following precaution should be taken. The portion of O.H. line crossing the building should be changed over to insulated wire or A clearance as per the para 6.2 shall be maintained over the top most part of the building and close cradle guarding should be provided below the line.

2.9.2 Laying of pipelines / structures in the vicinity of O. H. lines should be avoided. If laying is inescapable A clearance as per the para 6.2 shall be maintained over the top most part of the building and close cradle guarding should be provided below the line. Alternatively the portion of the line should be replaced with insulated wire or cable.

2.9.3 Work on a building or pipe lines or structures with overhead lines running above or nearby within the minimum vertical and horizontal clearance distances given at para 6.2 is permitted for lines of voltages up

to 650 V only. No work within the minimum vertical and horizontal clearance distances of live lines of voltage more than 650 V is permitted.

2.9.4 Planting of trees below the overhead lines should not be permitted.

2.9.5 The space around the terminal poles of overhead lines and shackle points should be kept clear of wild growth below.

2.9.6 Cables should not be allowed to run on floor without proper metallic protection.

2.9.7 Flexible cable connections to portable appliances should be free from joints and should not be in contact with swarf and sharp metallic objects.

2.9.8 Any abnormal behaviour like sparking seen on O. H. conductor should be reported to the electrical section immediately by anyone who sees it.

2.9.9 A snapped O. H. conductor or an O. H. conductor hanging loose, should be reported to the electrical section and security section immediately. A Durwan should be posted to warn any person going near the fallen line till the electrical section takes over the situation.

2.10 Works on or near Electrical Installation:-

2.10.1 Work on any live electrical installation should be carried out only with the prior permission and clearance of electrical maintenance section under their supervision and safety guidance.

2.10.2 Dismantling / shifting of any electrically operated apparatus should be done with prior intimation to electrical section and with their clearance. The objective is to ensure that cabling / wiring are protected and the lines are isolated.

2.10.3 Fuses / setting of relays etc. should not be tampered. Any alteration in the size of fuse, setting of relays of electrical apparatus should be done only by the authorised electrical persons.

2.10.4 No tampering of wiring is permitted.

2.10.5 Alteration, modification, temporary / permanent extension should be done only by authorised electrical persons.

2.10.6 Work on or near live bus-bars / O. H. line or exposed live parts (gantry, bus-bar for shop lighting or machinery, bare wire O. H. lines running on or near walls) should not be commenced without obtaining permit and clearance from electrical maintenance section.

2.10.7 Enclosures of the control panel should be kept closed properly and with all screws in-tact. Metallic swarf should not be allowed to get into or fall on or near it. A space of minimum 1 m all around should be kept free from swarf and metallic objects.

2.10.8 They should ensure that all portable appliances (with metallic body) used by them have a third wire connection to earth.

2.10.9 Earth pits should be kept clear, maintained and accessible.

2.10.10 Plantation of trees should not be done below O. H. lines.

2.10.11 Any abnormal behaviour (smoke, sparking, abnormally hot etc.) in switchgears should be reported to the electrical section immediately. No one other than authorised electrical persons should be allowed to go near it.

2.10.12 Any serious violation of this S. I. likely to endanger personnel or machinery should be reported to the officer controlling the section for rectification within a specified time (reasonable). In the event of non-rectification within the specified time the area / machinery involved in the violation of S.I. be disconnected. It will not be reconnected till the violation is removed.

2.11 It is the responsibility of the user section / user to ensure the safety of personnel / machinery under his control.

2.11.1 The instruction contained in para 2.6 and 2.7 will apply to the extent relevant.

2.11.2 Any abnormal feature / features such as heating up of an electrical accessory, sparking, electric shock or being O. H. lines loose / dangling / ruptured should be reported to the electrical section for rectification.

2.11.3 In the case hanging, loose or dangling conductors of an O. H. line system seen during non-working hours, the matter should be reported to the I/C electrical shift and I/C main gate who will contact the Electrical Officer / JWM / incharge of concerned EM Group and arrange to cordon off the place of fault if advised by them to do so.

2.11.4 The Electrical Officer / JWM / incharge of concerned EM Group shall, on receipt of such a message, take immediate steps to isolate power supply if considered necessary.

CHAPTER – III

AUTHORISATION

3.1 The CEA Regulation 2010 prescribe that a supplier or consumer to carry out duties accidental to the generation, transformation, transmission, conversion, distribution or use of electricity shall designate persons for the purpose to operate and carry out the work on electrical lines and apparatus. {the CEA Reg. 2010 3(1)}

3.2 HOS/EM shall maintain a register wherein the names of the designated persons and the purpose for which they are engaged, shall be entered. {the CEA Reg. 2010, 3(2)}

3.3 No person shall be designated under Para 3.1 above, unless:-

(i) he possesses a certificate of competency or electrical work permit, issued by the appropriate Government OR certificate of competency issued by DGOF for the purpose.

(ii) his name is entered in the register referred to in Para 3.2 above. {the CEA Reg.3(3)}

3.4 For the purposes detailed in Para 3.2 and 3.3(ii) the HOS/EM shall maintain the following records:-

(i) A record of qualification in **Proforma-1** for staff and IEs.

(ii) An authorisationregister in **Proforma-2** with the authorising and authorised persons signing it. Signature should be with date.

3.5 The authorisation register should be checked by the Divisional Officer once in a month.

3.6 The register maintained under Para 3.2 shall be produced before the Regional Electrical Inspector during his visits.

3.7 If on inspection, the Regional Electrical Inspector finds that the designated person does not fulfill the required qualification, he shall recommend the removal of the name of such persons from the register.

3.8 It is the responsibility of the HOS/EM to ensure that no work whether new work, repairs/alterations, adjustments and additions in the factory or factory estate is carried out except by an authorised person under the personal and direct supervision of a responsible competent electrical staff assigned for the work.

3.9 Works involving replacements of lamps, fans, fluorescent tubes, fuses, switches, cleaning of slip rings and commutators of motors and generators in the factory or estate shall be carried out by authorised persons under the general supervision / directives of a technical staff assigned for the purpose.

3.10 The HOS/EM will ensure that the person deputed for any work is authorised by him, in writing, is in possession of necessary competency certificates issued by the DGOF or license issued by State or Central Govt. covering the technical requirements of the work assigned to him and is competent to execute the work.

3.11 Staff assigned to technically supervise and execute / guide the work should have been cleared by the Electrical Supervisory competency board at DGOF Hqrs.

3.12 Staff and IEs cleared by the competency board at DGOF Hqrs., in the special trade can be authorised to supervise and execute works falling in that category only.

3.13 Normally and as far as possible working on live lines or in close proximity of live lines, or with live parts in an accessible condition or handling live parts of equipments should be avoided and it should normally be done after rendering dead the line or installations where the work is to be carried out and obtaining a shut-down permit under the permit system described in Chapter-IV.

3.14 Every person who is working on an electric supply line or apparatus or both shall be provided with tools and devices such as gloves, rubber shoes, safety belts, ladders, earthing devices, helmets, line testers, testing lamps and other safety gadgets required for protecting him from mechanical and electrical injury and such tools and devices shall always be maintained in sound and efficient working condition. {the CEA Reg. chapter III/19./(2)}

3.15 No person shall work on any live (hot) electric supply line or apparatus and no person shall assist such person on such work, unless he is designated in that behalf and takes the safety precautions given in **Schedule-III**. {the CEA Reg. 19(3)}

3.16 Except in the case of works referred to in Para 3.17 below, it is not necessary to make an entry in the register to authorise a person for each and every work. A general description of the scope of the work an individual is expected to perform and area of machinery to function may

be entered in columns 4 & 5 respectively of the Proforma. Any change in the authorisation of duties shall be recorded as a fresh authorisation.

3.17 Particulars of work and person detailed for each & every work of the following category should be recorded in the **Proforma-3** (Record of Special works) and should be executed under strict supervision of a technically competent staff, which will remain at the work spot till the completion of the work:-

(i) Works involving any person to ascend a pole or structure supporting un-insulated live conductors, closer than 1.5 m. from live conductors (for lines up to 650 V only). Ascending on pole supporting 11kV and more is not permitted under live condition.

(ii) Works on OH line system other than operation of AB switches.

(iii) Works requiring opening of enclosures containing the live conductors of any apparatus including switchgear and panel or entering an area where live wires / bus bars are exposed and not fully protected.

(iv) Work on control circuit of any machinery having multiple controls located at different places without taking a total shut down of the apparatus or taking only a partial shut-down.

(v) Works involving going up an EOT crane or a manually operated crane located near an EOT crane, without taking a shut-down of the power supply to the bus bars on the rail of the crane.

(vi) Major breakdown and repair works.

(vii) Works involving special consideration of safety.

(viii) Works involving handling of power supply cables which are carrying current and are not de-energised & discharged.

(ix) Works involving working on dead O.H. line (dead and isolated) but in a close proximity (less than 2 meters for voltage up to 650 V & 4 meters for 11kV or above lines) of another O.H. line which is live and for which shut-down permit is not taken.

(x) Works involving entry into enclosures / enclosed area contained live parts or conductors which are not totally insulated (e.g. control panel room of a plant wherein the conductors are not totally insulated / isolated.

3.18 Safety precautions to be taken by the authorised person:-

(i) All electrical works except these of routine nature like replacement of lamps, fans, fuses, tubes, switches, low voltage domestic appliances and cleaning of slip rings and commutators of motors and generators shall be done under the directions and technical supervision of competent electrical staff.

(ii) The work should be done by a competent and trained person who is aware of the danger that exists when working on or near the live mains or apparatus.

(iii) Proper safety gadgets and devices should be used by the persons involved in the process.

(iv) Proper tools, equipments, safety gadgets like rubber gloves, mats, rubber shoes, ladders, earthing devices, helmets, line testers, operating rods, safety belts etc., and any other devices recommended by the manufacturer as in practice to ensure safety should be provided and used.

(v) The persons in charge of work should examine the tools / equipments and safety gadgets / devices before use to ensure that they are in sound and efficient working condition.

(vi) The persons should be accompanied by another person preferably trained in the technique of artificial respiration, be capable of rendering first aid in the event of injury and be capable of putting off supply to the area where the work is being carried out in the event of an elec. accident involving flash over or leakage or shock.

(vii) Details of safety precautions required to be followed for different types of jobs required to be handled should be made by the factory in consultation with / approval of the REI, be appended along with authorisation register and got signed by all the staff and workmen as a token of having read and understood the instructions.

3.19 Working on live 11 KV and above lines/mains or apparatus except operation of VCB, AB switches and testing with instruments intended to be so used, shall not be carried out under any circumstances.

CHAPTER – IV

PERMIT SYSTEM

4.1 The following types of work shall not be commenced unless instructions contained in point No. 4.2 of this chapter are completely complied with:-

4.1.1 Works involving construction, erection, rectification of an electric installation or apparatus which is live or not fully dead / isolated & electrically discharged.

4.1.2 Work on an installation which although dead is capable of being energised by the operation (accidentally or otherwise) of switches, link / fuses or by any means or through accidental contact with electric system during the course of work.

4.1.3 Work in close proximity of a live installation within the accessible range.

4.1.4 Work on electric installations of 11KV and above of which a section is live.

4.1.5 All electrical installation work, including additions, alterations, repairs and adjustments to existing installations, except such replacement of lamps, fans, fuses, switches, domestic appliances of voltage not exceeding 250 V and fittings as in no way alters its' capacity or character, shall be carried out by the person licensed in this behalf by the Central Government, State Government or possessing DGOF competency in electrical field and under the direct supervision of a person holding a certificate of supervisory competency issued by DGOF or by a person holding a permit issued or recognized by the State Government. {CEA Reg. 29(1)}

4.2 Safety instructions while commencing work on mains / apparatus:-

4.2.1 The person entrusted with the work on mains or apparatus shall obtain a permit certificate as per **Proforma-5** after making the apparatus, installation, feeder or section of electric system dead and completely isolating the area where he will be working. This is particularly applicable for working on installations containing voltage 11KV and above, overhead lines of up to 650V, cables & installations, where there is a risk of back feed. Proper permit procedure as detailed in this chapter shall be followed.

Or

The person entrusted with the work, who takes a shutdown himself after putting 'Off' the switch removing the fuses. This is particularly applicable only in cases involving domestic installations working on the voltage below 650V, portions of the installations located in a small area having only one control point for supply, with no back feed in places where the area of work is close to control switch and is visible to the person (or where this is not visible he shall detail a man near the switch to ensure that the switch is not made 'ON' inadvertently).

Or

Any person takes a shutdown after informing his group In-charge, puts OFF the switch, removes the fuses, locks the switch room or switchgear to prevent any one switching it 'ON' without his knowledge (This is applicable in the case of Street light & places where there is no risk of back feed & feeders controlled by a single switching station).

4.2.2 The work shall be carried out by a person possessing requisite competency for the type of work.{CEA Reg. 3(3)}

4.2.3 Before any conductor or apparatus is handled, adequate precautions shall be taken, by earthing or other suitable means, to discharge electrically such conductor or apparatus, and any adjacent conductor or apparatus, if there is danger there from, and to prevent any conductor or apparatus from being accidentally or inadvertently electrically charged when persons are working thereon.{CEA Reg. 19(1)}

4.2.4 The person is authorised to do the work. {CEA Reg. 3(3)}

4.2.5 He is aware of the risks involved in the work and takes appropriate precautions.

4.2.6 Every person who is working on an electric supply line or apparatus or both shall be provided with tools and devices such as gloves, rubber shoes, safety belts, ladders, earthing devices, helmets, line testers, testing lamps and other safety gadgets required for protecting him from mechanical and electrical injury and such tools and devices shall always be maintained in sound and efficient working condition. {CEA Reg. 19(2)}

4.2.7 All safety gadgets mentioned under Para 4.2.6 shall be checked quarterly in general and every time before commencing the work, by a responsible person i.e. the group In-charge of concerned electrical maintenance group. He, after checking, shall render a report to HOS/EM. On the basis of these reports, HOS/EM then shall take necessary steps to ensure availability of the tools / safety gadgets and safety devices.

4.2.8 No person shall work on any live electric supply line or apparatus and no person shall assist such person on such work, unless he is designated in that behalf and takes the safety precautions given in Schedule-III. {CEA Reg. 19(3)}

4.2.9 He is accompanied by another person who is conversant with artificial respiration procedure & has enough knowledge to isolate the appropriate switch in the event of electric shock, electric flash over or burn injury due to any reason.

4.2.10 Every telecommunication line on supports carrying a line of voltage exceeding 650V but not exceeding 33 kV shall, for the purpose of working thereon, be deemed to be a line of voltage exceeding 650V. {CEA Reg. 19(4)}

4.3 Permit to Work procedure for electric maintenance:-

4.3.1 A Proforma of permit to work **(Proforma-5)** given in the annexure shall be used while issuing any permit to work.

4.3.2 The permit to work certificate from the person (in-charge operation) to the person (in-charge for any particular work) ensures that the portion of the installation where the work is to be carried out is rendered dead and safe for working. If more than one section or departments are working on the same apparatus or line, one permit to work certificate shall be issued to in-charge of each department / section. Restoration of the supply shall be done when all permit to work certificates are returned by concerned in-charges.

4.3.3 In a manned substation, electrician on duty as switch board attendant, is responsible for switching off / isolation of control switches prior to the issue of permit for a work and to ensure that these switches may not put 'ON' or part of the installation where the work under permit certificate is being carried out is not energised until the return of the permit duly cancelled by the permit receiving authority.

4.3.4 Permit to work certificate can be issued by the group in-charge of the concerned electrical maintenance, HOS/EM or staff / responsible persons authorised by him. In all cases the issue of a permit shall be recorded by the HOS/EM in a register maintained for the purpose in the **Proforma-4** in the annexure. Where the permit is issued by the group in-charge of the concerned electrical maintenance group or a person authorised by HOS/EM, the particulars of the permit issued shall be intimated to HOS/EM immediately after issue and shall be followed by clearance and

normalcy report as soon as normal power supply in the affected area is restored.

4.3.5 Permit books shall be treated as an important record. All sheets in the permit books and permit books themselves shall be serially numbered. No page out of the permit book shall be detached or used for any other purpose. If any sheet is detached, a dated and initialed statement shall then and there be recorded in the book by the person responsible for it.

4.3.6 A permit book can be issued to each person authorised by HOS/EM, who shall keep it in safe custody.

4.3.7 Generally a permit to work certificate will be issued to any factory employee working in EM section and authorised to do the electrical repair and maintenance work but it may be issued to any other section, firm or agency also for the work such as underground water line laying, ground leveling work, laying of sewage / drainage lines etc. While issuing permit to work for all type of excavation work in factory and factory estate, EM section shall also ensure in the permit that the work area being excavated is not having any underground cable. However, if permit to work is issued to any outer agency, firm or contractor, an electrician / staff well conversant with the supply system of that particular area shall be deputed for proper guidance regarding safety.

4.3.8 The counterfoil and the Permit to work certificate shall be prepared at the same time. The person issuing permit to work or SBA on duty (in the case of manned substation) shall carry out the operation of switching OFF / isolation, earthing etc. of the section, hand-over the keys of the controlling switch to the person receiving permit to work (if considered necessary) by issuing authority, before issuing the permit. The issuance and return of keys will also be recorded in the key register / logbook. The details of switches / links operated shall be recorded in the counterfoil and the certificate. He shall also fix a board on the switches put 'OFF', mentioning instruction that **"Men working on line, Do not switch ON"**. The issuing person and the SBA on duty (in the case of manned substation) and the person receiving the certificate shall sign at appropriate places in the permit and in the counterfoil. The issue of permit will be recorded in the log book and the details shall be intimated to HOS/EM for endorsing the details in **Proforma-4.**

4.3.9 Permit receiving person shall keep the permit certificate with him till the work is completed. In case he has to transfer the permit to another person, he shall fill in "Box 3" of the certificate and sign it and get the

signature of the person to whom the permit is transferred before handing it over to him.

4.3.10 After completion of the work, the receiving person of the permit / the person to whom the permit is transferred will cancel the permit by filling and signing in “PART-IV” of the certificate, “PART-III” of the counterfoil and hand over the keys of the control switches (if any) handed over to him at the time of issue to ensure additional safety. The issuing person or electrician on duty as switch board attendant (in the case of manned substation) shall fill in and sign the “PART-V” of the permit certificate and “PART-IV” of the counterfoil. He shall switch ‘ON’ the control switches, restore normalcy, record in log book the cancellation and intimate the HOS/EM the return of permit and normalcy. The counterfoil and the cancelled certificate shall be pinned / pasted together in the book. Later, all these permit certificates shall be placed in a file for record and further tripping system analysis. In case more than one permit has been issued for the same area, the return of all the permit certificates issued shall be awaited before switching ‘ON’ & restoring supply to the affected area.

4.3.11 The original permit shall be issued to the person actually doing the work or in-charge of the work and the counterfoil will be retained in the permit book, for further allocation of work to the workers authorising them individually to carry out the prescribed work. On completion of the work mentioned in the permit, it shall be returned to the issuing officer for cancellation.

4.3.12 Issue / return of permit shall also be entered in the logbook or log-sheet either in red ink or this endorsement shall be underlined. When change of shift occurs during the pendency of a permit, the outgoing officer issuing permit / SBA / Electrician shall inform about all the permits to his reliever verbally and by entering in the logbook or log-sheet before handing over the control to next incumbent. The incoming officer authorised to issue a permit / SBA / Electrician shall also sign the permit book or log sheet while taking over as a token of his acknowledgement having noted the pendency of the permits.

4.3.13 Allofficers issuingpermit and persons / in-charges concerned with the permit shall adopt similar logging procedure to avoid any confusion / discrepancy.

4.4 The instructions given below shall strictly be complied with at all times by the person in-charge and his staff working on any job with a permit to work:-

4.4.1 The person in-charge shall explain the nature and duration of work to be carried out to the permit issuing authority and obtain from him a permit to work before commencing work. This nature and duration of work shall be endorsed in permit also.

4.4.2 The permit issuing authority shall not issue a permit unless

a) Concerned switches / switchgears have been made "OFF" and contact making/breaking trolley has been withdrawn and are completely isolated on both sides, links and fuses opened, mains and apparatus discharged and earthed (to the extent feasible) adjacent live parts adequately protected. Where possible, the switches shall be locked, keys handed over to the permit receiving authority (if considered necessary) and the permit receiving authority will not return them until completion of the work. Switches and fuses of all control panel connected with the works covered in the permit shall also be made 'OFF' or rendered inoperative.

b) **"Men working on line DO not switch ON**" boards are attached in conspicuous places on the switch / MCCB / VCB / switchgear and apparatus and at all other control points under the permit to work.

c) An entry is made in the logbook / log-sheet to the effect that the switch / MCCB / VCB / switchgear and apparatus under permit have been made OFF / dead. On no account shall they again be made live until the permit is returned by the person in-charge who has done the work, removed earthings to the system provided for safety and returned the keys (if any), which were given to him at the time of issue of the permit.

4.4.3 The person (In-charge of work to be carried out) before allowing any workman to commence work on the mains / apparatus shall take the following precautions:-

a) He shall explain the nature and purpose of the work and precautions taken by the permit issuing authority to ensure safety of the workmen and shall also explain the precautions to be taken by them during the progress of work.

b) He shall ensure that if the work is being carried out at a height of more than 3.0 meters, the persons actually working at the height are free from (i) Epilepsy, (ii) High BP, (iii) Vertigo and (iv) Obesity. It shall also be ensured that their eye sight is also good.

{Reference OFB letter No. 104/SF/GEN/COS, Dated: 17/06/2016 & 9/06/2017 and letter No. 211/GEN/COS, Dated: 12/02/2018}

c) Satisfy himself that the switches controlling the mains and apparatus have been isolated, discharged properly, earthed, where possible, shorted with a discharge rod and ***"Men working on line, do not switch ON"*** caution boards have been placed at conspicuous places.

d) Warn the workmen and the public about the danger that exist in the vicinity of the area covered by the permit.

4.4.4 On completion of the work, ensure removal of all earthing devices so that the mains and apparatus are fit in all respects for charging, withdraw all workmen and warn them that it is no longer safe to touch or approach the mains and apparatus and thereafter return the keys and the permit to the permit issuing authority for cancellation.

4.5 Works of the following types may not warrant issue of a permit, provided all the condition stated in point No. 4.2 are complied with and the shutdown procedure detailed in the point No. 4.6 hereunder is followed:-

4.5.1 Works involving simple domestic installations such as replacement of lamps, fans, fuses, switches, domestic appliances of voltage not exceeding 250 V and fittings which in no way alters electrical system's capacity or character. {CEA Reg. 29(1)}

4.5.2 Simple apparatus with all controls located close to the person attending to it.

4.5.3 Machinery having only one point of entry of power supply and the switch installed close to the machinery.

4.5.4 Any other type of work permitted by the D.O. in writing.

4.6 The person detailed for the work shall put 'OFF' the switch, remove the fuse, neutral link if any, lock the switch (if possible) and lock the room (if possible), keep the fuses, keys etc. under his custody till the work is completed, and he shall:

(i) warn the persons in the area not to operate the switch.

(ii) put a board **"Men working on line. Do not switch ON"** (where work is being done in a substation or switching station).

(iii) The operation of the switchgear shall also be logged in the shift logbook and in **Proforma-6** (register).

4.7 Under no circumstances, one shall do repair / maintenance work on the installation, system or apparatus working on 11KV and above when they are live or energised with electric power. Only those works, which involve general switching "ON / OFF" operation of any switchgear, AB switches, VCB, OCBs (if any), testing with instruments / gadgets intended to be used under live line conditions may be carried out.

4.8 *No person or agency shall be allowed to work on wall or roof of a building or a metallic structure, perimeter wall or any part of an electrical installation which is close to an overhead line or installation, unless the electric section is informed and their permission is obtained in writing before commencing the work. Same shall be applicable to the work involving excavation, digging or leveling the land manually or using any type of earth moving machine. The electric section shall see the place & examine the scope of work, give shut down / permit and prescribe in writing the requirements to ensure safety. EM section shall also ensure on Work Permit that* ***"There is no underground cable laid at the place of excavation, digging or leveling the land".***

CHAPTER – V

SUBSTATIONS

5.0 The instructions in this chapter will apply to all substations, receiving stations, generating stations & switching stations to the extent relevant.

5.1 General safety requirements relating to installation, operation and maintenance of substations:-

5.1.1 Substations, receiving stations, generating stations, switching stations and the transformer rooms should have an independent approach connected to road of sufficient load bearing capacity to withstand movement of heavy equipments e.g. transformers, ACBs, VCBs etc. This approach shall be over and above any other approaches from production sections to switching rooms as may be considered necessary to meet the operational requirements.

5.1.2 Its location in the factories handling explosives should conform to STEC regulations (Latest issue 2017).

5.1.3 The floor of the substation building shall preferably be above the road level outside. Where necessarily constructed underground, due provisions for ventilation and drainage shall be made. [CEA Reg. 49{1(i)}]

5.1.4 Any space housing switchgears, transformers etc. shall not be used for storage of any materials especially inflammable and combustible materials or refuse. [CEA Reg. 49{1(i)}]

5.1.5 The drains outside the building shall be so constructed that water from outside does not seep in or get into the cable trenches.

5.1.6 Outdoor sub-stations (excluding pole type substations) and outdoor switching station shall be efficiently protected by fencing not less than 1.8 meters in height or other means. [CEA Reg. 49{1(ii)}]

5.1.7 The fencing of such area shall be earthed efficiently. [CEA Reg. 49{1(ii)}]

5.1.8 Where platform type construction is used for a pole type sub-station and sufficient space for a person to stand on the platform is provided, a substantial hand rail shall be built around the said platform and if the hand rail is of metal it shall be connected with earth. However, in the case of wooden supports and wooden platform the metal hand-rail shall not be connected with earth. {CEA Reg. 50}

5.1.9 A danger board with a sign of skull and bones (as per IS - 2551), showing the voltage (highest) handled in the substation in Hindi/English and local language, shall be affixed in a conspicuous position.

5.1.10 Danger boards of approved quality with correct voltage marked shall be placed on all equipment & control switchgears.

5.1.11 Substation Buildings shall not be used as shift room, site workshop, store room etc.

5.1.12 Substation buildings shall be kept neat and clean and free from dust.

5.1.13 All generating stations, substations, junction-boxes or pillars, in which there are many circuits or apparatus, shall be marked by means of indication of a permanent nature that the respective circuits or apparatus are readily distinguishable from one another. These circuits or apparatus may be working on different voltages or at the same voltage. (CEA Reg. 24)

5.1.14 HOS/EM shall arrange to prepare a schematic diagram/plan of the area of supply and on this diagram route and the alignment of the overhead/underground cables shall be marked. In case of underground works, the approximate depth of all the existing electric supply cables below the surface, number of cores and sizes of the feeding cables, location of street distributing/junction boxes and other electrical works also shall be marked. {CEA Reg. 11(1)}

5.1.15 Once in every year, the Schematic diagram/plan mentioned above shall be duly corrected so as to show the updated electric supply lines incorporating fresh changes (if any), street distributing boxes and other works for the time being in position. {CEA Reg. 11(1)}

5.1.16 Schematic diagram/plan mentioned under point No. 5.1.14 and 5.1.15above, shall also be prepared and maintained up dated in electronic / digital form. {CEA Reg. 11(3)}

5.1.17 Normally, readings of different parameters such as voltage, current, power factor etc. of the transformers and different feeders shall be endorsed in the log book on hourly basis, but if load on the transformer/feeder is going beyond the full load rating, more frequent readings i.e. half-hourly or readings at every fifteen minutes may also be taken. If critical condition of load persists beyond the rated capacity of transformer/feeder cable, immediate steps shall be taken to reduce the load and the SBA/technician on duty shall inform the in-charge concerned.

5.1.18 While changing shift duty, the outgoing SBA/technician shall brief about the abnormal condition (if any) such as any shutdown, tripping, critically loaded transformer/feeder etc. to the coming SBA/technician.

5.1.19 Substation buildings shall not be used as a general shift room or a place for keeping personal items and dresses etc., only authorised items (i.e. items listed in 5.2 below) shall be kept in the Substation. [CEA Reg. 49{1 (i)}]

5.1.20 A list of authorised persons shall be displayed in the substation. This list may be changed from time to time depending upon the duty allocated. Persons other than the above authorised persons shall not be permitted to enter in the substation. {CEA Reg. 3(2) & 3(3)}

5.1.21 The equipments at the substations shall not be operated by persons other than authorised persons. All operations carried out in all manned substations shall be endorsed in logbook **(Proforma 6)** and all type of operations carried out in any unmanned Substation shall be recorded in the concerned register. However, external cleaning of the switch gear, trenches, transformers (indoor type only) can be carried out by any person but under the direct supervision of the authorised persons.

5.1.22 All care shall be taken to ensure that the elec. installations and equipment are well protected from the entry of water or chemical dust by leakage or seepage or any other cause. Any seepage / leakage / entry of water into the substations, equipments and cable trenches shall be attended immediately.

5.1.23 If the substation feeds electric power to overhead lines and take off poles are located just outside the Substation building, the fencing shall cover the takeoff poles also to prevent unauthorised operation and damage to the pole & its accessories due to any reason.

5.1.24 One set of tools for emergency operation shall be kept available in the substation at all times, in addition to tools/gadgets required for normal operation of substation. Tool boxes pertaining to individual workmen not on duty shall be kept in a separate and specific room / place.

5.1.25 It shall be ensured that unless the conditions are such that all the conductors and apparatus may be made dead at the same time for the purpose of cleaning or for other work, the said conductors and apparatus shall be so arranged that these may be made dead in sections, and that work on any such section may be carried on by a designated person without danger. [CEA Reg. 44{ 2(xiii)}]

5.1.26 Only designated / authorised persons shall carry out the work on live lines, switchgears and apparatus. [CEA Reg. 44{ 2(xiv)}]

5.1.27 For works involving voltage exceeding 650 V, common work as to take readings of voltmeter, ammeter, to ON & OFF the circuits, operating gang operation switch etc. are permitted on live system and that also with using hand gloves, rubber boots and such other gadgets/PPEs of good quality and suitable voltage rating required to ensure safety.

5.1.28 Before any conductor or apparatus is handled, adequate precautions shall be taken, by earthing or by discharging electrically such conductor or apparatus, and any adjacent conductor or apparatus (if there is danger from it) and to prevent any conductor or apparatus from being accidentally or inadvertently electrically charged when persons are working thereon. {CEA Reg. 19(1)}

5.1.29 Every person who is working on an electric supply line or apparatus shall be provided with tools and devices such as gloves, rubber shoes, safety belts, ladders, earthing devices, helmets, line testers, testing lamps and other safety gadgets required for protecting him from mechanical and electrical injury. Such tools and devices shall always be maintained in good and efficient working condition. {CEA Reg. 19(2)}

5.1.30 No person shall work on any live electric supply line or apparatus and no person shall assist such person on such work, unless he is designated in that behalf and takes the safety precautions given in Schedule-III. {CEA Reg. 19(3)}

5.1.31 Insulating floors or mats (as per IS – 15652:2006) of appropriate voltage level shall be placed in front of the panels. {CEA Reg. 19(5)}

5.1.32 The individuals working in HT maintenance and having knowledge and experience in the field, need not be shifted to other areas frequently. {OFB letter No. 411/CEI/COS, Dated:- 05/10/2016}

5.1.33 (A) The work must be done by an authorised person in possession of requisite competency for the type of work involved.

(B) Authorised person / Persons must be in possession of:-

a) Requisite permit certificate (refer Chapter-IV).

b) Must have taken shut down in the manner detailed in Chapter-IV.

c) Authorisation to do repairing / maintenance works under live line condition (for voltage up to 650V only) is permitted and this shall be recorded under special works and the work being

done under the direct supervision of a competent and authorised staff.

5.2 The following shall be available in every S.S.:-

5.2.1 Fire (Sand) buckets filled with clean dry sand shall be conspicuously marked and kept in a readily accessible position for extinguishing fires in addition to fire extinguishers suitable for dealing with fires. {CEA Reg. 2010 - 27(1)}

5.2.2 There shall be minimum four sand buckets in each substation and fire extinguishers as per scale prescribed in the Annexure-A.

5.2.3 The fire extinguishers shall be tested for satisfactory operation as per relevant Indian Standard at least once a year and record of such tests shall be maintained. {CEA Reg. 27(2)}

5.2.4 A first aid box/cupboard conspicuously marked and equipped with such contents as specified by the State Government, shall be provided and maintained. {CEA Reg. 27(3)}

5.2.5 Two or more gas masks shall be provided conspicuously and installed and maintained at accessible place, in every generating station with capacity of 5 MW and above and enclosed sub-station, with transformation capacity of 5 MVA and above for use in the event of fire or smoke. {CEA Reg. 27(4)}

5.2.6 Adequate number of gas masks shall be provided at every generating station and enclosed sub-station with capacity less than 5 MW and 5 MVA respectively.

5.2.7 A set of instructions in Hindi/English and the regional language with action chart for the artificial respiration / resuscitation of persons suffering from electric shock shall be affixed in a conspicuous place in each substation, generating station and switching station. {CEA Reg. 28(1)}

5.2.8 Address/Telephone No. of the nearest doctor available shall also be arranged.

5.2.9 An artificial respirator in good and working condition. {CEA Reg. 28(3)}

5.2.10 Key board/boxes with pegs should be marked to indicate the particulars of the key hung on it. Each key should have a tag to indicate the lock operated by it. The particulars of the peg should match with that indicated on the key tags.

5.2.11 Hand gloves in good condition of approved quality (IS- 4770:1991 & IS - 13774:1993 for 11kV and IEC-60903:2002 for maximum working voltage 33kV), with the voltage upto which it can be used stamped on it, suitable for the highest voltage of the system in the substation.

5.2.12 Minimum one pair of rubber boots and other protective clothing as considered necessary.

5.2.13 Essential gadgets required for operation of switch gears, drawing–IN/OUT of fuses, operating rods, handles etc.

5.2.14 Hydro meter (If conventional batteries are used), cell tester, multi-meter/voltmeter for testing/checking the condition of the batteries.

5.2.15 Minimum one torch in working condition.

5.2.16 Emergency lighting units / system to provide general illumination.

5.2.17 A tool box containing all essential tools and safety gadgets for emergency operation in the S.S.

5.2.18 Adequate number of caution boards mentioned "**Men working on line" or "Do not 'ON' the switch"**.

5.2.19 A drawing of the power supply scheme of the factory and factory estate and a detailed schematic diagram of the equipments in the substation indicating the ratings of equipments & cables of incoming & outgoing supplies.

5.2.20 A logbook for manned Substations:- The logbook, apart from load details, shall record the condition of the tripping & emergency batteries (voltage, specific gravity daily).

5.3 Minimum Clearances:-

(a) For panels and switchgears:-

5.3.1 A clear space of not less than **one meter** in width shall be provided in front of the panels. [CEA Reg. 37{(iii)a}]

5.3.2 Space behind the switch board shall be either less than 20 cm. or more than 75 cm. [CEA Reg. 37{(iii)b}]

5.3.3 If the space behind the switchboard exceeds 75 cm. in width, there shall be a passage way from either end, clear to a height of 1.8 meters. [CEA Reg. 37{(iii)c}]

(b) For Transformers:-

5.3.4 The minimum clearance required from wall shall be as under:

1.25 m : from each wall for transformers bounded by walls on all sides.
1.0 m : from each wall for transformers bounded by walls on 3 sides.
0.75 m : from each wall for transformers bounded by walls on 2 sides.
0.50m : from the wall for transformers bounded by wall on one side.

5.3.5 Besides above, there should be enough space around transformer to facilitate inspection, testing and maintenance.

5.4 Safety requirements for installation and operation of switchgears at substations:-

5.4.1 The enclosures of all switchgears and bus-bars shall be kept free from holes or crevices and shall be vermin proof. Spare holes for cable entry or holes left out after taking out any instrument/relay etc. from the panel for repairs; shall be closed properly to make the panel insect and vermin proof. The doors of the switchgears shall be kept closed properly without leaving any crevices. All new / replacements of switchgear panels, pillar boxes and DBs shall be of factory fabricated and of reputed make only. {CEA Reg. 37(i)}

5.4.2 Contact making / breaking trolley of switchgears not intended to be operated for longer time may be lowered or racked out and locked. A board **"Men working on line"** or **"Danger - Do not switch ON"** may be displayed on such switchgears. The lowered or racked out switchgear shall be checked before taking it 'UP' or racking it 'IN', particularly if it has been kept in lowered or racked out condition for a long time.

5.4.3 When two or more switchgears feeding power to a common load either from two or more different power sources or from the same power source, these shall be provided with electrical interlocking system to keep the rest switchgears in 'OFF' position when one of them is in 'ON' position. When switchgears intended to be used for such type and to be procured/purchased new, interlocking having electrical as well as mechanical system shall be preferred.

5.4.4 The keys of the switchgears and the substation should be suitably tagged to identify the equipment or substation controlled by it and placed on appropriate peg in the key board suitably marked for ready identification. All removal & return of keys shall be recorded in a logbook and key register in **Proforma-9**.

5.4.5 All transformers, ACBs, VCBs and Switches etc. shall be at true level to the floor, and stand vertical.

5.4.6 Individual switchgear of any combined panel shall be provided metallic partitions on the sides to segregate it from the adjoining switchgear.

5.4.7 The cubicles, housing measuring instruments and protection relays connected with the circuit breaker/switchgear, shall also be so arranged that any flashover in the circuit breaker/switchgear does not damage the instrument / relay.

5.4.8 The correctness and proper functioning of 'ON' & 'OFF' indication on switchgears shall be maintained and checked regularly.

5.4.9 Instruments and protective relays, CTs and PTs shall be kept in functioning order at all times. The switchgears shall never be allowed to function with protective devices inoperative. (i.e. due to any Electrical/mechanical fault in the tripping mechanism or non-availability of power supply for tripping). Batteries (from tripping circuit) shall never be disconnected, when power supply system is "ON".

5.4.10 The setting of relays and choice of C.T. Ratio shall be such as to ensure correct degree of protection to the equipment controlled by it.

5.4.11 The tripping system / Batteries / relays shall also be checked regularly for their proper functioning. A regular log book shall be maintained in in the **Proforma-7** for the condition of batteries.

5.4.12 Switchgears shall be correctly and clearly marked to indicate the area or circuit controlled by it.

5.4.13 All live bare parts shall be adequately protected and made inaccessible under normal conditions. Arrangement shall be made to provide in readily accessible position switches for rendering them dead whenever necessary. Other suitable safety measures shall be taken as are specified in the relevant IS. (theCEA Reg. 17)

5.4.14 However, where this is not possible, suitable caution board mentioning "LIVE PARTS EXPOSED"" in Hindi/English and local language shall be provided at a safe distance to warn persons about these live parts.

5.4.15 In case live conductors pertain to supply voltage more than 650V and are exposed out of any panel, the panel room shall be kept locked and authorisation to receive the keys and open the room shall be made in written and one copy of this authorisation shall be made available at the place where the key is placed. Issue and return of such keys shall be made for specific purpose only and be recorded in **Proforma 3**.

5.4.16 In case of use of electricity at voltage exceeding 650 Volts, suitable interlocks shall be provided in the following cases:-

(i) Isolators and the controlling circuit breakers shall be interlocked so that the isolators cannot be operated unless the corresponding breaker is in open position. [CEA Reg. 45{1(i)}]

(ii) Isolators and corresponding earthing switches shall be inter-locked so that no earthing switch can be closed unless and until the corresponding isolator is in open position. [CEA Reg. 45{1(ii)}]

(iii) Where two or more supplies are not intended to be operated in parallel, the respective circuit breakers or linked switches controlling the supplies shall be inter-locked to prevent possibility of any inadvertent paralleling or feedback. If not interlocked, switchgears in OFF position shall be provided with a board ***"Back Feed" DO NOT OPERATE WITHOUT PROPER INSTRUCTIONS FROM CONCERNED STAFF"*** to avoid inadvertent / unsafe operations. [CEA Reg. 45{1(iii)}]

(iv) When two or more transformers are operated in parallel, the system shall be so arranged as to trip the secondary breaker of a transformer in case the primary breaker of that transformer trips. [CEA Reg. 45{1(iv)}]

(v) All gates or doors which give access to live parts of an installation shall be inter-locked in such a way that these cannot be opened unless the live parts are made dead and proper discharging and earthing of these parts should be ensured before any person comes in the close proximity of such parts. [CEA Reg. 45{1(v)}]

(vi) Where two or more generators operated in parallel and neutral switching is adopted, inter-lock shall be provided to ensure that circuit breaker provided to generator cannot be closed unless one of the neutrals is connected to the earthing system. [CEA Reg. 45{1(i) to 1(vi)}]

5.4.17 In case of use of electricity at voltage exceeding 650 Volts, following protection shall be provided in all systems and circuits to automatically disconnect the supply under abnormal conditions:-

(i) Over current protection to disconnect the supply automatically, if the rated current of the equipment, cable or supply line is exceeded for a time which the equipment, cable or supply line is not designed to withstand. [CEA Reg. 45{2(i)}]

(ii) Earth fault or earth leakage protection to disconnect the supply automatically, if the earth fault current exceeds the limit of

current for keeping the contact potential within the reasonable values. [CEA Reg. 45{2(ii)}]

(iii) Gas pressure type and winding and oil temperature protection (Buchholz relay) to give alarm and tripping shall be provided on all transformers of rating 1000 KVA and above or fitted with conservator. [CEA Reg. 45{2(iii)}]

(iv) Transformers of capacity 10 MVA and above shall be protected against incipient faults by differential protection; [CEA Reg. 45{2(iv)}]

(v) All generators with rating of 100 KVA and above shall be protected against earth fault or earth leakage. [CEA Reg. 45{2(v)}]

(vi) All generators with rating of 1000 KVA and above shall be protected against faults within the generator winding using restricted earth fault protection or differential protection or by both. [CEA Reg. 45{2(vi)}]

(vii) High speed bus-bar differential protection along with local breaker back up protection shall be commissioned and shall always be available at all 132 KV and above voltage sub-stations and switching stations and generating stations connected with the grid. [CEA Reg. 45{2(vii)}]

5.4.18 In cases, where a switchgear or transformer is suspected to have developed fault or where fire is seen inside, the following action shall be taken immediately:-

(i) The incoming supply / supplies controlling the supply to the switchgear under fault shall be put OFF immediately.

(ii) No one shall be permitted to go near the faulty switchgear or cross the path of flame / gushing hot oil (if any), unless the supply to the faulty switchgear is disconnected and the flames / gushing of oil has subsided.

(iii) Standing from a safe distance, attempts shall be made to prevent spread of fire to other areas in the substation & control the situation using sand buckets, fire extinguishers / shifting of inflammable items (if any), creating barriers in the paths of flame, etc.

(iv) While switching “ON” any switchgear before or after repairs, the operator shall keep himself as far away as practicable with his face turned away, so that in the event of any flashing over, burn injuries to the operator could be minimised. No person, other than person carrying out the switching ‘ON’ operation of the

switchgear shall stand very close to the switchgear at the time of its operation. Other staff and employees may stand at a safe distance.

(v) All tripping of OCBs (if any) due to suspected fault / fault condition shall be recorded in **Proforma 8**.

5.4.19 A linked switch with fuse or a circuit breaker of requisite capacity to carry and break the current for the voltage system not exceeding 650V, shall be placed as near as possible after the point of commencement of supply so as to be readily accessible and capable of being easily operated to completely isolate the supply to the installation. This equipment shall be in addition to any equipment installed for controlling other individual circuits, feeders or apparatus. {CEA Reg. 35(2)}

5.4.20 A circuit breaker of requisite capacity to carry and break the current for the voltage exceeding 33 kV shall be placed as near as possible after the point of commencement of supply. {CEA Reg. 35(2)}

5.4.21 Each distinct circuit shall be protected against excess energy by means of suitable cut-out or a circuit breaker of adequate breaking capacity suitably located and so constructed as to prevent danger from overheating, arcing or scattering of hot metal when it comes into operation and to permit for ready renewal of the fusible metal of the cut-out without danger. {CEA Reg. 35(4)}

5.4.22 All insulating materials shall be chosen with special regard to the circumstances of their proposed use and their mechanical strength shall be sufficient for their purpose and so far as is practicable of such a character or so protected as to maintain adequately their insulating property under all working conditions in respect of temperature and moisture. {CEA Reg. 35(6)}

5.4.23 Adequate precautions shall be taken to ensure that no live parts are so exposed as to cause danger. {CEA Reg. 35(7)}

5.5 Safety requirements for installation and operation of transformers at substations:-

5.5.1 Any apparatus having more than 2000 liters of oil shall not be located in the basement, where proper oil draining arrangement cannot be provided. [CEA Reg. 44{2(vi)}]

5.5.2 Where transformers having more than 2000 liters of oil are installed, whether indoor or outdoor, following safety measures shall be provided:-

(a) The baffle walls of four hours fire rating shall be provided between the transformers / apparatus to prevent damage and spreading of fire, due to any fault/explosion/fire in the transformer apparatus.

(b) Provisions shall be made for suitable oil soak pit and where use of more than 9000 liters of oil is involved, provision shall be made for the draining away or removal of any oil which may leak or escape from the tank/receptacle. Special precautions shall be taken to prevent the spread of any fire.

(c) Any type of spare oil (Diesel, lubrication or insulating) shall not be stored in the vicinity of any oil filled equipment in any sub-station or switching station.

(d) All the transformers and switchgears shall be maintained as per the schedule provided by the manufacturer or in accordance with the maintenance schedules prepared in accordance with the relevant codes of practice of BIS.

(e) Only dry type of transformers shall be used for installations inside the residential and commercial buildings.

[CEA Reg. 44{2(vi) & 2(vii)}]

Note:- point No. 5.5.1 & 5.5.2 are also applicable to OCBs or any other oil containing apparatus.

5.5.3 The transformers shall preferably be installed each in a separate room.

5.5.4 Adequate fire protection arrangement for quenching the fire in all the apparatus shall be made. [CEA Reg. 44{ 2(viii)}]

5.5.5 It shall be ensured that the transformers of 10 MVA and above rating or in case of oil filled transformers with oil capacity of more than 2000 liters are provided with fire-fighting system as per IS – 3034:1993 or with Nitrogen Injection Fire Protection System. [CEA Reg. 44{ 2(ix)}]

5.5.6 Where it is necessary to locate the transformers, sub-station or switching station in the basement, the CEA Regulation 44{2(x)} shall be followed.

5.5.7 It shall be ensured that oil filled transformers installed indoors in other than residential or commercial buildings are placed at the ground floor or not below the first basement. [CEA Reg. 44{ 2(xi)}]

5.5.8 All transformers shall be provided with temperature indicator, oil level indicator, ON/Off Load Tap Changer along with other standard accessories.

5.5.9 Off Load Tap Changer on transformer shall always be kept locked and be operated only after de-energising the transformer. If there is provision of ON Load tap Changer on any transformer, its operation at loaded transformer should be avoided.

5.5.10 When temperature indicators with electrical contacts provided, use of these contacts shall be for tripping the transformers at unmanned substations and for giving alarm at lower degree of risk and for tripping the transformer at serious fault, when the substation is manned.

5.5.11 The neutral point of any transformer/Generator shall be provided with two distinct and independent earthing connections terminating in its own earth pits. Earthing wires / strips for earthing the neutral of the transformers shall not be in contact with or close to the body of the transformer. [CEA Reg. 41(xiii) & 48{ 2(i)}]

5.5.12 The condition of silica gel and oil level in the conservator tank shall be checked periodically. Any abnormality / abnormalities like leakage of oil, heating/charring of cable terminals or uncommon noise and any deviation from normal parameters shall be attended immediately.

5.5.13 In case of every transformer the following shall be provided; namely:-

(i) On primary side for transformers a link switch with fuse or circuit breaker of adequate capacity. This link switch shall be capable to OFF supply to the transformer when it is at “No Load”.

(ii) All transformers shall be provided a circuit breaker on primary side, (a) having a capacity of 5000 kVA and above installed before the year 2000 and (b) having a capacity of 1000 kVA and above installed in or after the year 2000. [CEA Reg. 35{3(i)}]

5.5.14 In respect of all transformers installed in or after the year 2000, on the secondary side of all transformers a circuit breaker of adequate rating shall be installed. However, for transformers of capacity below 1000 KVA, on secondary side a linked switch with fuse or circuit breaker of adequate rating shall be installed. [CEA Reg. 35{3(ii)}]

5.6 Safety precautions while installation and operation of the electrical power generating sets:-

5.6.1 D.G. sets installed or proposed to be installed shall match the load requirement and characteristics.

5.6.2 Following minimum protective devices/system shall be arranged with any generator:-

a) Prevention of back feed from the main supply to the generator.

b) Prevention against overloading of the DG Set.

c) Adequate synchronizing system, if two or more generators are intended to operate in parallel.

5.6.3 D.G. Sets shall be installed as far away as possible from the power panel of the regular supply system. These shall preferably be installed in well ventilated separate room.

5.6.4 Often D.G. Sets of small capacities meant for specific loads are connected to the panel containing switchgears meant for several other loads besides the specific load. In such cases adequate fool proof precautions shall be taken to ensure that the entire load is not connected to the generator causing over loading to the generator.

5.6.5 Any kind of oil (diesel, lubricating or insulating) shall not be stored in D.G. set rooms.

5.6.6 Place where D.G. Sets are installed shall be treated as a generating station. All the instructions applicable to a generating station in the CEA Regulations' 2010, the Electricity Act' 2003 and general safety rules applicable to substations and any other electrical installation, shall apply to the extent they are relevant.

5.7 Safety precautions while installation and operation of the batteries:-

5.7.1 Batteries may be required to be provided for energising the tripping circuit and emergency lighting for the substation. The same batteries shall not be used for both the purposes.

5.7.2 The batteries if not enclosed in an enclosure with its own charging unit, shall be installed in a separate room fitted with an exhaust fan.

5.7.3 Periodic checking/testing and maintenance of batteries shall be as under:-

A. Daily:-

a) Indication of leakage, swelling or body deformation in any battery.

b) Voltage of any one battery (selected randomly).

c) Specific gravity of electrolyte of all cells of any one battery, selected randomly (applicable to the conventional batteries only).

d) In case power supply fails the switchgear indication light shall glow for at least about five minutes. If it goes off immediately, it indicates that the battery requires replacement.

B. Fortnightly:-

a) Checking of total voltage of the combined battery units under test conditions of 15 minutes loading, having minimum load equivalent to all tripping coils' resistances.

b) Checking the condition of all terminals of batteries and connecting leads for carbonization and pitting.

c) All nuts and bolts connecting the leads with the battery terminals shall be tightened.

d) Petroleum jelly shall be applied after tightening the nuts and bolts as mentioned above.

5.7.4 The results of tests/checks mentioned above shall be recorded in **Proforma-7** and the results shall be signed by HOS/EM and DO/EM once in three months.

5.7.5 Abnormalities noticed and remedial action taken shall be recorded and reported to the HOS/EM & DO/EM immediately.

5.7.6 The voltmeter, indication lamp, ammeter in the charging unit shall always be maintained in working condition.

5.8 Safety precautions for Cable Trenches and Cables.

5.8.1 Cable Trenches shall be designed, constructed & maintained in such a manner that there is no possibility of accumulation of water or oil in it.

5.8.2 Trenches should be covered by chequered plate or RCC slabs installed in flush with the floor of the substation so that there are no projections. (Projections can cause accident due to the stumbling during operations). Alternatively it can be filled with sand up to floor level. There should not be any protrusion on the trench covers.

5.8.3 Cotton waste, oil, waste materials, swarf & metallic articles, shop sweeping, etc. shall not be thrown in the cable trenches.

5.8.4 Cables should be laid on racks or trays with adequate clearance and shall not cris-cross or rest on one another. Cables should be clamped rigidly.

5.8.5 Power cables shall not be laid along with control cables. Control cables shall run independently preferably in separate trenches.

5.8.6 There should not be any cable joint in the trenches located inside the substation.

5.8.7 The armour of the cable shall bear continuity with the enclosure of the switchgear or the equipment into which it terminates.

5.8.8 A compression gland always shall be used at cable ends to keep the system dust, damp and vermin proof.

5.8.9 No other service pipelines or process line (Air, water etc.) shall be laid along with cables in cable trenches. All ducts provided for power cables and other services shall be provided with fire barriers at each floor crossing. {CEA Reg. 36(5)}

5.8.10 Cable boxes should not be fixed in between two circuit breakers, unless the clearance between the two is sufficient to prevent damage to circuit breaker or cable box, due to fault in the cable terminal box or circuit breaker. As far as possible, cable boxes shall be fixed on the rear side of the circuit breakers.

5.8.11 It shall be ensured that cable trenches inside the sub-stations and switching stations containing cables are filled with sand, pebbles or similar non-inflammable materials or completely covered with non-inflammable slabs. [CEA Reg. 44{2(xii)}]

5.9 Condensers / Capacitors:-

5.9.1 Condensers / Capacitors shall be controlled by an independent switch.

5.9.2 Suitable ammeters and power factor meters shall be provided to know the functioning of the unit.

5.9.3 Where APFC (Automatic Power Factor Controlling) devices are installed, suitable arrangement shall be made for manual operation also.

5.9.4 Suitable arrangement shall be made for immediately and automatic or manual discharge of every static condenser on disconnection of supply. Even after disconnecting the supply to capacitors, unless discharged completely, no one shall touch or come in contact with condenser terminals. {CEA Reg. 51}

5.10 Earthing:-

5.10.1 All earthing shall conform to BIS Code of practice (IS-3043- 1987) and shall be as per all the provisions made under the CEA Regulations 2010

No. 41 (for installations and apparatus not exceeding 650 V) & CEA Reg. 48(1) to 48(8) {for installations and apparatus including and exceeding 650 V).

5.10.2 Size of the earth plate / electrode and number of electrodes, their spacing, the earth resistance etc. shall fulfill the requirements of load condition and fault current likely to develop. It shall be ensured that operation of earth leakage relay or over current relay or fuse of highest capacity in the circuit, under earth fault condition. (For design of earth electrode refer IS – 3043 : 1987)

5.10.3 The size of the earth conductor shall be such as to ensure that under maximum earth fault condition:-

i) It is capable to take full fault current without burning off or causing a voltage drop not exceeding 32 V between earth and any point on the earth system.

ii) The resistance between any two points in the system does not exceed 1 ohm (0.5 ohm for buildings dealing with explosives).

iii) It shall be mechanically strong enough to resist any strain / mechanical injury likely to be put upon it.

iv) The minimum cross-section of earth conductor shall be as follows:-

(I) For large installations:-

(a) Main connections:- cross–section area of earth shall be 0.25 Sq. inch (i.e. 161 Sq. mm) for copper wire.

(b) Branch connections:- cross–section should be 0.1 Sq. inch (i.e. 64.5 Sq. mm) for copper wire.

(II) For sub-stations:– copper strip of 1 inch x 1/8 inch (i.e. 25.4 mm X 3.17 mm) as a ring main to which all apparatus are connected.

(III) For smaller installations:– copper wire of 8 SWG i.e. 4.0 mm square.

(IV) For domestic installations:– copper wire of 0.0045 Sq. in (7/22) i.e. 1.0 mm. square.

Note:- For aluminium conductors, corresponding size considering equal to the copper conductor shall be used.

5.10.4 Aluminium wires/ strips shall not be used as earth conductor below earth (Only copper / GI can be used). Where aluminium wires / strips is

being used in contact with lime cement, suitable spacer shall be provided.

5.10.5 Joint between Aluminium and Copper / GI shall be anti-corrosive type with lead packing in between.

5.10.6 Earth pits for all buildings shall be provided with proper earth pit chambers and shall be properly maintained.

5.10.7 No debris shall be thrown or wild growth be allowed near the earth pits.

5.10.8 The frame of every generator, stationary motor, portable motor, and the metallic parts, not intended as conductors, of all transformers and any other apparatus used for regulating or controlling electricity, and all electricity consuming apparatus, of voltage exceeding 250 V but not exceeding 650 V shall be earthed by two separate and distinct connections with earth. {CEA Reg. 41(xii)}

5.10.9 Neutral point of every generator and transformer shall be earthed by connecting it to the earthing system by not less than two separate and distinct connections. This is over and above the earthings required for body/frame. [CEA Reg. {41(xiii) & 48{2(i)}]

5.10.10 Every overhead line, sub-station or generating station which is exposed to lightening shall have efficient means for diverting to earth any electrical surges due to lightening which may result into injuries. {CEA Reg. 74(1)}

5.10.11 The earthing lead for any lightening arrester shall not pass through any iron or steel pipe, but shall be taken as directly as possible from the lightening arrester “without touching any metal part to a separate-vertical ground electrode or junction of the earth mat already provided. {CEA Reg. 74(2)}

5.10.12 It shall be ensured that the earth pit is always in an open area and not inside any building. No civil construction shall be carried out on any earth pit.

5.10.13 Earth system shall be maintained properly to ensure that it is able to provide adequate protection at all times.

5.10.14 All the earth pits of the different system may be inter-connected below earth.

Records of earthing system and its test results:-

5.10.15 A sketch showing the earthing system, location of earth pits (with serial number marked for identification) shall be prepared for all substations,

production buildings, block of residential quarters, amenity buildings & shall be available in ER test register. Location of all the earthing pits shall also be marked on the nearby wall.

5.10.16 Whenever, new earth pits are provided / added in the supply system, necessary sketch shall be prepared and recording of ER tests results shall be started right from the time of taking over.

5.10.17 The Earthings mentioned above shall be tested for its Earth Resistance on a dry day during dry season at least once a year and records of such tests results shall be maintained in **Proforma 10** (for LP earthing), **Proforma 11 A** (for buildings other than substation), **Proforma 11B** (for substation buildings) and **Proforma 11C** (for overhead lines) and shall be produced, to the Regional Electrical Inspector (if so required by him). [CEA Reg. 41(xvi) & 48(8)]

5.11 Safety before testing, maintenance and repairs of Switchgears, Transformers, Reactors, condensers & cables:-

5.11.1 Dismantling, testing or repairs of transformer, switchgear, cables or any other apparatus shall not be commenced unless the following actions are complied:-

i) A shut down is taken and proper permit to work certificate **(Proforma 5)** is obtained.

ii) All switches, (including those controlling the back feeds) which may keep involving a part of the switchgear and its circuits live are put off / isolated.

iii) The outgoing of feeder / bus bars is discharged and kept earthed till the completion of work.

iv) The work done by a competent and authorised person and is planned and to be executed under direct supervision of competent and authorised staff.

v) Use of inflammable liquids like petrol for cleaning any equipment at plant/site is a hazard. If however use of inflammable liquids is unavoidable, it shall be ensured that no flame or electrical apparatus prone to sparking is worked near it.

vi) Proper tools and safety gadgets shall be used by the workers and details of tools to be used are listed before starting the work and after completion of the work.

vii) All above instructions supplemented by the manufacturer's instructions shall always be followed at the time of maintenance

& repairs. In case the manufacturer's instructions are not available they should be obtained and be kept safely for future. Based on the above, the factory shall compile detailed instructions for maintenance, repairs & safety of each type of equipments for guidance.

5.11.2 In the event of a fault in the transformer / switchgear / apparatus involving gushing out of oil / smoke / fire, following additional steps shall be taken:-

(a) No one shall go near it.

(b) The transformer shall be put OFF from both the sides i.e. primary and secondary.

(c) If the fire is still continuing, attempts shall be made:-

i) to control the fire to the extent possible.

ii) Prevent spread of the fire.

5.11.3 After completion of the Repairing, maintenance or rectification work, following checks shall be made positively:-

(A) **Switch gear**.

i) The work has been done correctly and all the alignments are correct.

ii) All the insulations / bushings are free from cracks and there are no signs of current leakage or flash over.

iii) The ACBs / VCBs / Switchgears shall be tested for IR Value, Contact resistance, Dielectric strength for oil (if there is still any OCB left for replacement with ACB or VCB). The results shall be compared with the values obtained for similar healthy functioning Switchgears or the values recommended by the manufacture.

iv) Tripping mechanism of the switchgear is functioning properly and all the protective devices / interlocking etc. are in order.

v) Tripping batteries where provided are in healthy condition.

vi) Any fault in the circuit associated with the fault in circuit breaker is cleared before making it ON, alternately it shall be isolated.

vii) List of tools / spares / accessories, used for the purpose of repair, maintenance or adjustments etc. are to be tallied to confirm that nothing is left unaccounted.

viii) Work / operation such as repair, maintenance or adjustments etc. are to be recorded in the log sheet. All results of check & tests carried out after the work shall be recorded in a register.

ix) The permit (issued if any) for working on the circuit controlled by it is returned duly cancelled.

5.11.4 Only after the completion of the above formalities the switchgear must be made 'ON'.

5.11.5 For the purpose of assessing the functioning of protective devices or the switchgear a record of tripping under fault shall be maintained in **Proforma 8**.

5.11.6 Number of persons in the area shall be limited to the barest minimum, at the time of switching ON the switchgear after repair, maintenance or adjustments etc.

5.11.7 After the completion of rectification the following must be checked / followed before energising any equipment:-

(B) Transformer:-

i) The rectification has been done correctly, all the connections are tight, and all the jumpers are insulated and that there are no loose hanging live parts / connections, earthing wire or chain connected for safety has been removed.

ii) The bushings are in good conditions.

iii) The IR values, ratio tests, voltage tests, Dielectric strength of oil tests etc. are taken and found to be satisfactory. These final values should be recorded.

iv) Tap changer is in healthy condition at all positions.

v) Any faulty circuit associated with the fault in the transformer is cleared / isolated.

vi) List of tools / spares / accessories drawn for the purpose of repairs is checked to confirm that nothing is left in contact with conductor.

vii) Air lock in Buchholz relay, if provided, is removed.

viii) Oil level in the conservator tank is correct & there is no oil leakage from anywhere.

ix) Temp. Relay contacts are wired and are in functioning order.

x) Buchholz relay is wired and is in functioning order.

xi) No person is detailed in the transformer room at the time of energising. In case the transformer is in the same hall as the switchgear it should be ensured that no one remain near the transformer.

xii) Silica gel should be re-activated at 150^0 to 200^0 C.

xiii) Number of persons near the transformer are limited to the barest minimum at the time of switching 'ON'.

(C) Reactor.

i) The rectification has been done correctly and all connections are tight. The equipment is tested and found satisfactory.

ii) Any faults associated with the fault in the equipment is cleared / isolated and a certificate to that effect obtained from the maintenance authority.

iii) Sub paragraph number vi), xi) and xiii) of para (B) above will also apply.

(D) Condensers, Capacitors or APFCs:-

Point No. vi), xi) and xiii) of para (B), point No. (i) & (ii) of Para (C) above shall apply.

(E) Batteries.

(i) Manufacturer's instructions shall be followed for carrying out any repairs on the batteries.

(ii) Never apply heat (for soldering or brazing or sealing) with the stoppers closed and electrolyte filled in the cells. The stoppers and electrolyte shall be removed before such working.

(iii) Charging, discharging and maintenance of specific gravity of the electrolyte etc. should be done according to the manufacturer's instructions.

(iv) Alkaline batteries (if in use) shall not be kept in the same bay of acid batteries. It is preferable to charge the two types of batteries in different rooms.

(v) Exhaust fan shall be provided in the charging bay / room for the batteries.

(vi) Acid resistant tiles shall be provided for the flooring of battery room.

(vii) For new installations, Sealed Maintenance Free batteries should be preferred.

5.11.9 Testing of installation, apparatus, switchgear or supply system only up to and including 650V, under live line condition may be permitted, provided all steps mentioned as under are taken to ensure safety:-

i) Use of hand gloves of good quality and appropriate voltage rating.

ii) Use of proper tools (insulated pliers, screw driver, fuse puller, test lamp with exposed lead not exceeding 3 mm etc.)

iii) The gadgets required to be used for such live line working (checked and found in healthy condition) are used.

iv) No connections or disconnections are made under live line condition.

v) No attempt is made to inject any voltage into any part of the line /circuit by external connection or by passing / altering the connection while the switch is ON.

vi) Work shall be done under the direct supervision and directives of a qualified and experienced electrical engineer.

5.12 Maintenance schedule of Dry TypeTransformers:-

5.12.1 Before entering or working on the transformer, always de-energise transformer and ground the case and connect the ground to all terminals of the transformer. Remove these terminal earthing connections before re-energising the transformer.

5.12.2 All installation and inspection test results shall be recorded and filed for future reference and inspection.

5.12.3 Log books should be provided to record all switching operations, isolations and trip occurrence.

5.12.4 **(A) Daily Inspection:-**

(i) Inspect the transformer visually.

(ii) Note down winding temperature.

(iii) Ensure the surrounding of the transformer clean and dry.

(iv) Ensure adequate clearance / passage.

(v) Ensure winding and core temperature meters are functional and readings are regularly being recorded.

(vi) All covers are properly closed and locked.

(B) Quarterly Inspection:-

(i) Ensure that the transformer is free from obstructions. There is no accumulation of dust, dirt, seepage or water.

(ii) Ensure that all earth connections are properly connected and rigid.

(iii) Check the condition of incoming and outgoing cables.

(iv) Ensure all inspection covers, access, doors, plug and socket fastening bolts are in position and tight.

(v) Ensure tap changer cover is secure.

(vi) Ensure the integrity of the neutral earthing system.

(C) Yearly Maintenance / Scheduled Major Maintenance:-

(i) In order to facilitate major overhaul, de-energise the transformer and ground / earth its case and all terminals of the transformer.

(ii) The windings may be cleaned with a vacuum cleaner, a blower or with dry compressed air (Pressure should not be over 25 lbs/In.^{2}). The use of a vacuum cleaner should be preferred.

(iii) Remove any dust and rust from the core and windings.

(iv) Supports to cables, tap changer, terminal boards, bushings and other major insulating surfaces should be brushed or wiped out with a dry lint free cloth.

(v) All nut and bolt connections are to be tightened properly.

(vi) Winding insulation test should be checked and the test results should be recorded.

(vii) Minimum values of the insulations must be according to the recommendations of manufacturer of the transformer or as per the table given below:-

MINIMUM INSULATION RESISTANCE TABLE		
S. No.	Winding Class (KV)	Insulation Resistance (MΩ)
1	1.2	600
2	2.5	1000
3	5.0	1500
4	8.7	2000
5	15.0	3000

CHAPTER – VI

OVERHEAD LINES

6.1 General Introduction:-

Some of the safety points applicable to overhead lines in general are given here under:-

6.1.1 For the purpose of this SI, the term Overhead lines include all aerial lines (insulated or bare) used for transmitting /distributing electric power including service lines.

6.1.2 The lines shall be constructed keeping in view the prime factors of safety as well as electrical and mechanical design considerations.
{theCEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Reg. 2010 No. 90(1)}

6.1.3 **For Chemical Factories,** the installation shall in addition be governed by STEC regulations (chapter X) / safety instructions for explosives factories / buildings.

6.1.4 CEA Regulations, BIS Standards / Specifications & Code of practices, international IEC standards and Standing Instructions for Overhead lines in general and given below are required to be complied with at the time of installation, testing, maintenance and repairing of overhead lines. However, if there are some contradiction in international IEC standards and BIS Standards /Specifications, latter shall be followed.

6.1.5 The overhead line system shall be constructed so as to ensure:-

(a) Voltage conditions are within permissible levels.

(b) Improvement of reliability and security of power supply.

(c) Improvement in quality of supply.

(d) Adequate capacity for load growth for next 5 years.
{CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Reg. 2010 No. 92}

6.1.6 Overhead lines shall be routed preferably through an open area, (where there is not much movement of persons) as far away from buildings as possible. It shall terminate as close to perimeter or boundaries to the estate as possible. The objective is to ensure its rout through the factory and the estate to keep minimum. {CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Reg. 2010 No. 93}

6.1.7 An overhead line shall not cross over an existing building as far as possible and no building shall be constructed under an existing overhead line. {CEA Reg. 60(1) & 61(1)}

6.1.8 Where an overhead line of voltage exceeding 650 volt passes above or adjacent to any building or part of a building or structure, it shall have on basis of maximum sag a vertical clearance above the highest part of the building immediately under such line, as given in **table 6.2.1**. {CEA Reg. 61(2)}

6.1.9 Electric overhead lines shall be designed and constructed complying with the requirements mentioned in applicable Indian Standards as well as other rules and regulations as per latest amendments. The design and construction of the electric lines shall be such that they perform their intended functions. {CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Reg. 2010 No. 94(1)}

6.1.10 Extension of existing lines shall be carried out after ensuring that the limits of voltage variations on the lines are not exceeded.
{CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Reg. 2010 No. 94(2)}

6.1.11 Reliability and security of supply shall be improved by sectionalizing the overhead lines, auto re-closers, ring main units (RMUs) and fault passage indicators as per techno-economic considerations.
{CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Reg. 2010 No. 94(3)}

6.2 Clearances:-

6.2.1 Minimum vertical and horizontal clearance from the ground, buildings, any structure, tree branches etc. shall be not less than:-

Table 6.2.1

<table>
<tr><th rowspan="2">Minimum Clearance from the Ground</th><th colspan="4">VOLTAGE RANGE</th></tr>
<tr><th>When Voltage exceeds 33KV</th><th>Voltage not exceeding 33 KV</th><th>Voltage not exceeding 11KV</th><th>Voltage Not Exceeding 650 V</th></tr>
<tr><td>Lines erected elsewhere other than along or across or any street.</td><td>5.2 m + 0.3 m for every addl. 33 KV or part thereof by which the voltage of the line exceeds 33KV</td><td>5.2 m, (For voltage Exceeding 11 KV but not exceeding to 33 KV)</td><td colspan="2">4.6 m if conductor is bare, 4.0 m if conductor is insulated. (For voltage up to and including 11 KV)</td></tr>
<tr><td>Along a street</td><td rowspan="2">6.1 m+ 0.3 m for every addl. 33 KV or part thereof</td><td colspan="2">5.8 m (For voltage Exceeding 650 KV but not exceeding to 33 KV)</td><td>5.5 m</td></tr>
<tr><td>At road Crossing (across a street)</td><td>6.1 m</td><td>6.1 m</td><td>5.8 m</td></tr>
<tr><td>When an overhead</td><td>3.7 m + 0.3 m for</td><td colspan="2">3.7 m</td><td>2.5 m (When the line passes</td></tr>
</table>

line passes above or adjacent to any building or part of a building or metallic structure. (For any flat roof, open balcony, verandah roof and lean-to-roof and on the basis of maximum sag in the line)	every addl. 33 KV or part thereof (When roof is flat then from the highest point of building)	(When roof is flat then from the highest point ofbuilding) (For voltage Exceeding 650 KV but not exceeding to 33 KV)	above the building a vertical clearance from the highest point ofbuilding)
			2.5 M (For pitched roof, when the line passes above the building a vertical clearance immediately under the line)
The horizontal clearancebetween thenearest conductor and any part of such building or metallic structure.(on the basis of maximum deflection due to wind pressure)	2.0 m + 0.3 m for every addl. 33 KV or part thereof (When line passes adjacent to the building)	2.0 m (For lines of voltage exceeding 11kV up to and including 33 kV) (When line passes adjacent to the building)	1.2 m (For lines of voltage exceeding 650 volt up to and including 11 kV) (When line passes adjacent to the building)

{CEA Reg. 58, 60(2) & 61(2)}

6.2.2 Where an overhead line crosses another overhead power line, clearances shall be as under:-
(Minimum clearances in meters between lines crossing each other)

S. No.	Nominal System Voltage	11-66 kV	110-132 kV
1	Up to 650 V	2.44	3.05
2	11-66 kV	2.44	3.05
3	110-132 kV	3.05	3.05

6.2.3 No rods, pipes, or similar materials shall be taken below or in the vicinity of any bare overhead conductor or lines if these contravene the provisions for clearances under CEA Regulations 58, 60 and 61.

6.2.4 No materials or earth work or agricultural produce shall be dumped or stored.

6.2.5 No trees shall be grown below or in the vicinity ofbare overhead conductors, lines or underground cables to contravene the provisions of the CEA Regulation [No. 58, 60 and 61].

6.2.6 No flammable material shall be stored under the electric supply line.

6.2.7 No fire shall be allowed above underground cables. Firing of any material below electric lines shall be prohibited. {CEA Reg. 64}

6.2.8 For new installations, it is recommended to go for underground cables for communication purposes. However, no underground telecommunication cable shall be laid without a minimum separation distance of 0.6 meters to the underground power cable of voltage exceeding 33 kV. {CEA Reg. 76(2)}

6.2.9 Where conductors forming parts of systems at different voltages are erected on the same supports, adequate provision to guard against danger to linemen and others, shall be made from the lower voltage system being charged above its normal working voltage, by leakage from or contact with the higher voltage system and the methods of construction and the applicable minimum clearances between the conductors of the two systems shall be as specified in Point No.6.2.2 for lines crossing each other. {CEA Reg. 62}

6.2.10 Phase separators should be provided in the overhead lines for maintaining adequate clearance under condition of wind, storm, rain etc., wherever required.

6.3 Guarding.

6.3.1 Guarding is a must at the following instances:-

(a) Where overhead line cross streets, buildings, any structures, barbed wire fencing, perimeter wall / fencing.

(b) Where lines of different systems or voltages cross each other or are carried on same support.

(c) On all power lines above 650 V up to and including 33 KV erected along or crossing street.

(d) Where an overhead line crosses or is in proximity to another overhead line, guarding arrangement shall be provided so as to guard against the possibility of their coming into contact with each other. {CEA Reg. 69 (iii)}

6.3.2 Where guarding is required, the following shall be observed:-

(i) Every guard-wire shall be connected with earth at each point at which its electrical continuity is broken.

(ii) Every guard-wire shall have an actual breaking strength of not less than 635 kg and, if made of iron or steel, shall be galvanized.

(iii) Every guard-wire or cross-connected systems of guard-wires shall have sufficient current-carrying capacity to ensure them

rendering dead, without risk of fusing of the guard-wire or wires, till the contact of any live wire has been removed.
{CEA Reg. 70}

6.3.3 Guarding must include cross piece / cradles / catch guards as per scale given below:-

(i) At all street / road crossings:- One cradle piece per running meter of the line.

(ii) Crossing of power lines of different systems, crossing of overhead pipelines, supports, roofs of buildings, earthed structures, fencing, metallic objects:- One cradle piece every 0.5 m run on the portion above the pipe line etc. plus 1.0 m on either side.

6.3.4 By road side:-

Where the space below is frequented by persons walking across, one cradle piece 0.5m away from the pole on either side & one cradle piece at every 2.0 m length of span.

6.3.5 Open country & at other places:-

One cradle piece or catch guard on both side of the pole (if pole is not end pole).

6.3.6 Where line up to and including 650 V and telephone lines supported on the same poles:-

(a) One cradle piece every at 0.5 m length of the line span, when the clearance between the lines of the two systems is less than 1.5 m.

(b) One cradle piece at every 1.5 m length of the line when clearance of the two systems is more than 1.5 m.

6.3.7 The object of guarding is to ensure disconnection of power supply in the event of a conductor breaking. To achieve this effectively, the guarding should be connected to earth and the protective system tuned effectively to function in the manner stated above. While guarding is a must at places indicated under 6.3.1, at other places other protective devices like catch guard, ring guard etc. can be used, provided the fuses / protective devices are correctly set to trip/off the supply in the event of fault (Snapping / excessive sagging leading to short circuit).

6.3.8 Earthing shall be provided to all metallic poles, any metallic fitting attached thereto and guarding at minimum three (3) equidistant places

at the span of 1.0 km and it shall be continuous over the entire length of the line. {CEA Reg. 72 (1)}

6.3.9 Metallic bearer wire used for supporting insulated wire of overhead service lines of voltage not exceeding 650 V shall be efficiently earthed or insulated. {CEA Reg. 72(2)}

6.4 Stay Arrangements:-

6.4.1

(i) To prevent tilting of a pole from its normal position due to abnormal wind pressure and deviation of alignment, the pole shall be kept in position by stays. The stays shall be provided where the overhead lines are at:-

(a) angle locations;

(b) dead end locations;

(c) tee off points;

(d) steep gradient locations;

(e) cut- point;

(f) along the straight run at minimum two locations in one (1) km.

(ii) Galvanized iron stay wires and stay rods of adequate size shall be used. The individual wire used to form "stranded stay-wire" shall have a minimum tensile strength complying with relevant IS. For double pole structure, four stays along the line, two in each direction and two stays along the bisection of the angle of deviation or as required depending on the angle of deviation shall be provided.

(iii) When two or more stays are provided on the same pole, each stay shall be grouted entirely separate from the other.

(iv) The angle between the pole and stay wire shall be about 45 degrees and in no case it shall be less than 30 degrees. ·

(v) Stays shall be anchored either by providing base plates, angle ironor rail.

(vi) Stays shall either be connected to earth or shall be insulated using a stay insulator. If insulated, stay wires shall be connected to the pole with a porcelain guy strain insulator as per relevant IS. The Porcelain insulator shall be inserted in the stay wire at a height of minimum 3.0 m vertically above the ground level. The strain

insulators shall be free from defects, thoroughly vitrified and smoothly glazed.

(vii) Wooden insulators shall not be used for providing insulation to stay/guy wire.

{All above are as per {CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Reg. No. 100(1) to (7)}

6.4.2 Stays shall be always in tension and not remain loose at any time.

6.4.3 Direction of stay shall be such as to neutralise any strain on the poles due to tension of conductor/s.

6.4.4 Parts of a building or structure should not be used to anchor or support a stay or overhead line.

6.5 Earthing arrangements:-

6.5.1 Earthing of Poles:-

(i) All metallic supports shall be permanently and effectively earthed. The earthing arrangement shall conform to relevant IS.

(ii) Metal cross arms and insulator pins for PCC and PSCC poles shall be bonded together and normally earthed at every pole for 33 kV or 22 kV or 11 kV lines and at every 5th pole for lines below 500 volts.

(iii) The support on each side of a road crossing, railway crossing or river crossing shall be earthed.

(iv) All steel poles on which switches, transformers, fuses etc. are mounted shall be earthed.

(v) All poles above 650 volts, irrespective of inhabited areas, shall be earthed. For poles below 650 V guarding with continuous earth-wire shall be provided invariably, connected to earth at three equidistant points in one km.

{All above are as per {CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Reg. 2010 No. 99(1) to 99(6)}

6.5.2 All metallic cross-arms/supports of insulators, clamps, guarding wires shall be connected to earth through an earth wire running all along the overhead line, and earthed at 3 nearly equidistant places in one km. {CEA Reg. 72(1)}

6.5.3 The earth wire shall be connected (in addition) to an earth pit at terminal poles and shackle points. The earth wire on either side of a shackle point should have continuity.

6.5.4 The earthing system of the overhead lines shall be checked initially after completion of the installation before commencing supply. Subsequently, every year checking shall be done on the earthing system before the onset of monsoon and results of earth resistance test at each earth point shall be recorded in **Proforma 11C**.

6.5.5 The earth resistance of surge absorber should also be checked once a year. The functioning of a surge absorber shall be checked after each lightening stroke, for its effectiveness, involving functioning of the surge absorber. {CEA Reg. 41 & 48}

6.6 Supports (Poles and Towers):-

6.6.1 The supports shall be poles or narrow based lattice towers with fully galvanised structure as per site requirement.

6.6.2 Poles may be used for 33 kV, 22 kV, 11 kV and lines below 650 V as per requirement. The poles shall be pre-cast concrete (PCC) pole, pre-stressed cement concrete (PSCC) pole, rolled-steel joist, rail pole or steel tubular pole as required, provided PCC and PSCC poles shall not be used at cut-points and as end poles.

6.6.3 Concrete poles shall be preferred in plain areas.

6.6.4 For locations involving long spans or higher clearances on account of crossing of power or communication lines or a railway line, specially designed poles / lattice towers may be used.

6.6.5 For angles of deviation of more than 10 degree, double pole structure shall be used.

{All above are as per {the CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Reg. 2010 No. 95(1) to 95(8)}

6.6.6 All poles supporting overhead lines shall be properly numbered. The number should also indicate the feeding substation, system and maximum voltage of conductors carried.

6.6.7 Supports carrying conductors involving back feed etc. should be specially marked in red. Switches controlling back feed or alternate supply should be provided with some locking device to prevent inadvertent operation, painted in red and carry suitable marking to indicate the back feed/alternate supply.

6.6.8 Supports of overhead lines pertaining to different agencies (controlled/operated) installed in the same area shall be marked and painted in different colours to enable easy identification of the system.

6.6.9 AB switches / TPMO switches where provided shall be kept locked.

6.6.10 The area below surge absorbers, AB switches, D.O. fuses, shackle and tapping points shall be kept clear of wild growth and be easily approachable.

6.6.11 Trees and metallic structures (not forming a part of the electric installation) shall not be used to support any overhead line / service line.

6.7 Danger Notices Boards / Plates:-

Every pole/structure of voltage exceeding 250V shall be affixed with permanently in a conspicuous position, a danger notice in Hindi or English and the local language of the district, with a sign of skull and bones of a design as per IS-2551.[theCEA Reg. 18]

6.8 Anti-Climbing Devices-

Anti-climbing devices shall be provided on the supports. For this purpose barbed wire conforming to relevant IS for a vertical distance of 30 to 40 cm. at a height of 3.5 to 4meters from ground level or clamps with protruding spikes at a height of 3 to 4meter shall be used.

{CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Reg. No. 102}

6.9 Line Span:-

(i) Line span shall be decided taking into consideration topography, wind pressure, type of support, conductor configuration and ultimate tensile strength of conductor.

(ii) The span shall be within the range specified by IS.

(iii) Uniform span shall be maintained as far as possible between consecutive pole structures.

(iv) While constructing a line, if a road crossing occurs at mid span, then a pole shall be placed on one side of the road so as to avoid mid span at the road crossing.

(v) While crossing another power line, the lower voltage line shall be underneath. The lower line shall normally not cross at mid span of the upper line.

(vi) While placing poles on high ground, shorter poles can be used while maintaining proper ground clearance at the middle of the span.

(vii) Poles shall normally not be placed along the edges or cuts or embankments of creeks and streams.

(viii) At all the places where the new line crosses over roads or another existing line, adequately earthed guard wire mesh below the line shall be provided to avoid the conductor of the new line falling over the areas below, in case of any break. In cases where the line passes below an existing line, the guard wire mesh shall be provided above the new line under construction.

{All above as per CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Reg. No. 96(1) to 96(8)}

6.10 Erection of Poles and factor of safety:-

Erection of poles shall be carried out in accordance with the provisions of relevant IS. For factor of safety in overhead lines CEA Reg. 57 shall be followed.

6.11 Insulators, Insulator Strings and Hardware Fittings:-

(i) Pin insulators shall generally be used on the straight stretch of a line. The pin insulators shall conform to relevant IS. These may be used on lines up to 33 kV.

(ii) Shackle insulators shall be used in lines below 500 volts and these shall conform to IS. Strap type fittings shall be used for a dead end location, while U-clamp fittings shall be used at tangent locations.

(iii) Requisite type of suspension and tension insulator strings with disc insulators or long rod insulators offering equivalent performance shall be used on 33 kV or 22 kV or 11 kV lines. The number of insulators and creeping distance shall be selected based on electrical system parameters taking into account altitude of site, expected environmental and pollution conditions etc. For critical locations with high pollution level, anti-fog type insulators or polymer insulators may be used for better performance. The special coating on the insulators may be used as per requirement.

(iv) Disc Porcelain insulators shall conform to relevant IS. Polymer / composite insulators conforming to relevant IEC / other international Standards may also be used.

(v) Disc type insulators shall be of Ball and Socket type or Tongue and Clevis type.

(vi) Insulator strings shall be complete with all required hardware fittings. The fittings shall conform to relevant IS.

{the CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Reg. No. 104}

6.12 Cross-Arms:-

Cross arms shall be provided in accordance with the requirement. In case, they are made of mild steel, the cross-arms and the clamps shall be hot dipped galvanized conforming to relevant IS, after completion of fabrication. Welding at site should be avoided as far as possible, in case welding becomes necessary, the joint shall be covered with cold galvanizing paint. {the CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Reg. No. 105}

6.13 Conductor:-

6.13.1

(i) The size of the conductor shall depend upon the voltage regulation, factor of safety, power to be transmitted, length of line, future load requirement consideration, line voltage and mechanical strength desired.

(ii) Aluminum conductor steel reinforced (ACSR) or equivalent all aluminum alloy conductors (AAAC), all aluminum conductor (AAC), aluminum alloy conductor steel reinforced (AACSR) complying with relevant IS shall be used according to requirement.

(iii) Required accessories for conductor and earth wire viz. mid-span compression joints, repair sleeve, T-connector, flexible copper bond, vibration dampers, spacer / spacer-dampers, earth wire clamps etc. shall conform to relevant IS.

(iv) The configuration of conductors on the line can be triangular, horizontal or vertical depending upon the voltage level of the lines, terrain, right of way and clearances to be maintained. In case horizontal clearance from a building is difficult to secure, vertical arrangements of the conductor shall be adopted.

{the CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Reg. No. 106(1) to 106(5)}

6.13.2 No conductor of an overhead line shall have more than one joint in a span and joints between conductors of overhead lines shall be mechanically and electrically secure under the conditions of operation.

6.13.3 The ultimate strength and the electrical conductivity of the joint shall be as per relevant Indian Standards. {the CEA Reg. No. 56}

6.14 LTSpacers:-

To avoid clashing and accidental mutual touching of bare overhead conductors on LT lines, spacers, which can be either spiral or composite shall be provided in between conductors at appropriate locations in different spans (particularly for lines having longer spans or lines having large sags encountering high winds).

{the CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Reg. No. 107}

6.15 Cables:-

6.15.1

(i) Underground cables or Aerial Bunched Cables (ABC) of adequate rating can also be used for supplying power. Cables shall conform to relevant Indian Standards.

(ii) PVC cables shall not be used in systems working exceeding 650V.

(iii) AB Cables shall be used in the theft and accident-prone areas.

(iv) Direct burying of underground cables shall not be adopted except where cables enter and take off from a trench.

(v) The underground cables shall be segregated by running in separate trenches or on separate racks.

(vi) The cable trenches shall be properly sloped so as to, drain freely any water, which may enter.

(vii) Cable trenches shall not be run through oil rooms.

(viii) Adequate number of spare cores shall be included in all control cables.

{the CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Reg. No. 108(1) to 108(9)}

6.15.2 Underground power cable shall be laid as per the table given below:-

S. No.	Voltage (V)	Minimum Depth Required
1	Up to 650 V	0.75 m
2	650 to 11 kV	1.00 m
3	More than 11 kV	1.20 m

6.15.3 No underground telecommunication cable shall be laid without a minimum separation distance of 0.6 meters to the underground power cable of voltage exceeding 33 kV. {CEA Reg. 76(2)}

6.15.4 Cable laid under road crossings, drainage/sewage line or subject to heavy load etc. shall be drawn through “Class C GI pipe” of sufficient

size (to house the cable comfortably) and single length (i.e. without any in line joint) and in rest of the complete length it shall be covered with Class A bricks on it and at least 6 inch deep bedding of clean and dry sand (3 inch under and 3 inch above the cable).

6.15.5 When any cable is to be laid under road crossing, road digging/cutting shall be avoided. Preference shall be given to lay the cable through horizontal boring method through the conduit/pipe housing the cable.

6.16 Service Lines-

6.16.1 No service line of tapping shall be taken off an overhead line except at a point of support.

6.16.2 Provided that the number of tapping per conductor shall not be more than four in case of connections at voltage not exceeding 650 V.{the CEA Reg. No. 71}

6.16.3 No. of service lines emanating from a pole shall be limited to four. If more number of service lines are required to be taken this can be done through a Kiosk or Pillar box or distribution board mounted on the pole in a weather proof enclosure.

6.16.4 All insulated wire service lines should be adequately supported by a G. I. catenary wire.

6.16.5 Person assigned to work on overhead line must be provided with the following:-

(i) A suitable strong ladder.

(ii) A piece of rope for lashing the ladder to the pole.

(iii) Safety belt.

(iv) A pair of hand gloves of approved quality.

(v) A helmet of insulating material.

(vi) Rubber boots.

(vii) A line tester.

(viii) A torch in working condition (if night working is involved).

(ix) Discharge rod.

(x) Shorting chains.

(xi) Tools required for the use on overhead lines (pulley draw use ropes, blocks etc.) for the type of work.

(xii) Any other equipment / gadgets to ensure safety as necessary.

(xiii) A test lamp having following specifications:-

(a) Lamp holders shall be of bakelite pendent type.

(b) Always two test lamps (230 V types) of equal wattage connected in series shall be used for testing MV installations. These test lamps can be fitted on a bakelite sheet. Shorting of one test lamp with a coin is not permitted.

(c) Test leads shall be adequately insulated and be of stiff wire. The bare ends shall not be more than 5 mm. They can be connected to test probes.

(d) The test lamps shall be checked before use to ensure that it is in working order.

(e) As far as possible neon testers should be used to check the live points before using the test lamps.

(f) The testing shall be done by only one person. Any other person / helper shall not remain close to the unit being tested. While testing, the person testing it shall keep his head as far away from the apparatus being tested, as possible.

(g) Use of test lamp in an area where explosives are handled shall be done with the permission of the concerned safety / production staff.

6.16.6 Person/Employee actually working at more than 3.0 meter height shall be free from (a) High BP, (b) Vertigo, (c) obesity & (d) Epilepsy. He should have good eye sight also. {OFB letter No. 104/SF/GEN/COS, Dated: 09/06/17}

6.17 Lightning Protection:-

6.17.1 The surge arresters (SAs) shall be placed at the terminal points of the lines and also at the junction points of cables and bare overhead conductor lines.

6.17.2 For 33 kV, 22 kV and 11 kV lines, surge arresters having rated voltage of 30 kVrms, 20 kVrms and 9 kVrms and discharge current rating of 10 kA, 7.5 kA and 5 kA, complying with relevant IS, shall be used respectively.

6.17.3 The earth wire of appropriate size to take care of predicted/design fault currents and lightning complying with relevant IS shall be used. The earth wire shall be either of Galvanized Stranded Steel (GSS) or alternatively ACSR/ AACSR conductor.

6.17.4 The earthing lead for the surge arrester shall not pass through any iron or steel pipe, but shall be taken directly to a separate earth electrode.

{the CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Reg. No. 110}

6.18 Protection of 33 kV, 22 kV, 11 kV and LT System:-

6.18.1

(i) The protection scheme shall be finalized based on prudent utility practice.

(ii) An earth leakage protective device shall be provided as per requirement of Central Electricity Authority (Measures Relating to Safety and Electricity Supply), Regulations as and when these are notified by the Authority.

{the CEA (Technical Standards for Construction of Electrical Plants and Electric Lines) Reg. No. 111}

6.18.2 It is the responsibility of In-charge/EM of concerned group to check and ensure that the tools and safety gadgets used by the workers are in good & safe working condition. This shall be done on a monthly basis by the Staff / in-charge for the work and every time before commencing the work by in-chargeof the gang. Under no circumstances should a person be allowed to use unsafe tools / safety gadgets.

6.18.3 Warning boards should be fixed at either end of the zone of work and at the controlling switch. The warning board bearing an inscription “MEN WORKING ON LINE. DO NOT SWITCH ON.” This should be in English / Hindi and local language.

6.18.4 Line should be discharged to earth. Lines should be shorted by shorting chain at either end of the work zone.

6.18.5 No person shall apply test voltage to any mains unless he has received a permit to work and has warned all persons working in the mains of the proposed application of test voltage. If any part which will become alive, is likely to be exposed, as a result of application of test voltage the person in-charge of the test shall take precautions to ensure that the exposed live portion does not constitute any danger to any person. It should also be ensured by the person in-charge before application of test voltage that no other permit to work has been issued for working on these mains.

6.18.6 No person shall work within the minimum safe distance from the exposed live mains or apparatus. The minimum distance depends upon the actual voltage. This does not apply to operations carried out on mains and apparatus which are so constructed as to permit safe operation.

6.18.7 No person after receiving of permit to work shall work or any way interfere with any high voltage mains or conductors or conduits carrying voltage exceeding 650V, except under the personal instructions and supervision at site of work by a competent person.

6.18.8 Except for the purpose of testing, phasing etc. the earthing and short circuiting device shall remain connected for the duration of work.

6.18.9 Earthing devices shall be connected only after verification that the circuit is rendered dead. It should be done in such a manner that the persons doing the job are protected by earth connection on both the sides of the working zone. All the three phases should be effectively earthed and shot circuited, though work may be proceeding only for one phase.

6.18.10 The earthing and short circuits of lines specified in the permit to work shall be removed or interfered only with the authority of the person In-charge for the work.

6.18.11 When the mains to be worked upon are to be divided into two or more sections; isolation & earthing etc. shall be carried out on each section.

6.18.12 It shall be ensured that the control switches controlling different feeders or circuits are correctly marked. This shall also be confirmed before commencing the work that the line is really dead.

6.18.13 Work on overhead lines and apparatus should, as far as possible, be planned in such a way that it would be possible to return the permit and energise the installation on the same day. Where this is not possible and work has to be continued on the same permit, the next day or after few days, the In-charge of the repair team should before commencement of work, check that the switches, DO fuses, Gang operating switches etc. controlling the line are in the ‘OFF’ position and the line is discharged.

6.18.14 Adequate care should be taken during rectifications of the breakdowns of overhead lines that continuity of earth wire between its different sections, earth pit guard, iron mongery on the poles, stays (where un-insulted) are not impaired. Any rectification necessary should be done before energising the system. Testing of earth continuity and earth resistance should be checked after each major line repair.

6.18.15 When dead mains are to be connected to live mains, all connections to live parts shall be made at last and in all cases phase sequence shall be checked to ensure that only like phases are connected together. Before inserting fuses or links in a feeder of distribution pillar controlling the

cable / O. H. distribution lines on which a fault has been cleared, each phase shall be connected through a test switch / fuse.

6.18.16 No work shall be done on any overhead line during the period of thunder and lightning.

6.18.17 The above precautions are applicable even in cases where work has to be done on overhead line conductor of a feeder / circuit / system / Street lights / Telephone system / P.A. system supported on the same pole or supports. If the work is being done on the lower most conductor and the work does not involve stringing or drawl / renewal of lines or jumpers and there is a clearance of more than 6 ft. between it and the next vertical conductor above, permit / shut down need not be taken. Shut down will however be taken for the lines below.

6.19 ADDITIONAL PRECAUTIONS WHILE WORKING ON LINES HAVING VOLTAGE EXCEEDING 650 V:-

6.19.1 All lines shall be regarded as live and a source of danger and treated accordingly unless it is positively known to be dead, discharged and earthed.

6.19.2 No person shall work, or test or earth line without a permit to work except in cases where the work involved is connecting and testing apparatus etc. specially designed for connecting to live parts and work is done with equipments and safety gadgets / devices by the authorised person under the supervision of a competent person.

6.19.3 The operations of proving dead, earthing and short circuiting of any mains shall be carried out only by an authorised person under the instructions of the person in-charge of maintenance.

6.19.4 The electrical circuit shall be broken only by authorised persons by disconnecting switches, isolating links, unbolting connections or switches which are racked out. Where possible, the isolation should be checkedvisually.

6.19.5 Where the means of isolation, are provided with a device to prevent their operation by un-authorised persons, the device (lock) shall be used.

6.19.6 All earthing devices should be checked periodically and always prior to their use. Earthing devices should be connected only after verification that the circuit is rendered dead. It should be done in such a manner that the persons doing the job are protected by earth connections on both sides of the working zone. All the three phases should be effectively

earthed and short circuited though work may be proceeding on one phase only.

6.19.7 When the mains to be worked upon are to be divided into two or more sections, isolation & earthing etc. should be carried out on each section.

6.19.8 After completion of the work on O. H. line, all the earthing / shorting to earth shall be removed. The line shall be inspected visually and with the help of instrument to confirm that (a) no tools or (b) wire / earthing chain are left on the O. H. line (c) the line is in safe condition for charging (d) the readings of IR & ER are satisfactory. (e) the test result shall be recorded. (f) surge absorbers are O.K.

6.19.9 After testing the high voltage cables with DC voltage (megger) the cable shall be discharged through a 2 Mega-ohms resistance and not directly; owing to dielectric absorption, which is particularly prominent in the DC voltage testing of HV cables. The cables shall be discharged for a sufficiently long period to prevent rebuilding of voltage.

6.19.10 After completion of rectification & check-up detailed in 6.20.8 & 6.20.9; check should be made on the tripping batteries, protective devices of the switch gears and confirm that they are in healthy working order. This should be done before restoring the supply. Under no case should a switch be made 'ON' without confirming that the protective / tripping devices are satisfactorily functioning.

6.20 OTHER INSTRUCTIONS TO ENSURE SAFETY IN RESPECT OF OVERHEAD LINES:-

6.20.1 Whenever an arcing jumper, a snapped O.H. line conductor or a pole bent / broken and standing tilted in a precarious position is seen by anybody, the person seeing it shall report it immediately giving exact location to (a) security office and (b) electrical shift person.

6.20.2 He shall if possible also request the nearest available estate / security durwan or if durwan is not available, any responsible person to stand at the place, to warn the passing persons of the danger and remain there till relieved by a durwan or Security Staff or electrical personnel.

6.20.3 The in-charge gate office on receipt of the message shall:-

(A) pass it on to (a) JWM/ Electrical (in his absence D.O. Elec.) (b) Shift I/C (c) Electrical Section and (d) Orderly officer.

(B) arrange immediately to post one or two darwans at the spot to warn the persons passing that way of the danger. The durwan /

darwans will remain there till the situation is cleared by Elect. Section.

(C) obtain a confirmation in writing from the Elect. Sec. that the snapped wire has been isolated / made dead and that there is no danger.

(D) Record the time and date of the confirmation.

6.20.4 Orderly officer shall ensure that the above instructions are being complied without any delay.

6.20.5 Once the Electrical Staff reports at the place, it is their responsibility to rectify / isolate the snapped line. Till this is done the durwan shall not leave the place.

6.20.6 Tree branches shall be regularly cut to ensure the clearance as per para 6.2 above.

6.20.7 Vines and shrubs shall not be allowed to grow on any part of the overhead line system.

6.20.8 The area below overhead line shall be free from accumulation of debris, metallic scrap etc.

6.20.9 No material should be stacked below any overhead line; where it is unavoidable the following shall be complied:-

(A) Clearance as indicated in para 6.2 of this chapter.

(B) Close cradle guarding.

6.20.10 No building / structure should be constructed below overhead lines of 11kV and above.

6.20.11 No person or agency shall be allowed to work on wall or roof of a building or a metallic structure, perimeter wall or any part of an electrical installation which is close to an overhead lineor installation, unless the electric section is informed and their permission is obtained in writing before commencing the work. Same rule shall be applicable to the work involving excavation, digging or leveling the land manually or using any type of earth moving machine. The electric section shall see the place & examine the scope of work, give shut down / permit and prescribe in writing the requirements to ensure safety. EM section shall also ensure on Work Permit that **“There is no underground cable laid at the place of excavation, digging or leveling the land”.**

CHAPTER – VII

ELECTRICAL INSTALLATION IN BUILDINGS

7.1

7.1.1 It is the requirement under CEA Regulations-2010 that all electrical installations shall be installed, operated and maintained in such a way as to prevent danger to human being, animal and property. {CEA Reg. 12(1)}

7.1.2 All electric supply lines and apparatus shall be of sufficient rating for power, insulation and estimated fault current and mechanical strength for the duty cycle required to be performed.{CEA Reg. 12(1)}

7.2 Service lines:-

(A) General Conditions:-

7.2.1 It shall be ensured that all electric supply lines, wires, fittings and apparatus are in a safe condition and in all respects fit for supplying electricity and all precautions shall be taken to avoid danger arising from such supply lines, wires, fittings and apparatus etc.

7.2.2 All service lines, either for any production building, office or residential quarters or block, which are underground or which are accessible shall be so insulated and protected as to be secured under all ordinary conditions against electrical, mechanical, chemical or any other injury to the insulation.

7.2.3 Every consumer using electric supply, supplied by the factory, shall take all possible precautions for the safe custody of the equipment belonging to the factory but installed at the premises under their control and shall also ensure that the installation under their control is maintained in a safe condition.

{CEA Reg. 13 (1) to 13(4)}

(B) Service lines for buildings handling essentially lighting load:-

7.2.4 Service lines in non-explosive factories can be of bare wire / insulated wire, through overhead line or underground cable.

7.2.5 If insulated wires or cables are used aerially, they shall be supported on a catenary wire connected to earth at the overhead line end and with building earth at building end.

7.2.6 Any metallic structures not forming part of overhead line system and trees shall not be used for supporting the overhead lines.

7.2.7 The entry of the service line into a building shall be through a G.I. pipe bend (outside opening shall be bent down wards).

7.2.8 Service lines shall be free from joints.

7.2.9 A service line shall be taken off only from a point of support. The number of tapping per conductor shall not be more than four.

(C) Service lines for explosive buildings:-

7.2.10 In addition to above, these shall conform to the safety regulations prescribed by STEC (See Chapter-X).

(D) Service lines for buildings having predominantly power load:-

7.2.11 Service lines for buildings having power load shall generally be fed from sub-station switch or Kiosks (Distribution box), through cables or overhead lines.

7.2.12 Entry of power supply line into the building shall be through a cable connected to the overhead line or the switchgear in the substation.

7.2.13 Feeding cables shall terminate into a switch panel through a fuse switch / ACB / MCB / MCCB according to the load involved and level of protection required. Under no condition this shall be connected to a bus bar directly.

7.2.14 Earth wire of adequate size connected to the earth wire of overhead line or earth system in the substation (in case the cable is not metal covered and armoured) shall also run along the cable.

7.2.15 Buildings with heavy loads may have more than one service line or cable from the same voltage or different voltage systems. Adequate care shall be taken to ensure that no harm results to the installation or the person if the circuits get inter connected. In case this is not possible all steps should be taken to keep the two circuits physically isolated and distinctly separate.

7.2.16 Every generating station, sub-station, junction-box or pillar in which there are any circuits or apparatus, whether intended for operation at different voltages or at the same voltage, shall be ensured by the means of indication of a permanent nature that the respective circuits are readily distinguishable from one another.
{CEA Reg. 24}

7.2.17 The pole number at which supply from the substation or main switch is entering up to the pole and the source to which these are connected shall be marked on the switchgear.

7.2.18 Cables of different voltage systems, type of voltage such as DC / AC or cables meant for lighting circuits should terminate into switchgears physically isolated and separated apart from each other.

7.2.19 Cables used at voltage exceeding 650V shall terminate into switchgear having adequate voltage rating and protection system for earth fault and overcurrent/short circuit fault. Ends of such cables shall be sealed with suitable type of cable termination boxes.

7.3 KIOSKS:-

7.3.1 Service lines may emanate from a kiosk feeding a number of buildings in the area. The kiosk may be fed electricity through a cable from a substation or overhead line.

7.3.2 Each individual service line emanating from the kiosk shall be protected by a fuse, MCB or MCCB having appropriate O/Load rating.

7.3.3 The kiosk must be totally enclosed type i.e. insect & vermin proof and be easily accessible for maintenance. All screws, panels or doors opened for repairing, testing, maintenance etc. shall be re-fixed / closed completely, after job completion.

7.3.4 All kiosks shall be kept locked with key available in the shift room or manned substation.

7.3.5 The outgoing feeders & incoming feeders from and to the kiosk shall be clearly marked.

7.3.6 Danger board shall be provided on the enclosure of kiosks.

7.3.7 The enclosure of all kiosks containing voltage system of normally exceeding 250 V but not exceeding 650 volts shall be earthed as per the Indian Standards in this regard and the provisions in the CEA Regulation No. 41 and the kiosks containing voltage exceeding 650V shall be earthed as per the Indian Standards in this regard and the provisions in the CEA Regulation No. 48. {CEA Reg. 37(ii)}

7.4 Control switches and panels:-

7.4.1 The service lines shall be according to type of load terminating into any of the following:-

i) Iron clad switch/MCB of appropriate poles (i.e. Double Pole / Triple Pole) and current capacity and type for buildings involving lighting / small load.

ii) MCCB/ACB/SFU(Switch Fuse Unit)/Switchgear controlling supply to one or more power panels (for buildings involving heavy loads).

7.4.2 The iron clad switches / MCCBs / ACBs / SFUs(Switch Fuse Unit)/ Switchgears shall be easily accessible and be installed at the minimum height of 1.25 m to maximum 1.70 m for easy access, operation and maintenance.

7.4.3 Isolating switches / MCBs / MCCBs and switchgears shall be installed in an easily accessible position on each floor (in case of a multistoried building) and separate for each building i.e. for industrial / domestic buildings.

7.4.4 The spacing of the switches / MCBs / switchgears shall be such as to facilitate easy operation and maintenance.

7.4.5 The space housing the switches / switchgears shall be kept clean and dry. The space housing the switches / switchgears shall not be used for storage of any materials especially inflammable or combustible material or refuse. [CEA Reg. 49{1(i)}]

7.4.6 The space in front of switch boards / switchgears shall be kept clear up to a minimum distance of 1.0 meter width. [CEA Reg. 37{iii(a)}]

7.4.7 The space behind / front of the switch / switchgear panel and the switch room (if housed in a room) shall not be used as a rest room / office / store room / workshop etc. or for any purpose and shall be left free.

7.4.8 Fuses, protective relays shall be of appropriate rating commensurate with the load and proper settings with respect to other relays in the circuit.

7.4.9 Neutral links shall be provided in residential quarters/ offices where lighting & fan loads are involved.

7.4.10 Switch panels / switch rooms controlling power supply to heavy industrial loads shall be treated as a switching station and shall be provided with :-

(a) sand buckets and fire extinguishers suitable for extinguishing electric fire as per the recommendations of CFEES, and

(b) artificial respiration chart in Hindi, English and local language of the district.

[CEA Reg. 27(1) and 28(1)]

7.4.10 The instructions given in Chapter-V (Substations) shall also apply to the extent relevant.

7.4.11 On every switchgear / panel or main controlling switches / switchgears shall be affixed permanently in a conspicuous position a danger notice board in Hindi, English and the local language of the district, with a sign of skull and bones of a design as per IS-2551. [CEA Reg. 18]

7.4.12 Armour of the cable shall be connected to enclosure of the switch / switchgears with the help of a compression gland to ensure the earthing of the armour also.

7.4.13 All switches / switchgears shall be clearly marked to indicate the load controlled by it. Incoming switches / switchgears shall be marked indicating the source of supply i.e. from and to indications of supply connected with the switch / switchgear.

7.4.14 Switches in explosive buildings shall in addition be governed by the safety regulation mentioned in STEC (see chapter X).

7.5 Safety Regarding Cable Trenches in buildings other than substations:-

7.5.1 It shall be ensured that cable trenches containing cables are filled with sand, pebbles or similar non-inflammable materials or completely covered with non-inflammable slabs. [CEA Reg. 44{2(xii)}]

7.5.2 Cable trenches shall be kept clean and free from water / oil seepage. Shop sweepings, metallic swarf / articles shall not be dumped into the cable trenches. Cable trenches shall not be used for running pipe line, water line or any other type of process line.

7.5.3 Cables shall be properly supported on rack / trays / wall and not multiply-crossed or jumbled with each other in the cable trench.

7.5.4 No joint shall be made in a cable trench inside a building.

7.5.5 No machinery shall be installed on or above any cable trench.

7.5.6 Control and power, cables shall run separately laid on separate racks & trenches.

7.5.7 Cables of different voltage systems shall be segregated & run on independent trays / racks / supports.

7.5.8 Cables shall not be allowed to run on floors without any mechanical protection.

7.6 Safety regarding Wiring installations:-

7.6.1 All accessories used for wiring shall be of appropriate design to suit the load conditions. These shall conform to the CEA Regulations relevant and specification of the BIS code of practice (IS – 732:1989) to ensure safety.

7.6.2 All parts, spares and accessories used for the wiring in buildings handling explosives; their selection & installation, shall confirm to the regulations mentioned in STEC recommendations; in addition to the CEA Regulations relevant / ISCP etc. (Ref. Chapter X).

7.6.3 Apart from danger boards, outgoing circuit name and supply from the feeder/substation; no other stickers or notice shall be fixed on electrical equipment & controls.

7.6.4 All switches, distribution board, sub switches etc. shall be installed in an easily accessible position and be approachable.

7.6.5 The space in front of switch / DBs shall be kept clear for easy approach and operation. It shall not be used as storage space /dumping ground for production materials or scrap, shift room, workshop, testing bay or office. Cotton waste, heater, inflammable material shall not be kept on the switches.

7.6.6 No fuses or switches shall be provided on neutral unless it is a specific requirement under explosive regulations. However, there may be made a provision of a neutral link in neutral wire for testing purpose.

7.6.7 Every electrical installation other than voltage not exceeding 250 V, below 2 kW and those installations of voltage not exceeding 250 V, shall be controlled by an earth leakage protective device whose maximum earth leakage threshold for tripping should not exceed 30 milliamperes for domestic connections and 100 milliamperes for all other installations, so as to disconnect the supply instantly on the occurrence of earth fault or leakage of current. [CEA Reg. 42]

7.6.8 ACB/MCCB/Switchgear of every power panel and sub-panel controlling heavy load (exceeding 200 Amps) shall be provided with voltmeter, ammeter with selector switches, to indicate the availability of

the supply and the loading on the circuit. In case of heavy loads indicating lamps may also be provided on each phase.

7.6.9 The enclosures of the switchgear, electrical accessories and wiring of power panels shall not be used for hanging/keeping/supporting or dumping personal clothes or other articles.

7.6.10 Ceiling fans shall be hanging at a minimum clearance of 2.4 meters from the floor. It shall be installed above the height of a light fitting. The ceiling fan shall never be installed close to a hanging light.

7.6.11 General light and power wiring shall either run on walls at a height of 3.0 meters from the floor (if the ceiling of the building is more than 3.5 meter high) or at 0.5 meter below the ceiling (if the ceiling of the building is less than 3.5 meter high).

7.6.12 Wiring in residential quarters and office buildings may be in plastic conduits, conforming the relevant IS; but in industrial building wiring shall be done in metallic conduit pipes or on trays supported on walls, pillars or brackets or on trays in trenches. It should not run on the floor without a mechanical protection fixed permanently. If the mechanical support for the cable/wiring is metallic, it shall be connected to earth.

7.6.13 Electrical accessories shall be fixed rigidly & permanently and shall not be tied by rope or wires.

7.6.14 Wiring of different systems shall run independently with their accessories located separate from each other. Such wiring shall be marked/painted clearly to distinguish them and to prevent inter connection between them. {CEA Reg. 24}

7.6.15 No light or power shall be provided in cupboard or drawers of the work benches or workman’s cupboard.

7.6.16 All metallic enclosures of switchgears carrying live parts (such as bus - trunk) of voltage up to 250V, metallic support to switchgears, panels, shall be efficiently connected to earth. Where the supply voltage is not exceeding 250 V and where the installations are either new or renovated, all plug sockets shall be of the three pin type, and the third pin shall be permanently and efficiently earthed. All metallic enclosures of switchgears, panels, conduits carrying live parts of voltage exceeding 250V and up to 650 V, metallic support to switchgears, panels, shall be efficiently connected with two distinct and independent earth pits. {CEA Reg. 41}

7.6.17 X-ray and other machines involving high voltage/frequency shall be provided with an additional independent earth connection.

7.6.18 All type of safety regulations pertaining to electrical energy meters shall be followed as per the provisions made under the CEA (Installation and Operation of Meters) Regulations' 2006 and latest amendments therein.

7.7 Safety Provisions Regarding Portable appliances:-

7.7.1 All portable appliances shall be connected only through a plug socket of appropriate capacity and design and controlled by a switch i.e. no portable appliance shall be used without a plug top connected.

7.7.2 Portable appliances shall not be used inside the buildings handling explosives without the written permission of the Safety Section.

7.7.3 It is better and safer to have a few additional plug points at different places to avoid a long length of cable running haphazardly on the shop floor.

7.7.4 The cable type shall be of three-core for single phase appliance having metallic body or any metallic part exposed and working at voltage not exceeding 250V and the third wire shall be used as earth connection. However, if the outer body of any portable appliance is made of any insulating material and no metallic part of the appliance or apparatus is exposed and working voltage of the appliance or apparatus does not exceeding 250V, double insulated twin core cable may be used to supply power to such appliance or apparatus.

7.7.5 Flexible wires/cables shall not be used for portable or transportable motors, generators, transformers, rectifiers, electric drills, electric sprayers, welding sets or any other portable or transportable apparatus unless they are heavily insulated and adequately protected from mechanical injury. {CEA Reg. 21}

7.7.6 Where the protection is by means of metallic covering, the covering shall be in metallic connection with the frame of any such apparatus and earthed. {CEA Reg. 21}

7.7.7 The cables shall be three core type and four core type for portable and transportable apparatus working on single phase and three phase supply respectively and the wire meant to be used for ground connection shall be easily identifiable. {CEA Reg. 21}

7.8 Safety Regarding Inspection Lamps:-

7.8.1 Inspection lamps used in process buildings shall preferably be of 50 Volts or lower unless required otherwise.

7.8.2 For inspection lamps working at 230V, if unavoidable, supply shall be handled carefully to avoid wear-out of insulation or connection becoming loose or coming out.

7.8.3 Replacement of lamps/repairs to inspection lamps shall be done by the authorised electrical person only. Employees of production section shall never be allowed to repair the test lamp/replace lamps. No repairs to inspection lamp including replacement of lamp should be done with the lamp connected to plug point.

7.8.4 Portable lamps shall always be used with a mesh guard to protect it from any damage while handling it.

7.8.5 No joints are permitted in the inspection lamp leads.

7.8.6 The leads shall as far as possible be taken overhead & not allowed to run on shop floor or on any machinery / stores.

7.9 Earthing System:-

(A) General:-

7.9.1 All buildings using electric power for lighting or for power at different voltage levels shall have earthing system as per relevant Indian Standards and CEA Reg. 2010 No. 16, 37 (ii), 41 & 48.

7.9.2 All non-current carrying metal parts associated with an installation of voltage exceeding 650 V shall be effectively earthed to a grounding system or mat which shall:-

(i) Limit the touch and step potential to tolerable values;

(ii) Limit the ground potential rise to tolerable values so as to prevent danger due to transfer of potential through ground, earth wires, cable sheath, fences, pipe lines, etc.;

(iii) Maintain the resistance of the earth connection to such a value as to make operation of the protective devices effective.
{CEA Reg. 48(1)}

7.9.3 The work and design, number of earth pits, size of the earth conductor, type of earthing shall conform to IS - 3043:1987, concerned provisions of CEA Regulations-2010 and STEC regulations (for explosive buildings).

(B) Size of the earth conductor:-

7.9.4 the size of earth conductor shall be so taken as to be able to carry the maximum fault current of the circuit without fail.

7.9.5 Under faulty current condition, earthing conductor should not be rupturing or causing deterioration in the insulation of the system.

7.9.6 The resistance between any point of earthing system in the installation to earth terminal at the test point of earthing terminal shall not exceed 1.0 ohm.

(C) Earth pits:-

7.9.7 Resistance of the earth pit shall be such as to develop a fault current of twice the current required to operate the Earth Leakage Relay or three times the highest rating of the fuse in the circuit

7.9.8 Earth pits shall be located outside the buildings. No civil construction shall be made on/over an earth pit.

7.9.9 Number of earth pits shall depend upon the load used in the circuit. The number of pits will be designed in such a way as to meet the parameters stated above. However, actual numbers of earth pits may be more to achieve the required earth resistance or level of protection for the circuit.

7.9.10 For domestic buildings using electric power at the voltage not exceeding 250 V one or two earth pits may be adequate. For industrial buildings this will have to be carefully worked out considering the relevant IS specifications and provisions of the CEA Regulations-2010.

7.9.11 Each building supplied at the voltage not exceeding 250V shall have minimum two earth connections, one through the power supply feeder and the other through the building earth pit. However, these two earth connections may be inter-connected. {CEA Reg. 16}

(D) Testing / Inspection of Earth System:-

7.9.12 Earth system shall be tested once in a year in summer and dry season *{CEA Reg. 48(8)}*, and record of such testing shall be maintained properly in **Proforma 11A** for the buildings other than substation and in **Proforma 10** for the LP earthing system of the buildings (If provided).

7.9.13 While testing the earth pit, each earth electrode should be isolated from the system. If ER value of any earth electrode is found to be abnormally high immediate steps shall be taken to bring the ER value to the level specified.

7.9.14 Combined resistance of earth electrodes (where inter-connected) shall also be checked.

7.9.15 Details of rectification done & final reading shall also be recorded.

7.9.16 For testing of earthing of the buildings processing explosives, the frequency prescribed in STEC shall strictly be followed.

7.9.17 Before commencing testing/repairs of earth system in explosives buildings, clearance of production section & Safety section shall be obtained positively.

7.9.18 Depth and location of earth pit shall be so chosen that as far as possible there is moisture around it round the year.

7.9.19 Rails of overhead Cranes, hoists, lifts and walking beams etc. shall be electrically continuous and bear continuity to earth.

7.9.20 No pipe line carrying water, fuel, sewage, drainage, chemical or anything else shall be used as earth terminal or earth conductor. {CEA Reg. 41(x)}

7.9.21

(A) All metal casing or metallic coverings containing or protecting any electric supply line or apparatus shall be connected with earth and shall be so joined and connected across all junction boxes and other openings as to make good mechanical and electrical connection through their whole length.

(B) Conditions mentioned in 7.9.21(A) shall not apply where, the supply voltage does not exceed 250 V and the apparatus consists of wall tubes or brackets, electroliers, switches, ceiling fans or transportable apparatus, unless provided with earth terminal and to class-II apparatus and appliances.

Explanation:- The expression "Class-II apparatus and appliances" shall have the same meaning as is assigned to it in the relevant Indian Standards. {CEA Reg. 41(xiv)}

(C) For electrical installations and apparatus of voltage not exceeding 650V, all earthing systems shall:-

(a) consist of equipotential bonding conductors capable of carrying the prospective earth fault current and a group of pipes, rods and plate electrodes for dissipating the current to the general mass of earth without exceeding the allowable temperature limits as per relevant Indian Standards in order to maintain all non-current carrying metal works reasonably at earth potential and to avoid dangerous contact potentials being developed on such metal works.

(b) limit earth resistance sufficiently low to permit adequate fault current for the operation of protective devices in time and to reduce neutral shifting.

(c) be mechanically strong, withstand corrosion and retaining electrical continuity during the life of the installation and all earthing systems shall be tested to ensure efficient earthing, before the electric supply lines or apparatus are energized. {CEA Reg. 41(xv)}

7.9.22 The earthing lead for any lightening arrester shall not pass through any iron or steel pipe, but shall be taken as directly as possible from the lightening arrester without touching any metal part to a separate-vertical ground electrode or junction of the earth mat already provided for the building. {CEA Reg. 74(2)}

CHAPTER – VIII

ELECTRICAL INSTALLATIONS (MACHINERY) IN BUILDINGS

8.1 All electrically driven/operated machines must be provided with the following:-

8.1.1 The supply of electricity to each motor/a group of motors/other apparatus meant for operating one particular machine shall be controlled by a suitable linked switch/a circuit breaker/an emergency tripping device with manual reset of requisite capacity placed in such a position as to be adjacent to the motor/a group of motors/other apparatus readily accessible to and easily operated by the person in-charge and so connected in the circuit that by its means all supply of electricity can be cut-off therewith. {CEA Reg. 35(5)}

8.1.2 Where control gear is not accessible easily, at least a stop push button (for putting off the machinery) shall be provided on the machinery or close to it.

8.1.3 Adequate protective devices.

8.1.4 A power control switch (back up protection).

8.1.5 A danger notice in Hindi or English and the local language of the district, with a sign of skull and bones of a design as per IS-2551 shall be affixed permanently in a conspicuous position a on every motor, generator, transformer, machine and other electrical plant and equipment together with apparatus used for controlling or regulating the same, working at voltage exceeding 250V. {CEA Reg. 18}

8.1.6 Two separate and distinct connections with earth (when machine is operated at more than 250V or at three phase).{CEA Reg. 41(xii)}

8.1.7 In places where the switch is not located on the machine or its vicinity to show the ON/OFF position of supply.

8.2 The enclosures to the live parts/control panels must be closed, with no crevices or holes. There should be no exposed live part.

8.3 Holes left over due to removal of instrument should be covered to prevent accessibility of live parts or any foreign matter going.

8.4 The armour of the cables or conduit carrying the wires shall be effectively connected to earth and shall bear continuity with the

enclosure of the control switchgear / control box into which it terminates.

8.5 Swarf shall not be allowed to fall on control cubicles. The control cubicle shall be easily accessible. No production items or scrap shall be thrown / heaped on or around it.

8.6 Control box, bus trunks and electrical accessories shall not be allowed to be used for supporting or keeping any article.

8.7 For heavy /sophisticated machinery, controls may be kept away from the machines or housed in a separate room and following shall be observed:-

8.7.1 The room/area around the control switchgears shall be kept clean.

8.7.2 Nothing shall be kept on the control unit.

8.7.3 The room / places must not be used as a shift room /office or site workshop.

8.7.4 Maximum man limit for the room/area shall be prescribed. Only authorised persons shall be permitted in the room/area.

8.8 Men shall not be allowed to sit close to the control panel.

8.9 Cables connecting the machine shall be laid in a trench or run overhead on cable tray or run in conduits. In no case it shall be allowed to run on the floor without mechanical protection.

8.10 Selection of Cables:-

8.10.1 Cables shall be of adequate current carrying capacity and cater for the starting current requirement of the machine/installation without causing heavy voltage drop or heating during continuous use.

8.10.2 The choice of cable (type) shall depend upon the working voltage, phases, electrical load condition of the machine and the weather conditions of surrounding area, where machine is installed.

8.10.3 Cables of different systems (power cables, control cables and power cables of different voltage systems) shall run separately. Control / instrument cables shall preferably run in separate trays.

8.10.4 Cables shall adequately be supported on racks or clamps. They shall not be laid cris-cross.

8.11 Bus trunks:-

8.11.1 Where bus-trunking is used for connections to machines, it shall comply the following:-

(i) It shall be enclosed.

(ii) It shall be installed at minimum height of 2.5 m from the ground.

(iii) Danger notice shall be provided.

8.11.2 The body of the enclosure & supports should be efficiently connected with earth by two separate and distinct connections *(For working voltage exceeding 250 V).*

8.11.3 It should not be used for supporting or keeping any other articles or things.

8.11.4 The cable connections, with the bus trunks should be adequately supported.

8.11.5 All cable connections, conduits to machines emanating from the bus trunk should be rigidly supported.

8.12 Safety measures for Travelling Cranes:-

8.12.1 Every electrical travelling crane, hoist, walking beam or installation like these, to which electricity is supplied from an external source shall ensure that these are efficiently controlled by a suitable switch enabling all voltage to be cutoff in one operation. {CEA Reg. 20}

8.12.2 Where such vehicles, travelling cranes or the like runs on metal rails, it shall be ensured that the rails are electrically continuous and connected to earth at its ends. {CEA Reg. 20}

8.12.3 Indication lamps must be provided on the bus bar at its two ends.

8.12.4 The bus bar supply switchgear shall be located on a nearby wall/structure in an easily accessible position.

8.12.5 An earth leakage relay may be provided where it is operated from a cabin installed at a height.

8.12.6 Adequate space shall be available in front of the control unit for maintenance.

8.12.7 The live bus bars shall not be easily approachable. They should be protected by guarding.

8.12.8 Where two or more gantry cranes run on the same rails, a suitable alarm system shall be incorporated to warn the approach of a gantry crane too close to another gantry crane.

8.12.9 The ladder to the operating cabin shall be provided on the side where there is no bus bar and connected to the control cabin by a cat walk with rail supports to prevent falling or slips.

8.12.10 Lights and fans, in the shop shall be so located that any person going up for maintenance does not come in contact with live bus bars.

8.12.11 Operator sitting in the cabin shall be well protected from falling during operation. He shall not be allowed to operate, sitting on a plank or portable stool.

8.13 Overhead bus bars:-

8.13.1 Bus bars shall normally be enclosed in a metallic enclosure.

8.13.2 All bus bars must be controlled by a switch located in a readily accessible position in the shop.

8.13.3 Overhead bus bars when used in a shop, it shall be provided with adequate guarding to prevent its falling on its metallic supports.

8.13.4 The guarding shall be earthed effectively.

8.13.5 The bus-bar shall be supported on metallic frame work and supports.

8.14 L.P. system:-

8.14.1 The need for providing Lightening Protection to any building shall be decided in accordance with the relevant BIS and once it is provided it shall be maintained.

8.14.2 The portion of earth conductors preferably shall be of copper, GI or MS and not of Aluminium (Specially underground).

8.14.3 Joints between aluminium, copper and GI (dissimilar metals) shall be anti-corrosive with a lead packing in between. Inspection joints shall also be provided to facilitate testing.

8.14.4 Earth pits for LP system shall be independent. They may be connected with earth pits of power system underground.

8.14.5 LP system shall be checked / tested regularly and proper records shall be maintained in **Proforma 10**.

8.15 Static earth system:-

The requirements, design, testing etc. shall be governed by regulations / recommendations issued by STEC (Ref. Chapter X).

8.16 Maintenance & repairs to wiring & machine installation in bldg.

8.16.1 Works under the above category shall be commenced only after compliance of one of the following:-

(a) A permit to work is obtained in accordance with the permit **Proforma-5** (Chapter IV.) covering the location of the installation where work is to be carried out.

(b) Special works authorisation for working on installation involving intricate controls or controls located over a wide area or a part of whole of the installation, major break downs on overhead line system, live installation etc. Such works will be done in accordance with procedure laid out under chapter-III (Authorisation).

(c) Isolating supply to the equipment and control in case of minor works (electrical meter, lights / fans etc.). Work will be done only by an authorised person.

8.16.2 Working on installation which is fully or partly live may be permitted subject to the following conditions:-

(i) The person is competent to execute the works.

(ii) He is aware of the installation being partially / fully live and the risk involved in executing the work.

(iii) He takes all precautions necessary and follows procedure laid down to ensure safety.

(iv) He uses proper tools / gadgets / PPEs to ensure safety.

(v) He is authorised to do the type of the work.

(vi) In case of installation of voltage 650 V and more, the work is done under the supervision of a competent person.

(vii) The point number (vi) shall not apply for works like ON/Off operations of a switchgear, replacement of fuses, or works to be done with the help of safety gadgets intended to be used for the purpose.

8.17 Additional points to ensure safety in installations working at 650V and more:-

8.17.1 All works, except those like operation of switchgears or controls, and those intended to be worked under live line condition, shall be commenced only after switching off the power supply to the equipment on which work is to be carried out and discharging the conductors of power input terminal to earth.

8.17.2 The installation shall be checked and tested by a competent person before switching on.

8.17.3 Number of persons in the area where the work is being carried out and those near the switchgear shall be restricted to minimum at the first time switching 'ON' after repair/maintenance.

8.17.4 Other points to be borne in mind while doing rectification:-

(i) Identify the machine under repair, location of its controls, remote controls and control of incoming supply to the machine.

(ii) Visually check for any apparent damage. Arrange to rectify it before proceeding further.

(iii) Testing should be commenced after completely isolating the supply.

(iv) Switching "ON" after repair/maintenance shall be done only after results of 8.17.2 are found satisfactory.

(v) Always use the correctly rated fuses and relays. Do not use ordinary wire to replace HRC fuses. Do not run any machine after by-passing any protective device connected in the circuit.

(vi) Before switching on after repairs/maintenance, ensure that earthing system has been connected properly at specified places, short circuiting chain/conductors has been removed and all live parts are properly covered.

(vii) Check the operational characteristic and confirm that they are in order.

(viii) Avoid temporary works / connections.

(ix) Details of all major repairs / maintenance are recorded.

8.18 Periodic inspection & testing of elec. installation.

8.18.1 Periodic inspection and testing of all electrical installation shall be followed as per specified schedules.

8.18.2 Checking and testing results shall be recorded as per the Proforma/Formats.

8.19 Periodical inspection and testing shall include the following:-

8.19.1 Inspection, checking and tests recommended by manufacturer, as per BIS specifications, DGOF Standing Instructions and other directives issued by OFB from time to time.

8.19.2 Insulation Resistance test – once a year (minimum) **(Proforma-14)**.

8.19.3 Earth test – once a year (minimum)

8.19.4 Testing of protective devices i.e. tripping relays and circuit breakers once a year (minimum). Testing date, and due date should be displayed on the power panel nearby the tested relays.

8.19.5 Tests on tripping batteries as prescribed in this SI.

8.19.6 Power supply equipment as prescribed.

8.19.7 Checking of ceiling fans for fastening arrangement (split pins, rubber reels, check/lock nuts etc.) once in five years (minimum). Record of such checking should be maintained in **Proforma-19**.

8.19.8 The testing of meters shall be done at site or at EM section at least once in five years **(Proforma-13A & Proforma-13B)**. [The CEA (Installation and Operation of Meters) Regulation-2006 No. 18(2)].

8.19.9 IR and ER values of Machines as per manufacturers' recommendations.

8.19.10 Visual inspection of all installations once in 6 months.

CHAPTER IX

TEMPORARY WORKS, WIRING AND CONNECTION

9.1 Temporary service connections are given normally for 240 Volts / 415 volt system. Occasionally it may be given at voltage higher than 415 Volt also. They may be of three types:-

9.1.1 **To Contractor/Firm:-** To facilitate any firm/contractor for his construction / erection work in the factory or estate. These may be for any specific period depending upon the contract.

9.1.2 **To religious / social functions:-** These are given for a specific period generally not exceeding 15 days. These may be given to employees or organisations for religious / social functions.

9.1.3 **To buildings in the factory or estate to maintain continuity of power supply during the repairing/rectification period of permanent service connections.**

9.2 Besides the above, the factory may have to carry out temporary wiring works to commission or test machinery or provide illumination to work spots.

9.3 Proper records are required to be maintained to meet the contractual / Finance / Audit obligations in regard to temporary connections of the type mentioned in point Number 9.1.1 and 9.1.2.

9.4 Temporary connections of the type mentioned in point number 9.1.3 above and all temporary wiring works in Para 9.2 shall be authorised by a responsible officer nominated by the General Manager for the purpose and the authorisation for connection and disconnection recorded in a register **(Proforma 12)** maintained by the EM section. The installation provided shall comply with the following:-

9.5 For Contractor's service connections:-

9.5.1 Work shall conform to the CEA Regulations, IS Standards and code of practice as and where applicable.

9.5.2 The service connection will be done in a permanent manner with overhead bare conductors/cables supported rigidly on mechanically strong supports with provision of earth wire and guarding.

9.5.3 The meter and the power control switch / DB with fuses of proper capacity shall be installed in a weather proof enclosure or under a shed for protection from rain water or other climatic effects.

9.5.4 Double earthing is to be connected to the panels, metallic structures i.e. the power control switch / DB etc. shall be provided with its own earth pits in addition to running earth (depending upon quantum of load / compliance with the CEA Regulations & STEC recommendations.

9.5.5 The Firm/contractor shall get this installation tested and certified by an electrical engineer / supervisor holding the requisite competency prescribed under the CEA Regulations 5A. The tests shall be performed as per the CEA Regulation number 33 (i) to (iii) or the CEA Reg. 43 (as the case may be) and this test certificate shall be presented to the factory before asking the factory management for energising the line.

9.5.6 The installation will also be visited by the factory ESO and connection will only be given after the factory ESO concludes that the installation is satisfactory. For this purpose he may carry out IR, ER and such other tests as he considers necessary.

9.5.7 The contractor shall intimate the name of the person responsible for care and custody and safety of the installation who can be contacted by the factory to bring to the notice any unsafe features or violations noticed in the installation.

9.5.8 Once the connection is given no addition / alteration in the capacity and number of points in the installation will be permitted without the prior consent of the factory and certificate from the competent person referred in point 9.5.5 for the fitness of the installation (after the addition / alteration) and approval of the factory ESO.

9.5.9 The installation will also be visited periodically by the Electrical staff of the factory, ESO of the factory / Regional or Asst. Elect. Inspector / RCS during their inspection visits and defects / deviations from the CEA Regulations, Standing Instructions regarding electrical safety, if any, will be brought to the notice of the contractor or the person nominated by him under Para 9.5.7 in writing for rectification within a reasonable time depending upon the nature of the defect.

9.5.10 In the event of non-rectification of the defect within the period specified above, the supply will be disconnected and will be reconnected only after the ESO of the factory or REI or RCS are satisfied with the rectification of the defect/ deviation pointed out.

9.5.11 In the event of any serious defect (likely to endanger persons, factory installation or properly) noticed, the supply will be disconnected immediately and the contractor or his representative stated in Para 9.5.7 shall be intimated after the disconnection. The reconnection will be made only after the contractor rectifies the defect to the satisfaction of the factory ESO.

9.5.12 The firm/contractor will perform IR tests as per the CEA Reg. 33 and Earth Resistance tests in accordance with the CEA Reg. 41 or CEA Reg. 48 (as the case may be) for his installation and the records of such tests shall be prepared and maintained as per the CEA Reg. 41 (xvii) and 48(8). {the CEA Reg. 33, 41 & 48}

9.5.13 The inspection by Electrical Safety Staff /Asst. Elect. Inspector / Regional Electrical Inspector, RCS etc. initially and from time to time does not absolve the responsibility of the contractor for the safety in his installation and compliance with the CEA Regulations.

9.6 Temporary connections for religious / social functions:-

The service line with the earth wire shall be installed by the user in a manner approved by the factory and the final connection will be done by the factory after having satisfied that the party have complied all the safety rules and regulations applicable and the following:-

9.6.1 The work complies with the CEA Regulations, DGOF SI and any other instruction issued by the Central or State Government.

9.6.2 The power control switch, DB with fuses is of proper capacity. Energy meter installed in a weather proof enclosure protected from rain. {CEA Reg. 12}

9.6.3 The power control switch / DB etc., when installed outside a building or in an open area is provided with its own independent earth pits.

9.6.4 In the case the function is in an open area/stage, at least two suitable fire extinguishers capable of fighting electrical fire shall be provided. These may be maintained by the factory.

9.6.5 For the above purposes the installation should be checked and cleared by ESO or a person holding Supervisory Competency Certificate issued by the Central Government/State Government or DGOF before providing electrical supply connection.

9.7 The applicant getting the temporary connection will be personally held responsible for care of the installation, safe operations and compliance

with these instructions. He should ensure that his installation is free from danger to the personnel and property/ installation belonging to the factory.

9.8 No addition / alteration in the capacity and number of points in the installation is permitted without the prior consent of the factory and certificate from the competent person referred in Para 9.6.5 for the fitness of the installation after the addition / alteration. {CEA Reg. 29}

9.9 The installation shall also be visited and inspected by the ESO of the factory at the time of initial connection and may also be inspected by REI or RCS during their inspection visits.

9.9.1 Any defects / deviations noticed during the above visits will be brought to the notice of the applicant of the temporary connection for rectification within a reasonable time depending upon the nature of the defect. In the event of non-rectification of the defect within the specified time, the supply will be disconnected. {the CEA Reg. 31(3)}

9.9.2 In the event of any serious defect noticed (which is likely to endanger persons, factory installations or property), the connection will be immediately disconnected and the party may be intimated afterwards.

9.9.3 Records of IR and Earth Resistance tests will be maintained by the factory and shall be shown to the REI / RCS during their visits.

9.9.4 It is the responsibility of the person taking the temporary connection, as far as circumstances permit, to take precautions for the safe custody of the equipment on his premises belonging to the factory. He will be responsible for the consequences of any unsafe features and loss of property due to theft / pilferage. {CEA Reg. 13(3)}

9.10 Temporary works / wiring / service connection to buildings in the factory / estate area:-

9.10.1 Temporary service connection and wiring shall not be permitted in normal conditions. However, cases may arise when these may become unavoidable due to extreme urgency.

9.10.2 In such cases, written authorisation as laid down in point number 9.4 should be taken first & records of such temporary connections shall be maintained in **Proforma 12**.

9.10.3 The work will be done under the supervision of a Staff member whose name will be recorded in the register.

9.10.4 The installation where temporary connection is to be provided shall be inspected by an officer not less than a ***JWM*** and unless he is satisfied about the soundness of the installation, safety aspect and compliance with the CEA Regulations, it will not be energised.

9.10.5 The disconnection / changeover to permanent connection of such temporary connection/wiring will be watched by HOS/EM and the DO/EM. They will also sign the records of such temporary connections **(Proforma 12)** periodically, once in a month.

9.10.6 No other temporary works other than those stated in this chapter will be permitted. Any temporary work done un-authorisedly shall be disconnected immediately after coming to notice and person responsible shall be issued a warning letter.

9.10.7 Occupants of houses shall be advised twice a year through circulars not to carry out any temporary works / extensions in their government quarters/houses.

9.10.8 The instructions given in this chapter are made mainly from safety point of view, which are applicable to all temporary works and connections, in addition to various administrative instructions of the OF Board on the subject from time to time.

9.11 Testing:-

9.11.1 Resistance of earth continuity conductor i.e. the resistance between the main switch & any part of the earth continuity conductor should not exceed 0.5 ohm.

9.11.2 IR value between conductor and earth terminal should be:-

(i) On application of 500 V DC between each live conductor and earth for a period of one minute the insulation resistance of installation and equipment of voltage not exceeding 650V shall be at least 1 MEGA OHM or as specified in the relevant Indian Standard.

(ii) On application of 2.5 kV-DC between each live conductor and earth for a period of one minute, the insulation resistance of installation and equipment of voltage exceeding 650V but not exceeding 33kV shall be at least 5 MEGA OHM or as specified in the relevant Indian Standard.

[CEA Reg.33{1(ii) & (iii)}]

9.11.3 Resistance between the surface of a conducting floor & earth tested with 500 V megger using a wetted electrode should not exceed 50 x 10^3 ohm.

9.11.4 Resistance between the surface of antistatic floor and earth when tested by this method should be between 50 x 10^3 and 2 x 10^6 ohms.

9.12 LP System

9.12.1 The testing of LP installation requires initial testing as well as after any modification.

9.12.2 Resistance to earth of each individual earth termination shall not exceed 10 ohms X No. of earth terminations.

9.12.3 Resistance to earth of the installation with all earth electrodes & bonding of other services measured at accessible random points approximately equidistant from all earth electrodes shall not exceed 10 ohms.

9.13 Frequency of testing and Inspection

9.13.1 IR and ER tests:-

All fixed electrical installations within the enclosed explosives area are to be electrically tested not less frequently than recommended in the following schedule :- (STEC No. 7)

Category	IR	Earth continuity	Other test as per CEA Regulations 2010
A	Min. 6 months Max. 1 yr.	6 months 1 yr.	6 months 1 yr.
B	Min. 6 months. Max. 2 yrs.	1 yr. 2 yrs.	1 yr. 2 yrs.
C	Min. 1 yr. Max. 3 yrs.	1 yr. 4 yrs.	2 yrs. 4 yrs.
Other buildings within the explosives area	Min. 2 yrs. Max. 5 yrs.	2 yrs. 5yrs.	4 yrs. 5yrs.

9.13.2 Flexible cables used with electric appliances in building containing explosives should be inspected/ tested once in a month.

9.13.3 All electrical installations in explosive buildings should be inspected for any visible signs of damage or depreciation at least annually.

9.13.4 New installations of conducting floor / antistatic floor should be tested at intervals of 3 & 9 months. Thereafter the tests should be made at interval not exceeding 12 months.

9.13.5 Inspection & testing records should be maintained in a register and this should be seen by an audit officer / REI.

CHAPTER X

SAFETY IN ELECTRICAL INSTALLATIONS DEALING WITH EXPLOSIVES.

10.0 The existing electrical installations in buildings dealing with explosives are governed by STEC regulations {Pamphlet No. 7 (1982)}. These regulations are amended and updated in 1998, 2011 and latest in 2017 issue. These amended and updated regulations are applicable only to new installations and replacements over and above the CEA Regulations. These regulations do not apply to administrative buildings, or other personal accommodations, workshops not containing explosives within an explosive area. Some of the common provisions are given herewith.

10.1 Definitions:-

Explosive buildings are categorized into A, B and C type as detailed below:-

10.1.1 **Category A:–** This category comprises explosives Store-houses, Laboratories or process buildings in which explosives may give rise to flammable vapour in the building but not explosive dust. Category A is further sub-divided into Zones 0, 1 & 2.

(i) ***Zone 0***:- Zone in which the flammable atmosphere is continuously present or is present for long periods. In such situations, no electrical fittings / equipments should be installed. Zone O areas are generally encountered in petro-chemical industries. If installation of electrical equipments is considered absolutely essential, the recommendations laid down in IS/IEC 60079: Part 11:2006 (Reaffirmed 2013) should be used. For explosives like nitro-glycerin which has the property to sublime, it is recommended that either Dust-Tight or pressurised electrical equipment may be used.

(ii) ***Zone 1***:- Zone in which the flammable atmosphere is likely to occur in normal operation. Electrical equipment which is certified as flame-proof (FLP) with type of protection ‘d’{IS/IEC 60079 : Part 1 :2007 (reaffirmed 2012)} is recommended.

(iii) ***Zone 2***:- Zone in which the flammable atmosphere is not likely to occur in normal operation and if occurs it will exist only for a short time. Electrical fittings/equipment, which are suitable for category A Zone 1 are permitted. Alternatively, increased safety

fittings/ equipment with type of protection ‘e’ corresponding to IS/IEC 60079 : Part 7:2006 (reaffirmed 2013) or non-sparking electrical equipment with type of protection ‘n’ or non-sparking electrical fittings for Zone 2 corresponding to IS: 8224-1976 can be used.

10.1.2 **Category B**:– This category comprises magazines, laboratories or process buildings in which there may be exposed explosive or explosive dust but not inflammable vapour. It is sub-divided into two zones:-

(i) **Category B, Zone Z**:- The electric equipment certified to be dust-tight corresponding to IS: 110015-1984 is permitted. The electrical fittings should be Dust-Tight corresponding to IS: 4013-1967.

(ii) **Category B, Zone Y**:- Zone in which the incidence and amount of explosive dust produced by the exposed explosive may be considered insignificant. However, in the absence of effective housekeeping standards, Zone Y area may degenerate to Zone Z area. It is therefore recommended that for Zone Y area also, electrical installations and equipments are to comply with Zone Z specifications.

10.1.3 **Category C:**– This category comprises of explosive buildings. in which explosives are not exposed and do not give rise to flammable vapour or explosive dust. For this category buildings; all electrical installations, equipment and apparatus shall comply with requirements of totally enclosed (TE) electrical fittings as stipulated in STEC Specifications given in appendix ‘B’.

10.1.4 **Corridors and Verandahs** of ‘A’, B’’ & ‘C’ buildings can be provided with totally enclosed lighting fittings.

10.1.5 **Flame Proof**:– A type of electrical fitting which will withstand an electrical internal explosion of the flammable gas or vapour which may enter or which may originate inside the enclosure without suffering damage and which prevents the transmission of the explosion to the flammable atmosphere surrounding the enclosure.

10.1.6 **Dust tight**:– A type of electrical fitting which when used in a dust-laden atmosphere does not permit the entry of any dust.

10.1.7 **Totally enclosed**:– A type of electrical fitting which is protected by mechanically sound enclosure, weather proof and insect proof without opening for ventilation but not necessarily air tight.

10.1.8 **Floor antistatic**:– A floor which is sufficiently electrically conductive to disperse charges of static electricity, but has sufficient electrical resistance to minimise the danger from electric shock.

10.2 Design considerations:-

10.2.1 In all cases installations must be designed and installed to ensure that any overheating or sparking whether in normal use or under fault condition is confined within the approved housing or wiring system and electrical items concerned.

10.2.2 The circuit for all installations must be provided with excess current and earth leakage protection necessary to isolate the circuit concerned as quickly as possible in the event of a fault developing.

10.2.3 The surface temperature of any electrical equipment or installation (lamps chokes, material etc.) should not exceed the following limits:-

(a) Category 'A' & 'B' buildings - 100^0 C,

(b) Category 'C' Buildings - 120^0 C.

10.2.4 Any apparatus or component which may produce excessive temperature under abnormal conditions of operations should preferably be fitted with a thermal device to disconnect the appropriate circuit before the maximum safe temperature is exceeded.

10.2.5 All electrical installations, equipments & apparatus [FLP/DT/TE] shall be certified by CMRI, Dhanbad as suitable for use in explosive buildings.

10.3 POWER SUPPLY:-

The electricity supply to the building containing explosives may be either direct or alternating with a voltage to earth not exceeding 250 volts. On this basis a 500 volts 3 wire D.C. System or a 440 volts 3-phase 50 cycles, 4-wire AC system may be employed provided the mid-wire or neutral conductor is connected to earth in accordance with the Indian Electricity Act and the CEA Regulations.

10.4 Siting of Substation(S.S.) and Generating Station (G.S.):-

10.4.1 The generating stations and sub-stations (including mobile and semi-mobile generators) should be located at PIQD (*Process Inside Quantity Distance*) or a minimum distance of 45 meters whichever is more from any building containing explosives.

10.4.2 Low and medium voltage switch-houses and feeder pillars are to be sited not less than 10 meters from any building containing explosives.

10.4.3 If low and medium voltage electrical apparatus is provided with an effective containment (by means of 34 cm brick wall or equivalent) relative to the explosives, including overhead containment, then the minimum distance required at Para 10.4.1 may be reduced to that required by Para 10.4.2 and it should be in the shadow of traverse as far as possible.

10.4.4 To protect generating station and substation from an explosion, these should be sited at PIQD from the nearest explosive block building. Main generating stations should preferably be located at OQD (Outside Quantity Distance) from any explosive building.

10.4.5 When in an electrical generating station or substation or in switch-houses within an enclosed explosive area, fuel oil in sufficient quantity is held, drains must be provided to lead oil leakage in to a single filled sump of an adequate size to contain all leakage. Further a fire break of at least 2 meters must be maintained around the sump. This should be observed in addition to the requirements given in IS: 3034-1993.

10.4.6 Unmanned electrical substations serving only one building should be situated beyond traverse or beyond 45 m in case of un-traversed explosive building.

10.4.7 If serving a group of buildings, unmanned electrical substations should be provided a distance of SIQD from the nearest explosive building or 45m whichever is larger.

10.4.8 Solar power plants (without storage batteries) in explosive areas should be located beyond a distance of 45m from any explosive building. These solar plants should be on vacant grounds and no rooftop solar panel should be allowed for explosive building.

10.5 Distribution:-

10.5.1 Electrical distribution in an area containing explosives may be underground or overhead.

10.5.2 Cable laid underground should be adopted wherever practicable.

10.5.3 Overhead lines should terminate at not less than 15 meters from any building containing explosives and the remaining distance should be completed by underground cables.

10.5.4 Protective devices (surge absorber) should be provided at a junction of overhead line and the underground cable between conductors & earth.

10.5.5 Fixing of supports for overhead lines to building containing explosives is prohibited.

10.5.6 The factories have to hold up to date plans showing the position and size of all underground cables, including the location of all joints in cables, cable pits etc., within the explosive area.

10.6 Wiring system:-

10.6.1 The electrical systems within buildings and underground sites are to comply with the code of practice for electrical wiring installations IS: 732-1989.

10.6.2 The electrical system within building and underground site should comply with IS 732- 1989.

10.6.3 The following wiring system are permitted in category ‘A’, ‘B’ & ‘C’ buildings subject to specific requirement given in subsequent paragraph below:-

(i) Screwed metal conduit systems enclosing PVC cables

(ii) Mineral insulated copper / aluminium covered cables

(iii) PVC insulated multi-cored wire armoured cable

(iv) Paper insulated, lead covered steel wire armoured cables

(v) Additionally an approved non-metallic conduit system enclosing PVC cables may be used in category ‘C’ buildings only; i.e. for totally enclosed standard

10.7 Conduits:-

Metal conduits are to comply with following requirements:-

10.7.1 Metal conduits may be solid drawn / ERW or butt welded and screwed and galvanized or hot zinc dipped or stove enameled. They should conform to IS: 9537 (part 1) 1980 (Re-affirmed 2015) for buildings requiring FLP installation. Welded steel screwed conduits conforming to IS: 9537(Part 2) – 1981 (Re-affirmed 2013) may be used for buildings requiring DT / TE installations.

10.7.2 Metal conduits should be screwed tight into all fittings with minimum of thread exposed and is to be visible throughout the installation. Conduit unions only are to be used. Running couplers are prohibited.

10.7.3 In category ‘A’ & ‘B’ installations, conduit boxes are to be fixed independently of the conduit and their fixing holes are to be external to the enclosure.

10.7.4 In category B installations conduit threads are to be sealed with approved material and solid backed distance saddles only are to be used. Hollow saddles with a stable inert material are considered to be solid saddles.

10.7.5 Flexible conduits should not be used in hazardous locations. However, flexible conduits obtained with the imported machinery may be permitted during the warranty period only with periodical cleaning. These are to be duly replaced by approved type after the expiry of warranty period.

10.7.6 Non-metallic conduits may be used in category C installation under the following conditions:-

(i) Rigid PVC conduit systems complying with IS: 9537 (Part III) – 1983 (Re-affirmed 2013).

(ii) Approved systems are to be of TE Pattern.

(iii) Additional protection against mechanical damage as necessary.

(iv) A separate and adequately rated earth conductor to be enclosed throughout the system.

(v) slip joints / sliding joints should be made using a suitable adhesive.

(vi) Non-metallic conduit is not suitable for communicating or alarm wiring.

10.8 Cables:-

Cables in explosive buildings should meet the following requirements:-

10.8.1 Single strand conductor cables are prohibited in all conduit systems.

10.8.2 Cables are to be PVC insulated (1100 V grade complying with IS: 694–1990).

10.8.3 Minimum cross sectional area is 1 mm^2 (for copper) and 1.5 mm^2 for aluminium conductor cables.

10.8.4 Mineral insulated copper covered cables (MICC) bare or PVC sheathed heavy duty 1100 V class conforming to IS 1554 (part I 1988) (Re 2015) may be used.

10.8.5 Only flame proof DT Unions & glands permitted for category A & B installation.

10.8.6 MICC cables are not to be directly connected to apparatus subject to oscillation or vibration.

10.8.7 Multi-core PVC insulated, wire armoured and PVC sheathed cable, complying to IS: 694–1990 (Re 2015) may be used in situations where severe conditions are likely to occur.

10.8.8 Addl. protection against mechanical damage to be provided where necessary.

10.8.9 Flexible cables can be used where cable leads terminate on the machinery, which are in motion or vibration, with suitable compression glands.

10.9 Overhead Power lines

10.9.1 O. H. lines should be located at a minimum safe distance 'D' from explosive buildings as per formula:-

D = S/2 – H;
Where, S = length of the Span.
H = Height of the line insulators on the pylon or supporting structure.

10.9.2 Electrical safe distance from the foot of an earthed pylon or earthed network is determined by the requirement that in the event of maximum short circuit current to earth, the potential above true earth appearing at the explosive area perimeter fence must not exceed 4 V.

10.9.3 Guard wires should be provided where electrical wires cross over pathways or pass close to the explosive buildings.

10.10 Control of electrical supply circuits.

10.10.1 Electrical supply to an explosive building should be controlled by one or more Master Switch / Switches outside the building.

10.10.2 The master switches, should be close to each other and should be identified.

10.10.3 These should isolate every conductor entering the building (including neutral).

10.10.4 If installed inside the building, these should conform to the category of installation.

10.10.5 If DT fittings not available FLP can be used.

10.10.6 All circuits must be protected against O/L & E/Leakage.

10.10.7 All final sub-circuit switches should completely isolate all conductors including the neutral.

10.10.8 Lighting circuits may be controlled by the switches inside the building if they conform to the categories of installations.

10.10.9 A remote control, controlling any sub-station feeder switchgear to the buildings may be considered as an alternative to the installation of a large external master switches. It should be located in a clearly visible position outside the building or underground site. It should be of a suitably protected push-button or rotary switch type with pilot lamp ON/OFF indicators.

10.10.10 Switches shall be provided within a fire proof plant room to isolate every conductor entering all areas or rooms containing explosives.

10.10.11 O/L protection may be given by Automatic circuit breakers complying with (IS-3842 (Part I)-1967 (Re 2011).

10.10.12 Electrical apparatus located in category B & C buildings containing explosives but in the immediate vicinity or in an adjacent and separate plant room separate plant room should only meet the minimum TE standard.

10.10.13 Electrical apparatus adjacent to or within immediate vicinity of category ‘A’ building should be FLP, if the hazard area extends outside the building, otherwise the apparatus is required to be of minimum TE standards.

10.11 Lighting fittings and fans.

10.11.1 These should be in accordance with category of the installation.

10.11.2 Lamps may be of filament or florescent type.

10.11.3 Use of lamps higher than approved wattage is not permitted inside the fittings.

10.11.4 Keys for access to light fittings, accessories and conduit installation should be held by incharge of maintenance of the area and should be issued only to persons authorised by him.

10.11.5 Before opening any light fitting or any part of conduit system, the supply to the circuit should be isolated.

10.12 Thermally operated cut outs.

10.12.1 Thermally operated cut out to cut off supply to the circuit should be provided on chokes, fluorescent tubes, lamp fittings liable to overheating. The cut out should be set at 100^0C for 'A' & 'B' category & 120^0 C for 'C' category buildings and should not be of auto resetting type. Chokes and other ancillaries, if located inside the buildings, should be in accordance with the category of installation.

10.12.2 Un-protected fans are not to be fitted in an explosive building. Air conditioning or forced ventilation may be used as an alternative.

10.13 Mains operated portable equipment.

Portable mains operated lights with flexible leads are not normally permitted inside the explosive buildings. Where requirement is unavoidable, it should be operated with maximum 25 V through a flexible cable screened by a copper earth screen and protected by a neoprene sheath. The supply should be taken from a double wound transformer with earth screen between primary & secondary winding or winding should be mounted on separate limbs. A separate core shall be provided in each cable and the earth continuity conductor shall be bonded at both ends. Such lights should not be used in magazines.

10.14 Battery Operated Portable Equipment.

10.14.1 Portable flood lights of an approved battery operated type may be used only in category 'C' buildings.

10.14.2 Self-contained hand or head lamps and torches may be used in explosives buildings provided they comply with the following requirements:-

a) All external parts, if constructed of aluminum alloy, shall be free from frictional sparking hazard.

b) Dry batteries are preferred but if wet batteries are used, either lead acid or alkaline, the electrolyte is to be in gel form and un-spillable. Batteries must not be changed or charged in buildings containing explosives.

c) In areas where regulations require that non-ferrous tools are to be used, hand lamps and torches must also comply with this requirement.

d) Every lamp or torch shall be type-tested by the approving/certifying authority depending on the building category.

10.14.3 Lighting systems or equipment containing batteries are not to be left unattended inside explosives buildings.

10.15 Battery Operated Vehicles and Lifting Appliances

10.15.1 Traction batteries of the lead acid type in categories 'A' and 'B' installations should have all interconnections duplicated and solidly burnt or welded to guard against the production of sparks in the event of damage.

10.15.2 Traction batteries of the alkaline type are permitted with single interconnections with all terminal nuts, fitted with a locking device, at each cell.

10.15.3 The lids of all battery containers should be lined with a non-flammable non-hygroscopic insulating material. Means are to be provided for locking the cover in the closed position.

10.15.4 The battery plug and socket shall be interlocked with a switch to prevent removal and insertion while socket contacts are live or so secured to prevent removal by unauthorized persons.

10.15.5 The flexible cable to the battery plug should be VR, PCP or PVC-insulated and served, metal screened and PCP-sheathed overall.

10.15.6 Double pole wiring should be used throughout.

10.15.7 Circuit breakers of approved type should be provided to protect the main and auxiliary power circuits.

10.15.8 Cable glands for wiring on flame-proof or dust-tight vehicles should be of the flame-proof type.

10.15.9 The metallic enclosures of all electrical equipment should be bonded to the framework of the vehicle.

10.15.10 The use of solid state electrical control is preferred. Where control resistances are fitted, they should be housed in the correct category enclosures.

10.15.11 Battery operated vehicle and lifting appliances are not permitted inside buildings where explosives are stored under Magazine conditions.

10.16 Telephone lines.

10.16.1 They should be sited beyond process inside quantity distance (PIQD) from explosives buildings.

10.16.2 O. H. line should not be nearer than 15 m from explosives buildings.

10.16.3 Wiring inside the building must be totally enclosed in conduit.

10.16.4 Telephones, bells, intercoms should be of approved category for the installation. Where FLP/DT equipments are required, any equipment certified as intrinsically safe by CMRI, Dhanbad for use in a flammable concentration of petroleum vapour can be accepted alternatively.

10.16.5 These equipments can be located on the verandah/lobby of explosives buildings.

10.16.6 Personal communication equipments (cell phones) shall not be taken into explosive buildings.

10.17 Electrical heating.

10.17.1 Only low temperature heaters (100^0 C for category 'A' & 'B' and 120^0C for category 'C') are permitted inside the explosive buildings. They should be provided with non-automatic resetting type thermal cut out.

10.17.2 They should be permanently installed. Portable heaters are not permitted.

10.17.3 Air re-circulation system is not permitted for category 'A' & 'B' buildings. If these are inescapable, flame traps should be fitted to both intake & exhaust ducts and heater banks should be such as to prevent propagation of fire and explosion into a building.

10.18 Close circuit TV systems.

10.18.1 The equipment should be of approved design.

10.18.2 Camera should be mounted externally to the explosive area with a window provided for viewing the area required.

10.18.3 If camera is to be sited inside a building, it should comply with appropriate enclosure or should be pressurised or continuously purged with a clean air giving a small +ve pressure of 3-6 kPa (0.4-0.8 PSI).

10.18.4 Monitors, controls & ancillary equipment are to be sited outside the explosives buildings.

10.19 Electrical / Electronic Balances.

10.19.1 The display unit and power supply should be housed in FLP / DT enclosures.

10.19.2 All power supplies should be routed through approved type of zener barrier device.

10.19.3 All zener barriers should be earthed at a point.

10.20 Lightning protections.

10.20.1 It should be provided on all buildings containing explosives not exceeding 250 Kg for permanent storage and exceeding 500 Kg for temporary storages.

10.20.2 It should be in accordance with IS:3209-1989 and MOD letter no. 95327/STEC/RD-20/III/217/D(R&D) dt: 06-01-1971, as amended from time to time, shall be followed.

10.20.3 Suspended air termination network gives maximum protection.

10.20.4 30 degree zone of protection should be used for buildings with high risk.

10.20.5 A Spacing of 3 m from horizontal conductors for high risk buildings is necessary otherwise it may be up to 10 m.

10.20.6 Earth termination should be inter-connected by a ring conductor preferably buried.

10.20.7 For bonding of structural metal, metal ventilators, metal fittings, services, rails for cranes etc., these should be connected solidly to the nearest down earth conductors or roof taps. For further details latest STEC pamphlet No. 07 (2017) may be followed.

10.21 Earthing.

10.21.1 Three type of earthing systems are required viz; lightning protection, power-light circuits and static earthing, which are provided to an explosives building. These electrical systems are provided with individual systems of earthing. Common grounding is always desirable as it would equalize the various groundings to minimise the possibilities of a side flash from one grounding system to another.

10.21.2 The metallic sheath and armour of main supply cables, metallic pipes (compressed air, steam), rails or guides entering the building will be

bonded to the earthing system at the point of entry or exit outside the structure of building and will also be earthed at 75 m away from the building.

10.21.3 Earthing of AC supply system shall conform to the following:-

(i) Any supply system (exceeding 125V and up to 650V) shall have a point of the system connected with earth.

(ii) The connection shall be made at the generating station or substation and transformer and the insulation of the system shall be maintained throughout all other parts.

(iii) The connection shall always be maintained except when it is interrupted by a switch or link for the purpose of testing or locating a fault.

(iv) No resistance, impedance, fuse or circuit breaker shall be inserted in the earth connection.

(v) The current passing to earth shall be measured and recorded quarterly.

(vi) The point to be connected to earth will generally be the neutral point of a star connected system. System in which the voltage does not exceed 125 V need not be earthed.

10.21.4 In buildings and structures containing explosives and specially those having conducting / anti-static floors; earth leakage systems (voltage or current operated) should be provided.

10.21.5 Earth leakage circuit breaker (ELCB) with current operated core balance relays with a sensitivity of 20/25 mA operating in less than 50 milli seconds time are suitable for explosive buildings.

10.21.6 With installations having conducting or anti-static floors, earth leakage relays with a sensitivity as high as 1.25mA to 5 mA operating at less than 100 milli seconds have been found successful.

10.21.7 Where direct isolation of particular circuit may be hazardous, undesirable or impracticable, the earth leakage relay can be arranged to give a warning only that hazardous condition has developed.

10.22 Static Electricity

Adequate precautions must be taken to prevent the accumulation of static electrical charges. Thorough bonding must be carried out in order to earth all anti-static and conducting materials and all plants and equipment. Where drive or conveyor belts are fitted they are to be of a

material of sufficient conductivity to assist in draining away static charges.

10.23 Static earthing permissible resistance.

10.23.1 The basic difference between conducting and anti-static flooring is in its electric resistivity and the requirements are:-

(A) For Conducting Floor:-
Resistance of floor surface to earth must not exceed **50 kΩ.**

(B) Antistatic floor:–
Resistance of floor surface to earth must be between **50 kΩ** and **2000 kΩ**.

10.23.2 Personal resistance of an individual wearing conductive foot wear on any conducting flooring to earth shall not exceed **1000 k Ω**.

10.23.3 The total resistance of a person wearing anti-static foot wear on an anti-static floor should not exceed **10,000 kΩ**.

10.24 Periodical inspection & testing of installations.

10.24.1 Inspect installation for signs of mechanical failure such as, corrosion of conduit & conduit fittings, apparatus or damaged components due to overheating.

10.24.2 All terminals of flexible cables should be examined for tightness and signs of strand breakage.

10.24.3 Conducting and anti-static floors should be examined for excessive wear or mechanical damage.

10.24.4 Lightening protection installation should be inspected and all clamps, bonds and joints in the conductor should be examined for tightness or signs of corrosion. Conductors should be examined for mechanical damage and security of fixing.

10.25 Safety equipment for testing.

Tests should be done with prior permission of the Head of the establishment and the Safety Officer authorized to act on behalf of the head of the establishment has first checked that it is safe for testing. The Safety officer will remain present at the test place throughout the test, to ensure that adequate safety precautions are taken.

CHAPTER – XI

ELECTRICAL FIRE

11.0 CAUSES OF ELECTRIC FIRES:-

Electrical fires may be caused by one or more of the following reasons:-

(a) Loose connection / high contact resistance at joints.

(b) Overload in the electrical installation.

(c) Inadequate ventilation.

(d) Sparking / Arcing / Flashing.

(e) Blowing out of fuses under severe fault condition.

(f) Faulty equipment.

(g) Operation of the equipment under fault condition.

(h) Insulation failure causing short circuits or earthing.

(i) Fire in the building / installation due to other reasons causing electrical fault.

(j) Operation of any electrical equipment (not adequately protected) in an atmosphere of inflammable liquid / vapour, explosive dust or easily fire catching material.

(k) Heating up of oil, formation of gas in any oil-filled equipment such as OCBs and transformers. However, OFB vide letter No. 411/CEI/COS, Dated:- 19/10/16, 3/7/17 and 25/4/18 has directed to replace the existing OCBs with ACBs/VCBs. This should be strictly followed i.e. all OCBs are to be replaced with oil-less equipments.

(l) Non usage of appropriate type of electrical equipment in hazardous atmosphere.

(m) Miscellaneous causes like lightning etc.

11.1 GENERAL FIRE SAFETY PROVISIONS:-

11.1.1 Provisions of IS 3034-1993, ISCP 2190-1992, Petroleum Rules 1976, IS 1646-1997, different CEA Regulations etc. will apply to electrical installations to the extent relevant to Ordnance Factory installations.

11.1.2 Storage of fuel oil within 10.0 m of any building shall not be permitted unless the facing wall is a blank wall of brick or concrete of at least 25.0 cm thickness. If the facing wall has any door, or other openings,

storage of oil drums within 10.0 m of the building shall be allowed only if:-

(a) the storage area is ringed off by a dwarf wall of sufficient height to contain the entire contents of the drums stored within the storage area.

(b) No drum is stored within 3.0 m of doorways which shall be fitted with fire proof door.

(c) All other openings are protected either by wired glass or fire proof shutter or a drencher system.

11.1.3 Storage of drums of other flammable liquids having a flash point below 65.5^0C shall also be subject to the above requirements barring that the prohibitory distance shall be taken as 15.0 m instead of 10.0 m.

11.1.4 Coal shall not be stacked within 6.0 m of any building in open storage sites or boiler houses. The separating distance between coal stack and fuel oil storage shall not be less than 15.0 m.

11.1.5 At least one worker/staff trained in use of fire-fighting equipments shall be made available in all shift duties at all production sections. At least half strength of the EM section shall be trained for use of fire-fighting equipments and At least one EM worker/staff trained in use of fire-fighting equipments and providing first-aid shall be made available at all manned substations, generating stations, EM maintenance groups.

11.1.6 First aid fire appliances as per scales detailed in Annexure-A shall be made available for all electrical installation.

11.2 Fire Safety Provisions For Inflammable Liquids:-

11.2.1 Gasoline, Benzene, ether, alcohol and similar flammable cleaning fluids shall not be used on an energised electrical apparatus.

11.2.2 Flammable solvents mentioned above shall not be used in the vicinity of electrical equipment from which spark may be received.

11.2.3 Every electrical equipment shall be kept absolutely free of deposits of oil, grease, carbon dust etc.

11.3 Fire safety precautions for switchgears, circuit breakers, bus-bars:-

11.3.1 Every supply system shall be divided into suitable sections interconnected by circuit breakers and each section shall be separated from the adjacent section by fire resisting partition.

11.3.2 Control of operating bus-bars which run near electrically operated switches shall be protected from the effect of fire and short circuit either by screening or by effective partition with each other. Fuses for branch circuits to individual switches shall be in the screened or protected areas and not near the switches themselves since damage at the fuses may bring a fault on the control bus-bars.

11.3.3 There shall be no leakage of oil permitted from any oil containing apparatus.

11.4 Fire safety precautions for Cables:-

11.4.1 Where cables pass through a switch room floor into a basement or cable tunnel adequate precautions shall be taken to prevent:-

a) The draining of oil from the switch room into the basement or tunnel.

b) Slipping of burnt cables into the basement or tunnel.

11.4.2 In addition to the usual cable clamps above floor level, cables shall also be clamped immediately below floor level. Each cable or group shall (where possible) be protected by a metallic conduit pipe or frame of heat resisting material rising to a height of at least 45.0 cm above floor level or terminating just below cable gland sealed at the bottom and filled with sand or small pebbles.

11.4.3 Where cables rest on the floor of tunnels or basements they shall be separated into groups by vertical barriers of tile, brick or concrete and the trenches so formed shall be filled with small pebbles. Alternatively the cables may be separately clamped and each cable run shall be separated by a minimum clear space of 75.0 mm.

11.4.4 Cables shall not be routed near hot steam pipe, hot gas ducts. Wherever it is unavoidable, fire proof cables shall be used.

11.4.5 Power & control cables shall run separately.

11.4.6 No joint shall be permitted in a cable trench located inside a building.

11.4.7 Cable trenches shall be kept clean or filled with sand and covered. Oil, water shall not be allowed to go inside a cable trench. Cotton waste, shop products, waste materials, shop sweepings shall not be thrown into the cable trenches.

11.4.8 In the basement,

(a) The cables to primary side and secondary side shall have sealing at all floors and wall opening of at least two hours fire rating, and

(b) Fire Retardant Low Smoke (FRLS) cable of two hours rating shall be used.

[subsection (f) of the CEA Reg. 44{2(x)}]

11.5 Fire safety for electrical equipment containing oil:-

11.5.1 Any apparatus having more than 2000 liters of oil shall not be located in the basement where proper oil draining arrangement cannot be provided.

11.5.2 Where any apparatus having more than 2000 liters of oil is installed, whether indoor or outdoor, the baffle wall of four hours fire rating shall be provided between the apparatus, where adequate clearance between the units is not available.

11.5.3 Provisions shall be made for suitable oil soak pit and where use of more than 9000 liters of oil in any oil tank, receptacle or chamber is involved, provision shall be made for the draining away of any oil which may leak and special precautions shall be taken to prevent the spread of any fire resulting from the ignition of the oil. Adequate provision shall be made for extinguishing any fire which may occur.

11.5.4 Spare oil shall not be stored in the vicinity of any oil filled equipment in any such sub-station or switching station.

11.5.5 All the transformers and switchgears shall be maintained in accordance with the maintenance schedules prepared in accordance with the relevant codes of practice of BIS.

11.5.6 Dry type of transformers only shall be used for installations inside the residential and commercial buildings;

11.5.7 It shall be ensured that the transformers of 10 MVA and above rating or in case of oil filled transformers with oil capacity of more than 2000 liters are provided with fire-fighting system as per IS – 3034:1993 or with Nitrogen Injection Fire Protection system.

[CEA Reg. 44{2(vi) to 2(ix)}]

11.5.8 Provision of chapter V will also apply to the extent relevant.

11.6 Fire safety for Batteries:-

11.6.1 All batteries shall be stored/placed/charged in separate rooms i.e. away from MG. sets, converters or rectifiers and their switches / control gear etc.

11.6.2 Batteries and all its accessories shall be stored/placed/charged in a place free from dust, direct sun light and moisture and the place shall be well ventilated.

11.6.3 The batteries shall stand vertically on durable non-ignitable, non-absorbent and non-conducting material such as glass, porcelain or glazed earthen ware. If constructed of wood, it shall be slotted and treated with anti-sulphuric acid chemical.

11.6.4 The batteries shall be so arranged on the bench that a potential difference exceeding 12 volts shall not exist between adjoining cell terminals.

11.6.5 All combustible materials within 60 cm horizontal and 2.0 m vertical distance of a battery shall be protected by asbestos sheets.

11.6.6 Body of all battery charging units shall be of durable, non-ignitable and non-absorbent material. This along with rectifiers, transformers shall be on a bench which shall be kept dry and insulated from earth.

11.6.7 All permanent wiring shall be securely tied and protected against mechanical injury and efficient means shall be used for charger terminal connections with battery terminals.

11.6.8 As far as possible Sealed Maintenance Free (SMF) batteries shall be preferred.

11.7 Scale of Sand buckets:-

11.7.1 Fire buckets filled with clean dry sand and ready for immediate use for extinguishing fire in addition to fire extinguishers suitable for dealing with fires, shall be conspicuously marked and kept in all generating stations, enclosed sub-stations and switching stations in convenient location.

11.7.2 The Fire extinguishers shall be tested for satisfactory operation as per relevant Indian Standard at least once a year and record of such tests shall be maintained.
{CEA Reg. 27(1) & 27(2)}

11.7.3 Water and foam type fire-extinguishers shall not be used on electric fires. However, where combined electrical and flammable oil risks are present, dry powder extinguishers may be provided and used. Where

the machinery, switches and control gears of enclosed type are installed or used; CO_2 or ABC type fire-extinguishers shall be provided and used.

11.8 House-keeping to avoid Fire:-

11.8.1 The area around electrical installation should be kept absolutely clean and free from dust.

11.8.2 Grass and undergrowth shall be removed or cut short whenever required.

11.8.3 No waste material should be allowed to accumulate in the yard or below overhead line.

11.8.4 Wherever practicable, work involving cleaning by flammable solvents should be carried at outdoors.

11.9 Control of electrical fire:-

11.9.1 Isolate the affected part, transformer, switchgears or apparatus electrically.

11.9.2 Contact nearest fire brigade for help immediately. Simultaneously sand buckets and fire extinguishers should also be used to control the fire.

11.9.3 Take all necessary steps to prevent the spread of fire.

11.9.4 Follow regulations / directives issued by CFEES /STEC of Ministry of Defence in regard to buildings dealing with explosives or inflammable dust / vapour.

11.10 Safety while using fire extinguishers / fire-fighting appliances:-

11.10.1 Fire-extinguishers, which are not insulated, shall never be employed in fighting fires on or near exposed live conductors. Only such fire extinguishers shall be used on electrical mains and apparatus which are marked as suitable for the purpose. When using fire hose, it shall be ensured that the jet of water does not come in contact with live conductors or live parts of the apparatus.

11.10.2 It is dangerous to throw a stream of water, a wet blanket or a stream from ordinary soda-acid type extinguishers on live mains or apparatus. When found necessary to use them, make all the neighbouring mains or apparatus dead. Carbon dioxide, carbon tetrachloride and other special type of extinguishers, sand or dry blanket may be used on live conductors and apparatus.

11.11 Fire prevention:-

11.11.1 Precautions mentioned below are required to be followed for prevention of fire:-

(a) Do not keep spare oil in Substation or switching station.

(b) Do not keep any inflammable articles or article which can catch fire readily near and below fuse boxes, distribution boards, power control switches, circuit breakers and electrical apparatus.

(c) Keep the space below the poles supporting TPMOs / AB switches, D.O. fuses and surge absorbers free from wild-growth.

11.11.2 New substations, generating stations, distributing stations shall conform to IS-3034:1993 (code of practice for fire safety in industrial buildings and distributing station). These provisions shall be implemented in existing substations as early as possible during the course of normal maintenance or during future expansions / modifications / alterations etc.

11.11.3 The above measures shall be taken in addition to other fire preventive arrangements provided for quenching the fire in the apparatus.

11.11.4 Control switchgears shall not be located close to the transformers and any oil filled apparatus. They shall be easily approachable when the transformer or apparatus is on fire.

11.11.5 Cable boxes shall not be fixed between the OCBs (If any), unless the space between them is large enough to prevent damage to working OCB if there is fault in the cable box or another OCB.

11.11.6 Following steps may help in maintaining trouble free functioning and minimizing accident and fire risk:-

(i) Good workmanship, tight connection, proper insulation, use of good quality materials.

(ii) Proper grading of fuses and protective devices and relays.

(iii) Periodical checks regarding proper functioning of protective devices and relays and tripping devices.

(iv) Use of apparatus and cable of proper rating and periodical checks to ensure that they are not over-loaded.

(v) Look out for abnormal temperature / sound / behaviour in any part of the installation and apparatus.

(vi) Check the apparatus periodically (As per manufacturers' operation and maintenance schedule) during its functioning.

(vii) Use of proper protective type of fittings and wiring as approved by STEC and other safety instructions.

(viii) Chemical / explosive filling factories carry out checks on earth resistance, static earthing and personal resistance etc. as prescribed.

(ix) Always use approved clothing for explosive buildings.

(x) Protection of electrical fixtures from entry of water or chemical dust by leakage or seepage or any other cause.

(xi) Steps recommended by the manufacturers or gathered by experience / long association with the apparatus.

(xii) Compliance with the CEA Regulations, code of practices by BIS and other regulations regarding erection, maintenance and operation of electrical installations.

(xiii) *Electrical appliances installed in the respective offices must be switched off when room is not occupied, to avoid fire accident.* {OFB letter No. 001/FB/COS, Dtd:- 08/08/2018}

(xiv) Factories have to ensure statutory compliance including CEA Regulations, Rules of Central/State government and this SI in such a way to avoid any risk to the installation and personnel. {OFB letter No. 411/CEI/COS, Dtd:- 03/07/2017}

(xv) The individuals working in HT maintenance and having knowledge and experience in the field, need not be shifted to other areas frequently. {OFB letter No. 411/CEI/COS, Dtd:- 05/10/2016}

11.12 Directives for investigations of cases of Electrical fire:-

11.12.1 All cases of electrical fire involving damages to electrical installation (including wiring), electrical/electronic equipments (transformers, switchgears and electrically/electronically controlled machinery) shall be reported to the REI concerned and COS/OFB in the prescribed **Proforma 15** within **48 hours** after the information of the occurrence of the fire due to electricity.**{Section 161 of Elect. Act' 2003 & Intimation of accidents Rules' 2004}** *However, in the event of any accident appearing in the print and electronic media, the General Manager of the concerned factory shall immediately prepare a status report on the subject and send it for information to DDP through OFB/NDO. Ordnance factories should intimate on a real time basis any important/news/event/accident to OFB for cognizance. The General Manager ought to take personal attention in this regard. {OFB letter No. 03/Press/ICE (PR), Dtd:- 08/03/2018}*

11.12.2 An investigation by a Senior electrically qualified officer or a BoE with at least one electrically qualified officer (depending upon the nature and extent of damage) should be ordered by the GM of the factory immediately after the fire with terms of reference as indicated in **Annexure 'B'** and the proceedings and findings forwarded with remarks of GM to the Regional Controller of Safety and COS/OFB to reach them within 30 days of the occurrence of the fire.

11.12.3 Immediately after the occurrence of any fire the Electrical Safety Officer will visit the fire spot and shall,

(a) make his own assessment about the fire incident:-

(i) whether it is a case of electrical fire.

(ii) If so, whether it is a minor or major fire.

(b) If fire is looking major / serious, then he shall,

(i) study the circumstances leading to the fire / spread of fire.

(ii) note down violations of CEA Regulations, STEC recommendations, standards specified by BIS and/or recommendations contained in these DGOF Standing Instructions or any other safety directive issued by the Central Government/State Government or COS/OFB.

(iii) advise the factory to preserve evidence considered necessary to assist the investigating team / Board of Enquiry / REI/RCS and COS/OFB in arriving at conclusions and recommend to the factory to take photographs of the damaged equipment or installation where damage of very serious nature is involved.

(iv) assist the Board of Enquiry, investigation team, REI, RCS and COS/OFB in their investigation.

11.12.4 The REI concerned will visit the fire spot within fifteen (15) days of the occurrence of fire, make his own assessment on the circumstances leading to the accident; violation of CEA Regulations, Safety Code of Practice and these DGOF Standing Instructions and/or any other safety directive issued by the Central Government/State Government or COS/OFB and shall forward immediately his preliminary report through RCS to the COS/OFB, with a copy to GM of the factory.

11.12.5 The investigation / findings of BoE with remarks of GM sent by the factory to RCS will be examined by REI and his independent views and

remarks communicated to RCS shall be forwarded to COS/OFB (with copy to factory) within 45 days of the occurrence of fire.

11.12.6 The COS/OFB shall examine the report forwarded by RCS and prepare a consolidated report and shall forward it to DDG/Engineering or Member/TS (depending upon the extent of damage), covering the following:-

(i) Circumstances leading to the accident;

(ii) Extent of damage;

(iii) Causes of fire,

(iv) Details of violation of CEA Regulation/Regulations or Electric Safety Codes / Directives involved.

(v) Whether any disciplinary action against any person or persons is called for on grounds of negligence of duty or violation of safety code of instructions in this regard.

(vi) Remedial measures to minimise recurrence of such fires.

11.12.7 The decisions of DDG/Engineering or Member/TS (depending upon the seriousness of the damage) will be communicated to the factory for implementation with a copy to the RCS.

11.12.8 The above is in addition to normal reports / action required to be taken to satisfy audit and administrative authorities.

CHAPTER XII

ELECTRICAL ACCIDENTS

12.0 Most of the accidents are generally caused due to non-adherence to the safety regulations/norms. Extreme care should therefore be taken while working on electrical apparatus / installation particularly on live mains or apparatus or in its close proximity. Conduction of all tests as per the recommendations of the manufacturer of an equipment or an apparatus may eliminate most of the electrical accidents as well as fire cases. Compliance of the directives given in CEA Regulations, this SI and other directives issued from time to time by COS/OFB and other agencies shall also help in maintaining accident free and fire free working.

12.1 Electrical accidents can be of one or more of the following types:-

i) Electrical shock due to leakage of electricity.

ii) Injuries due to fall, stumbling etc.

iii) Electric burns due to flash over.

12.2 First Aid:-

12.2.1 A first aid box containing first aid medicines and equipment or cupboards conspicuously marked and equipped with such contents as the Central / State Government ***(under the Factory Act'1948)*** or as per the specifications mentioned in relevant IS, shall be provided and maintained in every generating station, enclosed sub-station, enclosed switching station and in vehicles used for maintenance of lines so as to be readily accessible during all working hours. A periodical check shall be made of the content of the first aid box. Any deficiencies shall be immediately made up. **{CEA Reg. 27(3)}**

12.2.2 All such boxes and cupboards shall be kept in charge of responsible persons (except, in the case of unattended sub-stations and switching stations); who are trained in first aid treatment and artificial respiration techniques and one of such persons shall be available during working hours. **{CEA Reg. 27(3)}**

12.2.3 The group in-charge concerned should also conduct drills in artificial respiration and in the rendering of first aid on half yearly basis. Lectures with practical demonstration should also be arranged once every year by the Medical Officers of hospital on different methods of artificial respiration, their usage under different circumstances etc.

12.2.4 Stretchers shall also be kept in all important electrical installations.

12.3 Important instructions for dealing with accidents:-

12.3.1 General Instructions:-

(a) Remove the patient from source of injury i.e. electric conductor, apparatus, equipment or moving machinery etc.

(b) If the clothes are smouldering, extinguish the sparks. Where breathing has stopped begin artificial respiration without delay.

(c) Keep the injured person lying down in a comfortable position with his hand level with his body until you know that the injury is not serious. This is a preventive action against fainting. Raise the patient's head if his face is flushed. If he vomits, turn his head to one side to prevent choking of respiratory path, otherwise keep him lying down with his head level. Protect him from unnecessary manipulations and disturbance. Do not pick him up by head and heels.

12.3.2 Keep the patient warm and reassure him. Do not over heat the patient. If the weather is cool, it is important to wrap the patient underneath as well as cover him.

12.3.3 Give immediate first aid in case of severe bleeding, stoppage of breathing, loss of heart beat and poisoning.

12.3.4 Look for other hidden wounds, bone fractures, hemorrhage, burns or dislocations. Be sure you find all injuries, minor as well as major. In case of a doubt about a body part, keep it free from twisting, bending and shaking. Rip open the clothes to look for the wounds. Taking them off in the usual way causes unnecessary suffering and aggravates the injuries. If the person is conscious, let him guide you to serve injuries. Pain is an important indication of any injury. If there is any doubt about the injury always treat it as a fracture.

12.3.5 Keep calm and do not hurry unnecessarily regarding moving the injured person, unless it is absolutely necessary and until you have a clear idea of the nature and extent of his injuries and have given first aid. Do not let the patient see his own injuries.

12.3.6 If, only one man is at site no attempt shall be made by him to go to the doctor leaving the injured person unattended. He shall make a call to a doctor of factory dispensary / hospital. In case several persons are injured in any accident, the First Aider should survey the entire

situation quickly and determine which of the victims have injuries that require immediate attention.

12.3.7 Arrange for a suitable transport to move the victim to a doctor, factory dispensary or hospital. Do not hurry, unless necessary. Three persons are normally necessary to place the victims on a stretcher; one will lift his head and shoulders, another will lift his hips and the third his legs. While doing so the stretcher shall be placed alongside the victim and the helpers shall kneel on one knee at the side of the victim away from the stretcher and simultaneously lift him into the same.

12.3.8 No attempt shall be made to administer any drink or stimulant through mouth when the patient is either unconscious or sleeping. However, if victim is cautious, he may be given some stimulants such as hot drinks of coffee or tea etc. If he recovers before the arrival of the doctor keep him warm and boost his moral.

12.3.9 After recovery the patient must not be allowed to strain himself in any way. The ordinary and general tests of death, particularly in case of electric shock, shall never be adopted without subsequent confirmation by a doctor.

12.4 First aid for electrical accidents:-

12.4.1 If the person is still in contact with the live conductor, appliance, apparatus or equipment, switch off the electric circuit at once.

12.4.2 If it is not possible to switch off the circuit quickly, no time should be lost in removing the body from contact with the live conductor with the help of any wooden stick or any other non-conducting means. Never touch the victim directly without insulating yourself or without making the conductor, appliance, apparatus or equipment electrically dead. Rubber gloves should be worn. If rubber gloves are not available, chair or table made of Wood or plastic may be used as insulation base. In no case, the victim’s body should be touched with bare hands. The victim may be pulled off from the live conductor by his coat, shirt etc. if they are not wet or with any other dry cloth or even dry newspaper folded into 3 or more folds may be used. Wooden rods or broom handle may also be used to raise the body or to detach victim from the live conductor.

12.4.3 A good plan is to stand on a dry board or stool or a few layers of thick newspaper bundles or even dry sacking and remove the victim from the live conductor. If the patient is in contact with an apparatus working at voltage 650 V and exceeding, he should be handled only after ensuring

that the line is made dead or piece of perfectly dry wood or rope should be used. Make sure to have at least 1.0 m length of wood or rope between the hands and the victim or any live conductor, appliance, apparatus or equipment.

12.4.4 If the patient's clothes are smoldering, the sparks should first be extinguished. The doctor should be immediately called for and in case the breathing is stopped, immediate action as given below should be taken.

12.4.5 Immediate action to recover patient:-

(a) When a man has received a severe electric shock his breathing usually stops. In accidents of this kind, speed may save the injured person's life. Hence, no time should be wasted in sending for a doctor but the patient should not be neglected during this period.

(b) The patient should not be placed in such a position which may bring pressure on the burns he may have sustained. He should also not be exposed to cold. Stimulants should not be administered unless recommended by a doctor. Cold water may be given in small quantities. In cases of electric fire or asphyxia smelling salts may also be administered in moderation.

(c) Artificial respiration without interruption, until natural breathing is restored, should be continued. Cases are on record of success after about 3 to 4 hours effort and even more.

(d) Resuscitation should be carried on at the nearest possible place of accident. The patient should not be removed from the place until it is found that the person is breathing normally, and then also should be moved only in a lying position. If it be necessary due to extreme weather conditions or other reasons to remove the patient before he is breathing normally, he should be kept in a prone position, and placed on a hard surface or on the floor of the conveyance. Resuscitation process shall be continued during the time victim is being moved.

(e) Artificial respiration, when taken recourse to, shall be continued until the patient recovers or the breathing is restored or the "Rigor Mortis" sets in or the doctors pronounce the patient is dead. There is a great danger of prematurely ceasing resuscitation process. Cases found, where breathing has been re-established even after eight (8) hours or more of resuscitation in case of electric shock and gas asphyxiation.

(f) A brief return of spontaneous respiration is not a certain indication for terminating the treatment. Not infrequently, the patient, after a temporary recovery of respiration, stops breathing again. The patient should be watched and if normal breathing stops, artificial respiration should be resumed at once.

(g) When the patient revives, he should be kept lying down and not allowed to get up or be raised under any circumstances without the advice of a doctor. If the doctor has not arrived by the time the patient has revived, he should be given some stimulant, such as hot tea or coffee or a drink of hot ginger or coffee. The patient should then have any other injuries attended to and be kept warm being placed in the most comfortable position.

12.4.6 First aid treatment should be given to all the burns.

12.5 Reporting of the Accident:-

12.5.1 Any electrical accident which occurs while generation, transmission, supply or use of energy or in connection with any part of electric supply lines or other works of any person and the accident results or likely to have resulted in loss of human or animal life or in any injury to a human being or an animal, shall be reported to the COS/OFB and REI/RCS in the**Proforma 16**.

{Pro-forma-16 as per the Intimation of Accidents (Form and Time of Service of Notice) Rules' 2004}

12.5.2 All accidents whether minor or major, fatal or non-fatal including slight injuries, where the injured person is even capable of performing his duties should be reported immediately to ESO.

12.5.3 The HOS/EM or in his absence the Divisional Officer of electrical maintenance section is responsible for sending the accident report as per **Proforma 16**. They will be held responsible personally for non-reporting or any delay in reporting the accident.

12.5.4 The following reports are required to be sent to the persons / offices within the period as indicated against each:-

(A) Accidents not involving loss of human life:-

COS/OFB, RCS and Regional Electrical Inspector	Within 48 hours of the information of the occurrence of accident in the **Proforma 16.**

(B) Accidents involving loss of human life:-

(a)	Chairman/OFB, Operating Member,	Telephonic message, followed by FAX / MAIL immediately after the occurrence but prior to

	Member/TS, RCS and COS/OFB	intimating Secretary/DP & OFBNDO.
(b)	Secretary/DP with copy to OFBNDO 'G' Block	Immediately after informing OFB authorities mentioned at (a) above.
(c)	Reports to other Government Departments such as, Police, District Magistrate, Factory inspector.	As specified under factories act under rules / laws / instructions of the State / Central government or departmental instructions & procedure.
(d)	COS/OFB, RCS & REI	Telegraphic/Telephonic Report within 24 hours of the knowledge of the occurrence of the fatal accident and a report in writing in **Proforma-16** within 48 hours of the knowledge of occurrence of the fataland all other accidents.

12.5.5 The report of the accident given to the COS/OFB, RCS & REI does not absolve the factory of its responsibility to give notice / information to the prescribed authorities under section 88 of the factory Act' 1948 or any other rules or act formed by the Central / State government or departmental instructions & procedures.

12.5.6 Submission of the report of Electrical Accident to the COS/OFB, RCS & REI is of vital importance as the claim for compensation by the affected person is governed by this report.

12.6 Investigation and follow ups after Electrical accident:-

12.6.1 All electrical accidents shall be thoroughly investigated. For this purpose all efforts shall be made to preserve all available evidences till seen by the investigating officer, enquiry officer, REI and Electrical Safety Officer. In case of serious electrical accidents, evidences shall not be destroyed till these are seen at least by the Enquiry officer, Board of Enquiry and ESO and Photographs of these evidences are also to be taken for further course of action.

12.6.2 Accidents of minor nature shall be investigated by an officer of the factory, preferably electrically qualified. His findings shall be forwarded to the COS/OFB, OF Headquarter concerned and REI/RCS.

12.6.3 Accidents of serious nature and those involving loss of animal life shall be investigated by a Board of Enquiry appointed by the General Manager. The fact that an animal only has lost its life does not mitigate the seriousness of the accident for it could have been a human being also.

12.6.4 Accident involving loss of human life shall be investigated by a Board of enquiry constituted by GM or Ordnance Factory Board. The BoE shall consist of:-

(I) The REI concerned or in his absence Regional Electrical Inspector of any other RCS as directed by OFB.

(II) A Senior Officer (electrically qualified) of the factory or another sister factory (in case of non-availability of an electrically qualified officer in the factory).

(III) Any other officer / persons as GM may consider fit.

12.6.5 REI shall not be included in any Board of Enquiry of electric accident not involving loss of human life.

12.6.6 A model list of general terms of reference suggested for the board of enquiry is given below as a guideline. However, this can be amended and altered to suit the actual requirement:-

1) The circumstances leading to the accident.

2) Causes of the accident.

3) Extent of damage to the person/persons, equipment and / or installation.

4) Whether the individual affected (victim) was authorised to be present at the place of work.

5) Whether the individual was competent to execute the work given to him.

6) Details of instructions (Departmental / DGOF SI or STEC) to ensure safety of the persons, which have been violated.

7) Details of violation of any of the provisions of the CEA Regulations.

8) Whether the accident is due to the act of negligence on the part of any of the employee / employees, if so, give details.

9) Whether the individual was under the influence of any drugs or alcoholic drinks.

10) Remedial measures / recommendations to prevent recurrence of such accidents in future.

11) Any other factors which are considered necessary to be investigated (depending upon the case).

12.6.7 Findings of Board of Enquiry along with GMs approval / remarks shall be sent to the COS/OFB with a copy to RCS & REI. Copies of all communications pertaining to cases of accidents involving loss of

human life, long hospitalisation or payment of compensations etc. shall also be intimated to Section A/A of OFB.

12.6.8 The General Manager may also initiate disciplinary action against the individual / individuals, if any serious lapses in compliance with the CEA Regulations or OFB Standing Instructions on Electrical Safety noticed during the preliminary investigations or brought out by the Board of Enquiry. Intimation of such disciplinary action shall also be given to OFB.

12.6.9 Electrical Safety Officer shall visit the accident spot and note the evidences available for information of the REI and shall guide the factory in taking photographs of the portions of the evidences which cannot be preserved for a long time in the interest of restoring power supply in the area or continuity of production. He will also assist the Board of Enquiry in investigation of the accident.

12.6.10 **Action by Regional Electrical Inspector:-**

(A) On receipt of intimation of the accident he shall visit the factory immediately in case of accident involving loss of human life, in case of serious accident within 5 days, and within 15 days in case of other accidents.

(B) If he is unable to reach the place of accident (in the case of fatal accident), he shall intimate RCS and OF Board on telephone or by Fax seeking their advice / instructions.

(C) He will submit findings of his preliminary investigation to the RCS and OF Board (COS/OFB) covering the following points:-

a) Circumstances leading to the accident.

b) Cause of accident.

c) Extent to which the installations did not comply with the CEA Regulations, OFB SI regarding electrical safety & other safety rules and regulations.

d) Remedial measures to avoid reoccurrence of such type of accident in future.

12.6.11 A copy of the findings of investigation / BoE done by the factory, will be forwarded to REI.

12.6.12 He will examine the findings / proceedings conducted by the concerned factory's investigation team / BoE and shall give his own views in the matter and submit it to the RCS who will forward it to COS/OFB with his remarks.

12.6.13 In case of accidents involving loss of human life, he will be directed by RD/RCS or COS/OFB and will participate in the BoE.

12.6.14 He will also carry out such further investigation as directed by RD/RCS, COS/OFB.

12.7 Time schedule for submission of findings:-

S. No.	Action	Accident Involving Loss of Human Life.	Accident Involving Serious Injury.	Other Accidents.
1.	Visit forpreliminary investigation and submission of report by REI.	Immediate	5 days	15 days
2.	Submission of findings by the factory.	At the earliest but not more than 3 days.	Within 7 days from the date of constituting Board of Enquiry	Within 15 days from the date of ordering investigation/ BoE.

12.8 **Action by COS/OFB**:- After receipt of all papers pertaining to the accident, COS/OFB shall scrutinise them and forward his views on the accidents, violation of the CEA Regulations, the findings of the board of enquiry, remedial measures etc. to Member/TS and to the DGOF for approval. After approval of DGOF, these will be communicated to the factory for necessary follow up action and implementation.

12.9 The status / progress of implementation of the remedial measures and any other action as advised by OFB shall be intimated by the factory toCOS(OFB) with copy to the RCS and Regional Electrical Inspector.

12.10 A record of all electrical accidents and their follow up action shall be maintained by the factory in **Proforma-17** and shall be shown to COS/OFB, RCS and Regional Electrical Inspector during their visit to the factory.

CHAPTER XIII

RECORDS AND THEIR UPKEEP

13.1 The following documents, registers and files shall be maintained and kept readily available in the factory by EM section for reference / inspection as and when required by any agency i.e. ESO, REI/RCS or COS:-

(a) Schematic diagram of the power supply system in the factory and factory estate (if any).

(b) Schematic diagrams of all Receiving Stations, Sub-stations, switching stations & generating stations (indicating ratings of the various equipments, VCBs, ACBs, MCCBs, sizes of cables etc.).

(c) A dimensional drawing of each substation showing location of equipments, clearance from the walls and other equipment in the substation building.

(d) The routes of various overhead lines, cables, distribution points, location of joints, tapping points of power for each building, type & size of the overhead conductors / cables shall also be shown on a key plan. On this plan other civil works such as water / drainage / sewage lines should also be shown as far as possible.

(e) Internal wiring diagram (if made available by supplier) of switchgears, transformers, apparatus, instruments and machinery.

(f) Operation and maintenance manual/instructions issued by the manufacturers for the electrical machinery and equipment installed in the factory.

(g) Detailed technical literature of various machines & equipments.

(h) Testing, servicing and calibration procedures recommended by the manufacturer.

(i) Test certificates of switchgears, transformers, apparatus, instruments, machines etc.; issued by their manufacturers.

(j) Test results of different parameters of switchgears, transformers, apparatus, instruments, machines etc.; obtained at the time of commissioning of the same.

(k) Plant history on power supply equipment and important plant &machinery.

(l) A copy of Standing Instructions on Electrical Safety issued by OFB, STEC & other statutory bodies/organisations.

(m) Different instructions issued by OFB on Electrical Safety as issued from time to time.

(n) A list and copy of latest STEC recommendations, IS, ISCP, BIS specifications relevant to the field of Electrical Engineering shall also be available in EM section of the factory.

(o) The CEA Regulations issued for different fields of electricity such as measures relating to safety and electric supply, technical standards for electrical plants & electric lines and installation & operation of meters etc. (latest editions).

13.2 All the above shall be updated immediately after carrying out any alteration / modification in the system, network, machinery or installation.

13.3 These should be suitably catalogued /categorized, so that ready reference is possible.

13.4 At least three copies of the above shall be prepared. One set should be available with HOS/EM, another set shall be kept in the Technical Library (if available) of the factory and third copy shall be handed over to Engineering Office.

13.5 The copies mentioned above shall be shown to the REI, RCS, COS(OFB), if they ask so during their inspection visits.

13.6 Following records shall be maintained by the HOS/EM:-

S. No.	Description	Ref. To Point No. of the Standing Instruction
a.)	Records of Electric Staff signing a register as a token of having read the Standing Instruction.	Para 1.6
b.)	Record of group in-charge concerned having read the relevant portions of the Standing Instructions to IE once in 3 months.	Para 1.9
c.)	Record of qualification of Staff & IEs.**(Proforma 1)**	Para 3.4(i)
d.)	Authorisation register of IE.**(Proforma 2)**	Para 3.4(ii)
e.)	Record of special works.**(Proforma 3)**	Para 3.17
f.)	Record of permits **(Proforma-4).**	Para 4.3.4 & 4.3.8
g.)	Permit certificate **(Proforma-5)**.	**Para 4.2.1, 4.3.1, 5.11.1(i), 8.16.1(a)**
h.)	Record of tripping (not due to fault). **(Proforma-6)**	Para 4.6(iii) & 5.1.21
i.)	Condition of batteries. **(Proforma-7)**	Para 5.4.11 & 5.7.4
j.)	Record of tripping (due to fault). **(Proforma-8)**	Para 5.4.18(v) & 5.11.5

k.)	Key register. **(Proforma-9)**	Para 5.4.4
l.)	Record of Tests of Earthing Resistance of LP (Lightning Protection) system. **(Proforma-10)**	**Para 5.10.17, 7.9.12 & 8.14.5**
m.)	Testing record of Earthing Resistance (buildings other than substations). **(Proforma-11A)**	Para 5.10.17 & 7.9.12
n.)	Testing of earth (Substations). **(Proforma-11B)**	Para 5.10.17
o.)	Testing of Earthing Resistance (Overhead lines). **(Proforma-11C)**	Para 5.10.17& 6.5.4
p.)	Register of temporary works. **(Proforma-12)**	Para 9.4, 9.10.2 & 9.10.5
q.)	Testing of energy meters. **(Proforma-13A &Proforma-13B)**	**Para 8.19.8**
r.)	Record of yearly inspection and testing of wiring installation for Insulation Resistance and general condition of wiring. **(Proforma-14)**	Para 8.19.2
s.)	Record of Electrical fire cases. **(Proforma-15)**	Para 11.12.1
t.)	Record of electrical accidents. **(Proforma-16)**	Para 12.5.1, 12.5.4(A) & 12.5.4(B)
u.)	Record of yearly inspection and testing of IR value of power supply system (Substations).	Para 5.4.2, 8.18.1 &8.19.2
v.)	Record of yearly inspection and testing of IR value of power supply system (Overhead lines).	Para 8.18.1 &8.19.2
w.)	Record of yearly inspection and testing of IR value of power supply system (cables).	Para 8.18.1 &8.19.2
x.)	Record of yearly inspection and testing of IR value of power supply system in buildings inside factory.	Para 8.18.1 &8.19.2
y.)	Record of yearly inspection and testing of IR value of power supply system in buildings in factory estate (if any).	Para 8.18.1 &8.19.2
z.)	General periodical testing of electrical machinery for IR & ER values. (For ER values Proforma 11A, 11B & 11C)	**Para 8.18.1 &8.19.2 (For IR) & 8.19.3 (For ER)**
aa.)	Progress report of rectification of the electrical safety deviation points noticed and intimated by ESO.	Para 2.3(viii)
ab.)	Record of testing of protective devices i.e. tripping relays and circuit breakers.	Para 8.19.4

The following records are required to be maintained by the sections stated against each record:-

*)	Testing of fire-fighting appliances in substations in **Proforma-18.**	Fire Brigade.
**)	Checking of portable appliances, inspection lamps for proper working and condition of their cables / leads.	Holding Section
(A)	FORM–I (for Installations of voltage up to and including 250V)	The CEA Regulation 2010.
(B)		.
(C)		The CEA Regulation 2010.

13.7 The records mentioned above shall be maintained by HOS/EM or he may authorise staff for different groups on his behalf but overall responsibility of maintaining the records shall be of HOS/EM. These records shall be signed by him fortnightly and shall be counter signed monthly by DO/EM. Group Officer / Controlling Officer of EM may inspect the records review the progress of testing works at a frequency of three months.

13.8 These records shall be shown to the COS/OFB, RCS, REI / AEI during their visits and shall be countersigned at one place in each register / file.

13.9 As per Para No. 13.7, the responsibility of maintaining these records may be entrusted to staff members posted in EM section by name by an office order. Any slackness on their part shall be dealt with as willful negligence of duty.

13.10 While carrying out inspection in the factory the REI / AREI may take guidance from the following formsof the CEA Regulation 2010:-

(A) FORM–I (for Installations of voltage up to and including 250V)

(B) FORM–II (for Installations of voltage exceeding 250 V and up to 650V)

(C) FORM–III (for Installations of voltage exceeding 650V)

DIFFERENT PROFORMAS, ANNEXURES, FORMATS, SCHEDULES AND TABLES.

P R O F O R M A – 1

{Ref. Para 3.4(i)}

RECORD OF QUALIFICATION

(For Staff & IEs - in Electrical Trade)

1. Name of the Staff / IE:-
2. Present designation (Give date):-
3. Date of entry in the electrical trade:-
4. Designation at the time of entry in the factory and section:-
5. Qualification & experience at the time of entry:-

Academic Qualifications		Technical Qualifications Particulars of (Diploma, License / Competency / Trade Test)			Experience
Particulars of qualification.	Year of passing.	Particulars of qualification.	Date / Year of passing.	Ref. No. of certificate / letter & name & address of issuing authority.	
1	2	4	5	6	7

P R O F O R M A – 2

{Ref. Para 3.4(ii)}

AUTHORISATION REGISTER

Name	T. No. / Personal No.	Designation	Work for which authorised	Area / Building / M/c. on which the work is authorised	Signature of authorising person	Signature of authorised persons
1	2	3	4	5	6	7

P R O F O R M A – 3

(Ref. Para 3.17&Para 5.4.15)

SPECIAL WORKS

Date	Section, Location of Machine or Area	Nature of Complaint	Persons deputed	Details of rectification done	Signature of Staff under whom the work is done	Remarks
1	2	3	4	5	6	7

P R O F O R M A – 4

{Ref. Para 4.3.4, 4.3.8, &Para 13.6(f)}

RECORD OF PERMITS

Date	Ref. Of message	Area affected by Permit	Purpose for which permit issued	Person issuing the permit	To whom issued	Permit No.	Time of issue	Time of clearance	Remarks
1	2	3	4	5	6	7	8	9	10

P R O F O R M A – 5

{Ref. Para 4.2.1, 4.3.1, 5.11.1(i), Para 8.16.1(a) & Para 13.6(g)}

PERMIT CERTIFICATE
I

Permit No.:- ……. Time:- ……..…….. Date:- ……

Department issuing permit:- ……..

1. I…….……certify that the following apparatus has been made dead, is isolated from all live conductors and has been connected to earth and the work mentioned in Para 3 can now be carried out in accordance with safety rules & regulation…….……..…… ……..……

2. For the purpose of making the apparatus dead, the following switches / isolators / links / fuse have been opened and the section so isolated has been earthed at each isolation point and danger notice plates fixed thereon.
Switches :-……..
Isolators :-……..
Links :-…….....
Fuses :-……...

3. Work to be carried out (testing work if any, to be specifically mentioned)
……
….……

4. I have recorded the above operations in the log sheet / log book including the instruction for the persons who may relieve me.

5. This permit is issued to .....
{Name of the person receiving permit for carrying out the work mentioned in Para 3}

Signature of SBA or the person issuing permit responsible for carrying out theabove work.

Designation:-

II

Department receiving permit:-……

I (name of the person receiving permit)……..confirm that I have been issued this permit by ……...(name of the permit issuing staff / officer/Authority) and have been placed in direct and continuous charge of the work mentioned in Para 3.and accept the responsibility of carrying out the said work taking all necessary safety precautions to avoid danger and no attempt will be made either by me or my men working under my control to carry out any other work or on any apparatus other than detailed in Para 1 & 3.

Signature of the person receiving permit and responsible for carrying out the above mentioned work.

Designation:- ……

III

I have transferred the permit to ……..., and he will be responsible for carrying out all the works mentioned in Para 3 of this electric work permit.

Signature of the person transferring the permit.

Designation:- ……

Signature of the person receiving the permit.

Designation:- ……

IV

Time:- ……, Date:- ……...

I confirm that the work specified in Para 3.on the reverse has been completed and all the workmen withdrawn and warned that it is no longer safe to work on the apparatus mentioned in Para 1 on the reverse. I also confirm that all temporary earths and other safety connections made by me and by men under my control have been removed except any precautionary steps taken by the permit issuing staff / officer before the issue of permit have not been interfered by me or by men under my control. I hereby return the permit for cancellation, leaving the dead apparatus ready for putting in to service.

Signature of person returning the permit.

Designation:- ……..

V

Time :- ……..., Date:- ……

The work mentioned in Para 3.on the reverse has been carried out, all earth made for the purpose have been removed and danger notice plates put aside. The following switches / isolator / links / fuses have been closed and the apparatus put back into service. Entry has been made in the log sheet / log book.

Switches ……..
Isolators ……..
Links ……..
Fuses ……..

Signature of the person receiving the permit and responsible for carrying out the above work or SBA.

Designation:- ……..

P RO F O R M A - 6

{ Ref. Para 4.6(iii)& Para 5.1.21}

RECORD OF TRIPPING (Not due to Fault)

Details of switches switched off / isolated	Purpose	Time of switching off	Switched ON	Remarks	Signature of the person/s putting off the switches & putting on after shut down.
1	2	3	4	5	6

P RO F O R M A - 7

(Ref. Para 5.4.11& 5.7.4)

CONDITION OF BATTERY

1. Location of the battery:- ……, 2. Amp. hour capacity:- ……..
2. Normal working voltage of the Battery:- ……..., 3. Type of Battery:- …….
4. No. of Cells:- ……...

A. Tests to be taken once in every shift:-

i) Total Battery supply voltage under load conditions with a load equivalent to trip circuit connected to it.

ii) Take voltage & specific gravity of any one cell selected at random.

Time	Cell	Voltage	Specific gravity	Remarks
1	2	3	4	5

B. Fortnightly maintenance:-

First and third week of the month (On fixed dates / or nearest working day).

Take voltage and specific gravity reading of each & every cell (for conventional lead acid batteries only) & record.

Date	Cell No.	Voltage	Specific gravity	Remarks
1	2	3	4	5
				Added distilled water, Applied petroleum jelly or details of defects noticed&other action taken.

.

· The periodic check-up register should be kept in every S.S. where tripping is by batteries.

P R O F O R M A - 8

{Ref. Para 5.4.18(v)& 5.11.5}

Record of trippings due to fault

One book for each Sub-station

Date	Name of the feeder (tripped)	Tripping time	Charging time	Relay indication	No. of tripping	Cause of tripping	Rectification details	Remarks
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**

To be filled by maintenance staff.

P R O F O R M A - 9

(Ref. Para 5.4.4)

KEY REGISTER

Date	Key No. & Description	Time of issue	Purpose of issue	To whom issued (Name)	Signature of person receiving it.	Time of return	Signature of persons receiving it back.	Remarks
1	2	3	4	5	6	7	8	9

PROFORMA-10

(Ref. Para 5.10.17, Para 7.9.12 & Para 8.14.5)

RECORD OF TESTS ON LP SYSTEM

Date	Resistance to earth. (From test point on the down earth conductor to earth terminal) No. 1 No. 2 No. 3 No. 4	Combined resistance of the LP system	Conditions of air terminations	Condition of earth down conductor	Condition of network / rings on the system	Remarks	Signature of persons performing the test

SKETCH OF LP SYSTEM

(To be drawn/used with Proforma 10)

BUILDING No.	DESCRIPTION
1	2
No. of earth pits:-	No. of air termination:-

P R O F O R M A – 11 A

{Ref. Para 5.10.17& Para 7.9.12)

RECORD OF TESTS ON EARTH SYSTEM

Building No.:- ……, Description:- ……...

Date	Resistance of each earth pit taken independently (After disconnecting it from the earth system)		Combined resistance	Condition of earth continuity conductor	Resistance from earth pit to any point in the building	Details of Rectification / action taken if any & date	Final reading after rectification	Signature of persons taking the test
1	Pit no. 2	Value 3	4	5	6	7	8	9

* Readings should be taken for power earthing system, LP system& static earthing system.

P R O F O R M A – 11 B

(Ref. Para 5.10.17)

Record of Tests of Earth system

(Sketch of S.S. Plan with locations of earth pits for L.P. System Neutral earth & Body earth)

Substation No.:- ……, Description:- …….

Date	Resistance of each earth pit taken independently after disconnecting it from earth system				Conditions of earth continuity conductor	Resistance from earth pit to any point in the bldg.	Details of rectification with date	Final reading after rectification	Signature of the person taking the test
	Earth system	Pit no.	ER value	Combined resistance					
	Neutral earth Body earth LP earth								

P R O F O R M A – 11 C

(Ref. Para 5.10.17 &Para 6.5.4)

TESTS OF EARTH SYSTEM OF O.H. LINES

Location / routing of the O. H. lines marked on a key plan of the factory should be attached in the register.

Portion of line tested	Results of earth test at pits. No. 1 No. 2 No. 3 No.4	Result of earth resistance of the span	Signature of the person taking the test	Remarks

P R O F O R M A – 12

(Ref. Para 9.4, 9.10.2 & 9.10.5)

Record of Temporary works & wiring

Date	**Details of work giving locations**	**Signature of authorising authority with date**	**Reasons for the urgency and period for which authorised**	**Date of connection**	**Name of the staff supervising when the work has been done**	**Signature of staff who has inspected & ordered connection after being satisfied. Results of IE/ER Test**	**Date of dis-connection or changeover to permanent work**	**R E M A R K S**
1	2	3	4	5	6	7	8	9

Proforma 13 A

(Ref.Para 8.19.8)

TESTING OF ENERGY METER

S. No.	Meter No. & Make	Details of removal			Details of re-fixing after test			Ref. to SL. No. Meter test record Proforma 13 **B**	Signature of person performing the test
		Qr. No.	Date	Meter reading	Qr. No.	Date	Meter reading		
1	2	3	4	5	6	7	8	**9**	10

PROFORMA 13 B

(Ref.Para 8.19.8)

TESTING OF ENERGY METER

S. No.	**Details of energy meter**			**Ref. of Sl. No. of Proforma 13 A**	**Results of initial test at different loads & test**	**Results of final test**	**Conclusion**	**Final reading of the meter**	**Date of handing over of the meter**	**Remarks**
	S. No. of meter & Make	**Technical data**	**Rev / KWH**							
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**

P R O F O R M A – 14

(Ref. Para 8.19.2)

Testing of wiring installation (IR Test)
For building other than S.S.

1. Building No.:-
2. Name of the Building:-
3. Description of Building:-
4. Type of load:-
5. Total load:-
6. No. of circuits:-

Date	Circuit No.	Insulation resistance of the wiring				Condition of wiring	Condition of wiring accessories	Remarks	Signature of persons performing the test
		P-1 to E	P-2 to E	P-3 to E	N to E				
1	2	3	4	5	9	7	8	9	10

P R O F O R M A – 15

(Ref. Para 11.12.1)

REPORTING OF ELECTRIC FIRE OR FIRE CAUSING SERIOUS DAMAGESTO ELECTRIC EQUIPMENT AND MACHINERY.

(To be dispatched within 48 hours of the knowledge of occurrence of fire in the factory)

1. Name of the Factory:

2. Date of fire:

First noticed at …….Hrs., Extinguished at ……..Hrs.

3. Location:

(a) Building No.

(b) Details of machinery / plants / installation involved in the fire.

4. Details of damages:

(a) Approximate cost of repairs (if repairable)

(b) Details of repairs to be carried out.

(c) Approximate cost of replacement of the machine / plant in full or in part (details of parts replaced, if latter).

5. In case of electric fire:

(a) How the fire was caused?

(b) Where did it first start?

(c) How the fire spread to the equipment / area involved?

(d) Whether the area was free from inflammable material viz. Cotton Waste, Oil, Inflammable liquids.

(e) Whether trenches were kept clean and covered and whether they were free from oil, cotton waste and easily fire catching materials.

6. If not an electric fire:

(a) How the fire was caused?

(b) Where did it first start?

(c) How the fire spread to the equipment / area involved?

(d) Whether the area was free from inflammable materials viz. cotton waste, oil, inflammable liquid.

(e) Whether trenches were kept clean and covered and whether they were free from oil, cotton waste and easily fire catching materials.

PROFORMA 16

{Ref. Para 12.5.1, 12.5.3, 12.5.4(A) & 12.5.4(B)(d)}

{As per the Form annexed with the Intimation of Accidents (Form and Time of service of Notice) Rules' 2004}

Form for reporting Electrical Accidents.

1. Date and time of accident:-

2. Place of accident:-
(Including Village/Town, Tehsil/Thana, District and State)

3. System and voltage of supply (whether EHV / HV / LV line, sub-station / generating station / consumer's installations / service lines / other installations):-

4. Designation of Office–in-charge of the generating company / licensee in whose premises or jurisdiction the accident occurred:-

5. Name of owner / user of energy in whose premises the accident occurred:-

6. Details of victim(s):-
(a) Human

S. No.	Name	Father' Name	Sex of victim	Full Postal Address	Approximate Age	Fatal / Non-fatal
1	2	3	4	5	6	7

(a) Animal

S. No.	Description of Animal	Number(s)	Name(s) of owner(s)	Address(es) of Owner(s)	Fatal / Non-fatal
1	2	3	4	5	6

7. In case the victim(s) is / are employee(s) of supplier:-

a) Designation of such person(s):
b) Brief description of the job undertaken, if any.:
c) Whether such person / persons was / were allowed to work on the job:-

8. In case the victim(s) is/are employee(s) of a licensed contractor:-

(a)Did the victim(s) possess any electric workmen's permit(s), supervisor' competency
If yes, give number and date of issue and the name of issuing authority.

(b) Name and designation of the person who assigned the duties of the victim(s).

9. In case of accident in the system of the generating company / licensee, was the permit to work (PTW) taken?

10. (a) Describe fully the nature and extent of injuries. e.g. fatal / disablement (Permanent or temporary) of any portion of the body or burns or other injuries.

(b) In case of fatal accident, was the post mortem performed ?

11. Detailed causes leading to the accident.
(To be given in a separate sheet annexed to this form)

12. Action taken regarding first aid, medical attendance etc. immediately after the occurrence of the accident (give details).

13. Whether the district Magistrate and Police Station concerned have been informed of the accident (if so, give details).

14. Steps taken to preserve the evidences in connection with the accident to extent possible.

15. Name and designation(s) of the person(s) assisting, supervising the person(s) killed or injured.

16. What safety equipments were given to or used by the person(s), who met with this accident (e.g. rubber gloves, rubber mats, safety belts, ladders etc.):-

17. Whether isolating switches and other sectionalising devices were employed to deaden the sections for working on the same? Whether working section was earthed at the site of work?

18. Whether the work on the live lines was undertaken by authorised person(s)? If so, the name and designation of such person(s) may be given:-

19. Whether artificial resuscitation treatment was given to the person(s) who met with electrical accident? If yes, for how long was it continued, before its abandonment?

20. Any other information/remarks.

Signature
Place: Name ----------
Time: Designation ----------
Date: Address of the person reporting

P R O F O R M A – 17

(Ref. Para 12.10)

S. No.	Date & time of the accident	Category of the accident Fatal / Minor / Major	Name of the person affected.	Location of accident site	Date of sending the accident report to Elec. Inspector	Findings of the B of E or Enquiry Officer (in the case of major accident)		Addl. Remedial measures recommended by RCS (REI)	Date of completion of rectification and Implementation of recommendation	Date of reporting / compliance to the HQrs.
						Cause of the accident	Remedial measures			
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**

P R O F O R M A–18

{Ref. Para 13.6(*)}

FOR RECORD OF MAINTENANCE INSPECTION AND TESTING OF PORTABLE FIRST AID FIRE EXTINGUISHERS

Serial Number of Extinguishers:-.....
Type of Extinguishers:-.....
(give capacity, where applicable)

Location:- …….....

Date of Purchase:-…….....

Serial No. of Entry	Date	Details of Test Inspection and Repairs with Remarks	Signature of person Performing the test	Signature of HOS/FB
1	2	3	4	5

PROFORMA – 19

{Ref. Para 8.19.7}

CHECK LIST OF CEILING FANS														
S. No.	Factory Inventory No.	Location	Date of Checking	Condition of Blades & Fixing Screws	Condition of Split Pins		Condition of Check nut		Condition of Hook & U clamp		Condition of Hook & U clamp	Condition of Bobbin / Rubber bush & fixing Nut & bolts	Sign. Of Individual Checking the fan	Remarks
					Top	Bottom	Top	Bottom	Top	Bottom				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

PROFORMA 20 A

{Ref. Para 2.4 (iii)}

ELECTRICAL INSPECTION REPORT BY ELECTRICAL SAFETY OFFICER (ESO)

To,

Sr. General Manager / General Manager,
.....
.....

Through: D.O. (Under whom ESO is working)

Sub:- Electrical Inspection by Electrical Safety Officer.
Ref: DGOF letter No. 411/E/S/I dt. 29-7-82.

Details of defects in the electrical installation of the factory and factory estate (if any) noticed during the inspection visit of the undersigned are enclosed herewith with a request for early rectification od the points raised and communication of completion of rectification directly to the Regional Director, Controllerate of Safety, (…… region) with a copy to undersigned.

S. No.	Date/Dates of inspection	Location	Defect noticed	Remedial Action Required	Remarks, if any.
1	2	3	4	5	6

Signature of ESO
Name of ESO in block letter

Copy to:

The Regional Director,
Region Controllerate of Safety (……. Region)

[Note:- No need to forward this copy to OFBHQ, Kolkata (order vide letter No. 411/CEI/COS, Dtd.:- 10-05-2013)].

PROFORMA 20 B{Ref. Para 2.3 (viii)}

Name of the Factory .....
Month.....

To
The Regional Director,
Region Controllerate of Safety (……. Region)
.....
.....

SUBJECT:-RECTIFICATION OF DEFECTS POINTED OUT BY ELECTRICAL SAFETY OFFICER (ESO)
Reference:- Electrical Safety observations raised by the ESO for the month of .....

Details of rectification of the observations raised by the ESO for …….. factory as per reference are forwarded herewith as listed below:-

S. No.	Date of inspection	Location of Observation	Details of defect	Remedial Action Taken	Date of Rectification

.....
..
.....
..
Remarks of Electrical Safety Officer.

Counter signed by:

General Manger AGM/Jt.GM DO/EM HOS/EM

Copy to:

1. Electrical Safety Officer (ESO)

[Note :- No need to forward this copy to OFBHQ, Kolkata (order vide letter No. 411/CEI/COS, Dtd.:- 10-05-2013)].

ANNEXURE-A

(Ref. Para 5.2.2 & Para 11.1.6)

Recommended scale of portable fire extinguishers.

Example of Occupancy:-

Area	Recommended First Aid Fire Extinguishers
Workshops, Generators, Transformers, Electrical Motors Switchgears Battery charging rooms A/C Plant rooms Telephone Operator room Cinema Projector room Electronic equipment & Computers room	One extinguisher (10 KG dry power) per 100 Sq. Mof floor area, with a minimum of two extinguishers of the same type per room / compartment / group of machines. *OR* *As per the recommendations of CFEES fire audit for the factory.*

For MAIN RECEIVING STATION

S. No.	Type of Fire Extinguishers	Minimum Quantity Recommended
1	Carbon Dioxide Fire Extinguishers of 4.5 Kg capacity	2 Nos.
2	Dry powder ABC type 10 Kg.	2 Nos.
3	Sand buckets	3 Nos.
4	Trolley mounted carbon dioxide fire extinguishers of 22.5 Kg (Minimum Cap.) coupled with discharge hose and high pressure flexible rubberhose of minimum 6 meter length.	1 No.

ANNEXURE 'B'

(Ref.Para 11.12.2)

RECOMMENDED TERMS OF REFERENCE FOR ELECTRICAL FIRE

i) Circumstances leading to the fire:-

ii) Extent of damage-details, extent of repairs / replacement involved and cost:-

iii) Where did the fire start? How did it travel? :-

iv) Extent to which area was free of oil / cotton waste / fire causing materials:-

v) Whether trenches were clean and covered by trench covers:-

vi) Details of injuries to persons(if any) and how he got injured:-

vii) The extent to which the CEA Regulations, Electrical Safety Codes / instructions were complied with details of violations:-

viii) Whether the fire was caused due to negligence of any person/persons, give details specifying the name of the person /persons:-

ix) Remedial measures recommended:-

ANNEXURE C

SAFETY POSTER FOR VIGILANCE AGAINST ELEC. ACCIDENTS

IMPORTANT: Electric shocks are easily received and can be easily avoided. The risk is not always APPARENT BY BEING CAREFUL. Observe scrupulously the following **Do's** and **Don'ts**.

DO		DON'T
(C – 1) MAINS AND APPARATUS		
Before replacing a lamp or handling a fan, make sure that the supply is switched off.		Do not connect single pole switch fuse in a neutral circuit, but always connect in the live or phase wire.
Use correct size and quality of fuse wire, when renewing blown fuse.		Do not renew a blown fuse until you are satisfied as to the cause and have rectified any irregularity.
When removing fuse, put out the supply first when replacing, the supply end should be put to last.		Do not use copper wire as substitute for fuse wire.
Place sign 'men working' or other warning boards on main switch before commencing work.		Do not close any switch unless you are familiar with the circuit which it controls and know the reason for its being opened.
Before working on any circuit or apparatus make sure that the controlling switches are opened and locked or the fuse holders withdrawn.		Do not touch or tamper with any elec. Gear or conductor, unless you have made sure that it is dead and earthed. High voltage apparatus may give leakage shock or flashover without touching.
Always treat circuit as alive until you have proved them to be dead, the insulation of the conductors may be defective.		Do not work in live circuits without the express orders of the person-in-charge. Make certain that all safety precautions have been taken and you are accompanied by a second person, competent to render first aid and artificial respiration.
Before working on motor or other rotating machine, make sure that it cannot be set in motion without your permission.		Do not disconnect earthing connections or render ineffective the safety gadgets installed on mains and apparatus.
Cultivate the habit of turning your face away whenever an arc or flash may occur.		

Guard against arcs as well as high		Do not tamper with the meter boards

voltage, remember that burns from arcs may be very severe.		and cutouts, unless you are authorised to do so.
See that all splices / joints and connections are securely made.		Do not expose your eyes to an elec. arc. Painful injury may result even with short exposure.
Use extreme care when treating an inductive circuit as dangerously high voltage is likely to result.		Do not close or open a switch or fuse slowly or hesitatingly; do it quickly and positively.
Thoroughly discharge to earth all cables before working on the cables..		Do not turn your face and then grope for switch or fuse.
Test rubber gloves periodically.		Do not use metal case flashlight around apparatus which is energised.
Place rubber mats in front of elec. switchboards.		Do not place any part of your body in circuit either to ground or across the terminal when making a connection or operating.
Prevent accumulation of gases in unventilated manholes. Varnishes emit inflammable vapours.		Do not use wires with poor insulation.
		Do not touch an elec. Circuit when your hands are wet, or bleeding from a cut or an abrasion.
		Do not work on energized circuits without taking extra precautions, such as the use of rubber gloves and wooden handles.
C-2 PORTABLE LAMPS AND APPLIANCES		
Ensure that all portable appliances are provided with 3 pin plug and socket connections and the metal work of the apparatus is effectively earthed.		Do not use a lamp in a metal holder fixed to the end of a loose flexible wire as a portable hand lamp.
Always use portable hand lamps of the insulated safety type and provided with a rubber, plastic or wooden handle and wire guard.		Do not disconnect a plug by pulling the flexible cable or when the switch is ON.
		Do not use kinked or perished cables for portable lamps and appliances.
		Do not plug in any portable lamps or apparatus before making sure that the switch is OFF and that the wall plug is properly inserted in the socket.

C-3 FIRE		
Disconnect the supply immediately		Do not use fire extinguishers on electrical

in case of fire on or near elec. Apparatus.		equipment unless it is clearly marked as suitable for that purpose. Use sand in bucket instead.
Make sure, when using water hose, that the jet of water does not come into contact with live apparatus.		Do not throw water on live elec. Equipment in case of fire. It is dangerous to you.
Keep flammable material only in special containers and in fireproof rooms.		
Be sure that your men are familiar with the location of fire-fighting apparatus.		
Organise precautionary fire drill.		
Have sufficient number of fire extinguishers located in strategic positions. So that they may be available for immediate use in various areas.		
Check fire-fighting apparatus periodically.		
Wipe up oil as soon as possible, use sand to cover oil spots.		
C-4 ELECTRIC SHOCK		
Remove the casualty from the cause, render first aid and send for doctor or take the casualty to a hospital or dispensary.		Do not take necessary risk with electricity. Low voltage under certain circumstances can be more dangerous than high voltage.
Report all accidents whether minor or major, non-fatal or fatal immediately to the person-in-charge.		Do not leave the casualty in contact with live apparatus. Switch off current immediately.
Study carefully and practice first aid treatment for injured persons.		Do not attempt to disengage a person in contact with a live apparatus which cannot be switched off immediately. Insulate yourself from earth by standing on rubber mat, or board before attempting to get him clear. Do not touch the body, pull him by clothes ,if they are dry or push him clear with a piece of dry wood.
Whenever possible use one hand only when working about an electrical circuit even though it is supposed to be dead.		Do not discontinue artificial respiration until recovery / death is certified by the doctor. It may take even more than 2 to 3 hours for recovery.
		Do not remove the body without the permission of the police even after certification of death by doctor.

C-5 GENERAL SAFETY PRECAUTIONS.

Preach and practice safety at all		Do not wear loose clothing, metal

times. Good work can be spoiled by an accident.		watchstraps,. Bangles or finger rings while working on elec. Appliances. Do not hang clothes and such other things on elec. Fittings.
Work intelligently and carefully, haste causes many accidents, be sure of what you are doing.		Do not work on a pole or other elevated position if there is a live part on it without safety belt and rubber gloves, and unless a competent person stands on the ground nearby to direct operations and give warnings.
Examine before use all safety appliances such as rubber gloves, mats, ladders, goggles, insulated pliers etc. For their soundness.		
Always add the acid or soda to water and not vice versa when mixing sulphuric acid or caustic soda and water.		Do not use a ladder without a lashing rope; otherwise the ladder should be held firmly by another person.
Always report immediately to the person In-charge or to any other proper authority any dangerous condition or a dangerous practice which you may observe.		Do not go carelessly near running belts on machines.
		Do not remove danger notice plates or other signs or interfere with safety barriers or go beyond them.
Always be cautious while lifting or removing a heavy apparatus or material.		Do not bring a naked light near battery. Smoking in the battery room is prohibited.
Warn others when they seem to be in danger near live parts of apparatus.		Do not allow visitors and unauthorised persons to touch or handle elect..apparatus or come within the danger zone of high voltage apparatus.
Always be careful and take no chance against any possible accident.		Do not enter excavation which give out obnoxious smell, or work in badly lit, badly ventilated and congested areas.
Attend to all injuries however slight they may be.		Do not touch a circuit with bare fingers or hand or other make shift devices to determine whether or not it is alive.

ANNEXURE – D

Some of the electrical accidents which actually happened.

(I) A wireman was deputed for repair work on an O.H. line in a factory. He took a shut down from a switch and went up the pole to carry out the work. After completing the work he asked his assistant to put the switch 'ON'. After his assistant had left, he perceived that he had left his plier on the O.H. conductor. He asked his another assistant to go quickly up the pole and remove it. His second assistant went up and as he put his hand on the pliers he received an electric shock (his first assistant had switched on the line in the meantime) and fell down the ladder and sustained injuries.

Points of safety violation:-

1. The wireman was careless in leaving his tools on the line. He should have checked his tools before arranging switching 'ON'. He should have gone himself and confirmed about switch and put it off himself if it was on, instead told the 1st Asst. of his action and then asked his 2nd asst. to go up the pole.

2) The labourer / assistant should have tested the line before putting his hand on the plier.

3) The labourer / assistant did not use safety equipment while going up.

(II) In a receiving station of a factory a 11 KV OCB developed serious damage due to fault in its circuit. The 11 KV OCB was removed for repairs. Repairs took one and half years. After OCB was repaired it was tested and was found to be satisfactory. The circuit fault had also been repaired. The OCB was put on, immediately thereafter a loud noise was heard and hot oil / vapour gushed / splashed out. Several people who had gathered around the switchgear sustained burn injuries, some of them died later.

Investigations revealed that:-

i) The assembly was not done perfectly.

ii) Two bushings replaced by the factory was presumed to be defective.

iii) The tripping batteries were not functioning. Indicated a voltage of 12.3 V (on no load) against 24 V on load. The relays did not operate.

iv) Many people had gathered around the switchgear which was not necessary.

v) No records of tests carried out or the results were available.

Whenever a repair on an OCB is carried out, all checks & tests should be recorded. The details of checks / tests to be carried, method of test etc. should be made in the form of detailed instructions. Before putting the switch ON the tripping system battery should be checked for operation. A written cancellation of permit or line clear should be obtained. In the case of major repair on H.T. OCB, Regional Electrical Inspector should also be associated with the test.

(III) An Electrician had gone up a gantry crane to attend the fault. His Asst. was below controlling the switch of the gantry crane. There was not adequate space in front of the O.H. line control panel of the gantry crane. The electrician was working in a damped space. Just behind him was the bare wire O.H. bus for the crane. He asked his assistant to switch on and started testing. During the course of testing with the switch on, a flash over occurred on the panel. The electrician in the act of falling behind came in contact with live bus, sustained injuries and died after a few hours.

There should be enough space in front of the control panel for working. The bus bar should have been protected from becoming prone to accidental contact.

(IV) A workman went up a mechanical crane for repairs. Just below this crane there was another electrical crane installed for a bay. The workman did not tell anyone and went up for checking. As he was coming down he slipped and came in contact with live bus bars of electrical crane below. His body got shock. No one knew of the accident for quite some time, till someone saw him above and about the manner in which he was lying. He used the alarm but it was too late.

It is necessary that any person going up a crane should take permission of JWM who must make sure that the area is electrically safe and that there are no risks of elec. shock before allowing him to go up.

(V) The electrical parts of a bar mill installed in a pit developed fault. It was repaired. The metallic contacts, chokes etc. were cleaned by petrol. Petrol was used liberally (more than necessary). A few minutes later an electrical hand blower (commutator type) was switched “ON” for work of drying the electrical parts. As soon as it was switched ON the pit caught fire and persons standing in the area near the machine sustained injuries and one of them died later.

Lapses:-

1) Petrol should not have been used in a pit, Carbon tetra-chloride would have been better.

2) Electric blower commutator type should not have been used in this atmosphere.

3) An exhaust fan should have been worked to remove inflammable atmosphere before using the elec. blower.

(VI) Work was being done on 11 KV panel fed by two cables from the Electricity Board. One of the cable developed fault. The work should have been done by the Electricity Board, but the factory undertook to do it themselves, to help production. This was only oral understanding. A shut down was taken orally. Work was started on a particular day but was not continued on the succeeding two days. After three days the gang came back for work. They

presumed that the condition of the shut-down which they had taken still existing. They did not check. In fact one of the cables has been energised by the EB during this period. They opened the OCB back cover. As soon as the person went in, he received 11 KV shock from back feed of the 2nd cable & died.

Lapses:-

1. It was in-correct to work on H.T. installation without proper earthing.
2. Proper shut down permit in writing should have been taken.
3. The person should have checked that the cables are all dead before opening the panel.

(VII) An OCB (MV) was idle for long time after repair. On a particular day it was to be energised. It was racked in. In the process a flash over occurred. The flash over continued for some time till the OCB on HT side was tripped manually. Three person sustained injuries, one of them died later.

Lapses:-

1. The tripping battery for HT OCB was not installed / have been removed.
2. The OCB was not checked properly before racking it in.

(VIII) CASE OF FIRE ACCIDENT / INCIDENT:-

A fire accident had happened in Electroplating and painting shop, causing damage to the machinery, equipment and the building of several lakhs. Fire alarm was sounded by the Control Panel installed in the Fire Station as one of the Heat Sensitive detector installed in the building was actuated. Fire Brigade personnel could not approach the affected second floor immediately due to the presence of heavy smoke inside the building. Fire Brigade tried to douse the flames by applying water jets from outside the building using ladder. Later on, nearby Fire Brigade and Civil Fire Brigade also joined in fire-fighting operations and finally the fire was controlled after about two hours.

CAUSE AND SUGGESTED PRECAUTIONS:-

Investigations revealed that due to overheating of oil by electric heater (about 250 liters of mineral oil kept for quenching purpose), the thermostat control of which failed and oil temperature reached its flash point which subsequently caught fire. The fire spread rapidly through exhaust duct laid for extracting fumes to service floor (first floor) as well as Painting Shop (3rd floor).

REMEDIAL MEASURES:-

i) Closing time checks should be strictly enforced and floor / section in-charge should be involved and made responsible.

ii) Night patrolling by Security Staff inside the factory complex should be carried out.

iii) Construction material of exhaust duct as far as possible should be made of non-combustible materials. Alternatively, fire retardant coating may be applied to restrict spread of fire.

iv) The openings from which the duct passed through one compartment to another or from one floor to another may be sealed effectively with appropriate sealant. Moreover, the exhaust system in a particular building may be localised so that it could not affect the entire building.

v) The possibility to install fire dampers at appropriate locations inside the duct should be examined to stop flow of hot gases in emergent situations. Traditional heat / smoke sensitive early detection-cum-alarm system should be replaced by Analogous Intelligent and addressable type detection system which is considered more reliable and reduce false alarms considerably. Warning system should also incorporate hooter / siren installed on top of the building. Detection system should always be maintained in perfect working condition by awarding contract to reputed firm.

vi) Ground hydrant installation should also be kept charged round the clock so that precious time is not wasted for refilling water tank of fire-fighting appliance.

vii) Factory fire brigade should be equipped with life-saving equipments i.e. breathing apparatus and Fire Proximity suits. Adequate number (minimum four each) of such equipment should be kept ready for use in emergency. The fire could be fought only from outside the building and fire brigade personnel could not go inside the building.

viii) Emergency lighting system particularly in corridors, staircase and other escape routes should be provided inside the building. Electrical circuit of such lighting should be drawn independent of normal lighting and a standby power supply should also be available in case of failure of normal supply particularly during fire conditions.

ix) Mechanical smoke extracts should be installed inside the building. Moreover a smoke extracting equipment may be provided to the Factory Fire Brigade to clear smoke from inside the fire affected building.

ANNEXURE – E

Defects commonly noticed in the Electrical Installations in Ordnance Factories.

1.1 Substations (General):-

· S.S. is not approachable.

- Transformer / switchgear room is not approachable.
- S.S. is dirty / full of dust, cobwebs etc.
- Danger boards are not provided on elec. Equipment.
- Danger boards are not of approved design.
- The voltage indicated on the danger board does not tally with the actual voltage.
- Danger boards are not fixed permanently.
- Danger boards are not readable.
- Artificial respirator charts are not provided.
- Artificial respirator not provided in the manned S.S.
- Fire Extinguishers not provided.
- Fire extinguishers not provided in adequate numbers.
- Fire extinguishers not placed in a readily accessible position.
- Fire extinguishers provided are not of appropriate type.
- Sand buckets not fixed in a readily accessible position.
- Sand buckets not provided.
- Sand buckets are not provided in adequate numbers.
- Sand buckets are not filled with dry sand.
- Portable type appliances susceptible to sparking are used without fan in a building laden with vapour of petrol & other inflammable materials.
- Automatic fire alarm / warning / quenching systems is not in functioning order.
- Sundry stores are kept in Switchgear & transformer room.
- S.S. is being used as a storeroom / office / workshop / rest room.
- Names of the persons authorised to remain in the S.S. is not available in the S.S.
- Key boxes not provided.
- Keys are not tagged properly for identification & easy drawl.
- Key register not maintained.
- Key register not maintained properly.
- Trenches are not covered.
- Cables are laid crisscross in the cable trenches.
- Cables are not laid on proper racks.
- Control & power cables are running together.
- Cables trenches are not filled with sand.
- Oil / water is seen in cable trenches.
- Cotton waste, metallic swarf / scrap heavy metallic articles shop sweepings etc. Seen in the cable trenches.
- Roof of the S.S. leaking.
- S.S. floor not level, flooring has sunk at places.
- S.S. floor is lower than the road level outside.
- Proper pathway not provided for transformer installation in the yard of the outdoor S.S.

- Rubber gloves not provided.
- Rubber gloves provided are not of approved quality & correct voltage.
- Rubber mats not provided in front of HT Switch gear.
- Rubber mats provided are cracked.
- Rubber mats provided are not of approved quality.

1.2 Substations(Transformers):-

- Transformer does not have adequate clearances, from the wall.
- Transformer does not have adequate clearance to facilitate going round it for inspection.
- Transformer does not have adequate clearances from the roof / ceiling.
- Transformer tap changer is not locked.
- Neutral strip loose / touching the body.
- Transformer neutral not provided with two independent connections terminating in their own earth pits.
- Neutral strip not of adequate size.
- Nameplate of the transformer not provided / not readable.
- Transformer oil level low in the conservator.
- Oil leaking.
- Oil Oozing from installations / bushings / terminal boxes.
- Soak pit not provided for transformer having oil content more than 2000 litres.
- Transformer not provided with temperature indicator.
- Temp. Indicator not functioning.
- Temp. Indicator / alarm relay not working for tripping / indication / alarm.
- Temperature indicator is not readable.
- Buchholz relay not provided / connected.
- Sub-station with transformers of total capacity 2000 liters located in a common area are not provided by baffle wall to prevent spread of oil fire.
- A number of transformers are installed in a common hall, without adequate separation / provision of a baffle wall.
- Catch pit / sump connected to drain to collect the drainage / leakage not provided.
- Switchgears are installed close to transformers, without any baffle wall separation.
- Cables leading to terminal boxes are not properly supported.
- Terminal boxes open.
- Cable connection are not adequately taped or insulated.
- Compound Oozing out from terminal boxes.
- Ventilation in the transformer rooms is inadequate.
- Transformer running hot.
- Transformers not provided with breather.
- Breather has not been properly conditioned.
- Transformer body is not provided with two earth connections.
- The earth wire is not of adequate size.

1.3 Substations(Switchgears):-

- Switchgear does not have adequate front clearance.
- There is no passage of width 30 inches clear to a height of 8 feet on the back side.
- The clearance of the switchgear panel on the side from the wall is inadequate.
- H.T. & L.T. Switchgears are installed close to each other without adequate clearance.
- Bus-bar capacity of switchgears / panel are not adequate (commensurate with the rating of the switchgear).
- Indication lamps are not functioning on switchgear.
- Indication lamps on switchgear missing.
- Indication lamps of wrong colour fixed. This may give a false indication on the 'ON/OFF' position of the switchgear.
- ON/OFF position of the switchgear not correctly marked.
- Switchgears are not correctly marked to indicate the load / circuit.
- Instruments not functioning on the switchgear.
- Protective devices not functioning due to defective mechanism.
- Protective devices not functioning due to batteries not being provided / protective relays not being wired / or defective batteries.
- Protective relays are not properly graded.
- Switch gear capacity inadequate for the load.
- Interlock of switches to prevent opening of switches in the ON condition not functioning.
- Time lag relays not functioning.
- No oil in dash pot of O/L relay.
- Handles missing on the L.T. switches.
- Switches meant to be used with HRC fuses are being used with wired fuses.
- Fuses in the switches by-passed by wires.
- Fuses of improper size provided in the switch.
- Fuse wires fixed in place of HRC fuses in allswitchgears / isolators / link switches.
- Fuses are not properly graded.
- Temporary wiring seen in the switch gear.
- Instrument compartment not separated from the switchgear compartment by metallic sheets.
- Individual switchgears of a switch panel not separated from the adjacent switchgear by metallic sheets.
- Switch panels HT Switch panels fed from independent source of supply are not well separated from each other.
- Live parts of switchgear exposed / are easily accessible.
- Potential transformers are not functioning.
- Current transformers do not match load condition.
- Auxiliary supplies are not provided with a control at the point of entry.
- Auxiliary supply controls are not clearly marked.

- Emergency light wiring is not distinguishable from the main wiring.
- Switch gears are not insect & vermin proof.
- Openings are seen on the switch gear panel. The door is not closing properly.

1.4 Substations(Earthing):-

- Earth resistance of the electrode is high.
- Earth conductor is not of adequate size.
- Earth conductor used underground is of Aluminium.
- Earth pits are installed too close to each other.
- Earth chambers are not provided for the earth pits.
- Earth pits could not be located.
- No. of earth pits are inadequate.
- Neutral has not been provided with independent earth pits.
- Earth pits of LP system is common with that of power supply system.
- Electrical equipment are not provided with two independent connections to earth.

1.5 Substations(Batteries):-

- Condition of batteries connected is such that it is inadequate to operate the relay.
- Electrolyte level in the battery low.
- Battery is installed close to apparatus.
- No exhaust fan provided in the battery room.
- Instruments on the battery charger not functioning.
- Battery voltages are not being checked under load condition.

1.6 Condensers:-

- Condensers are not provided with discharging device.
- Terminals of condensers are exposed.

1.7 Miscellaneouscommon defects at substations:-

- Bus bars are not enclosed in a metallic enclosure.
- Bus bars are not taped.
- A/B switches in the yard not locked.
- Surge absorbers not provided at the points of termination of O.H. lines & S.S. Cables.
- No lifting facilities provided in the S.S.
- No ramp provided in the S.S. to shift the heavy equipment.
- Ramp is not connected to road.
- Temporary wiring seen.
- Wiring of different systems are not clearly suggested and identified.
- Wiring accessories are being used to support cloth line.
- Live parts are seen exposed (Fuses without carriers, broken switches, plugs,un-insulated wires, open bus bars).
- First aid boxes not provided.

- First aid boxes do not contain items prescribed by the State Govt.

2.1 Overhead lines:-

- The wire size used for O.H. lines does not match the load conditions from the current carrying capacity / permissible voltage drop point of view.

2.2 Overhead lines (Clearances):-

- The clearance of the O.H. lines from the ground is not adequate.
- O.H. lines pertaining to the H.T. system supported on the same poles as those carrying O.H. conductor of MV/LV system do not have adequate clearance.
- O.H. lines of different systems are crossing without adequate clearance.
- O.H. lines do not have adequate clearance from the roof of the bldgs. or topmost portion of metallic structures.
- O.H. lines do not have adequate horizontal clearance from bldgs. or metallic structures.
- O.H. lines are accessible to men working on metallic structures or bldgs.
- O.H. lines are running close to trees. Tree branches are passing through the O.H. lines.
- Conductors of different systems (250V, 650V, 11kV, 33 kV or above 33 kV System/Telephones) are crossing each other without adequate clearance.
- Conductors of different systems (HV/MV/LV/PA system/Telephones) are fixed on the same support without adequate clearance.
- Terminal poles are not accessible.

2.3 Overhead lines (Earthing):-

- Neither earth wire provided on O.H. lines nor are the individual poles earthed.
- Metallic clamps/brackets supporting O.H. lines are not connected to earth.
- Earth wire is not continuous.
- Earth wire not connected to earth at 4 places per kilometer.
- Earth wire down conductors seen cut.
- Earth wire size inadequate.

2.4 Overhead lines (Guarding):-

- Guarding provided on O.H. lines is in-adequate and does not comply with the S.I.
- Guarding wire is not connected to earth.
- Guarding does not cover the width of O.H. lines system.
- Danger boards not provided on H.T. and E.H.T. Poles.
- Anti-climbing devices not provided on H.T. Poles.

2.5 Overhead lines (Stay):-

- Stays are seen loose/broken.
- Stays are neither continuous with earth nor provided with insulator.
- Stays not provided in proper direction.

2.6 Miscellaneous common defects in overhead lines:-

- Lightning arrestors / surge absorbers are not provided at terminal points before connecting it to cables.
- Inflammable/metallic scrap heaped below O.H. lines reducing the clearance.
- Poles of the O.H. lines are seen rusted. They require painting.
- Poles of the O.H. lines are seen weak and broken.
- Poles of the O.H. lines are not marked to indicate the feeding point and circuit.
- Too many service connections have been taken from a pole.
- Switches/fuses provided on the poles are not enclosed in a weatherproof enclosure.
- A/B switches are not locked.
- Ordinary fuse wire being used in place of D.O. fuse.
- Handles of A/B switches missing.
- The arrangement of isolation of circuits/transformers in the outdoor substations is not safe/fool proof.
- The emergency generators are not connected to the bus-bar with a foolproof protective system to prevent feedback.
- The emergency generator is not of adequate capacity to match the load that gets connected from the L.T. Bus in the event of main supply power failure.
- Instruments/indication lamps of the control panel of the emergency generator not functioning.
- The body and control panel of the emergency generator not properly earthed.
- O.H. lines are passing close to/over buildings involving explosives/explosive processes and petrol godown.
- O.H. lines of distribution system controlled by different agencies are seen passing in the same area of the Factory Estate without adequate distinctive marking. It is preferable to have O.H. lines of only one agency to distribute power in the Estate area.
- O.H. lines are crossing playgrounds. These should be removed.

3.1 Cables & cable trenches:-

Cable trenches inside the buildings:-

- Cable trenches are not covered or covered fully.
- Cable trench cover is not in flush with floor.
- Water, oil, seen in cable trenches.
- Metallic scrap, heavy metallic objects, sharp edged metallic articles seen in the cable trench.
- Cable trench not filled with sand.
- Cable trench cover protruding in the cable.
- Water/steam/process lines running over cable trenches.
- Machinery installed on cable trenches.
- Cables running on the shop floor on the ground unprotected.

3.2 Cables:-

- Cables are not adequately sized and are getting hot.
- Cables of different voltage systems are not sagregated and are running together.
- Control/Instrument cables running with power cables.
- Cables are not laid on racks.
- Cable is cris - crossing and resting over the another.
- Cable joints are seen in cable trenches in a bldg.
- Cable routing (outside the bldg.).
- Cable markers not provided.
- Cable crossing nallah / rivulet not anchored.
- Cable running below a bldg.
- Cable running below the road unprotected.

3.3 Earthing of cables:-

- Cable armour not effectively earthed.
- Cable armour not effectively connected to the enclosure of the terminating switch using compression glands.
- Continuity of earth not existing between the two ends of joints.
- Compound/oil oozing out of cable joint box/trifurcating box, cable box.

4.1 Residential buildings (When service line is with bare conductors):-

- Service line touching the trees/tree branches.
- It does not have the horizontal clearance from the bldg.
- It does not have the vertical clearance from the bldg.
- Earth wire not provided with the service line.
- Earth wire not continuous with the earth system of O.H. line or the bldg. Earth.
- Guarding not provided to the service line.
- Guarding provided not adequate.
- Guarding not connected to earth.
- Service line is too long. Requires addl. support.
- Trees/structures have been used to support the O.H. line system.

4.2 Residential buildings (When service line is with insulated wire):-

- Service line rubbing against/touching tree branches.
- Earth wire not provided with the service line.
- Catenary wire to support the service wire not provided.
- Catenary wire not connected to earth of the bldg. / O.H. line system.
- Earth wire not connected to the earth system of the bldg.
- Service wire rubbing against metallic part of the bracket or entry pipe.
- Service line not supported rigidly inside the bldg.
- Cable armour not earthed effectively.
- Cable not protected mechanically.
- Joint seen in the service line.
- Cable seen damaged.

4.3 Other points related to service cables of residential buildings:-

- Cable not adequately sized.
- Aerial fuse not provided.
- Aerial fuse not properly graded.
- Service lines (unauthorised) taken outside the bldg. Premises in an unsafe manner.

4.4 Main switch / Distribution board / Metering Unit:-

- Connection done loose, haphazardly &in temporary manner. Fittings loose.
- Main switch / DB not closed properly.
- Birds nest seen in DB / Main fuse boxes.
- Live parts are exposed.
- Fuses removed & tapping taken by passing the fuse.
- Fuses are oversized.
- Building Earth not connected to service line earth.
- Control switches are not marked correctly to indicate the load.
- Cut out not sealed.
- Meter not working.
- Neutral link not provided.
- Fuses not graded.
- Earth wire of inadequate size.

4.5 Wiring installation(in residential buildings):-

- Wiring tampered / cut & taped.
- Live parts exposed (naked wires, uncovered terminals, broken accessories)
- Temporary / loose / dangling wire.
- Accessories not fixed permanently.
- Single pole switch connected in the neutral.
- No earth in 3 pin plug sockets.
- Non usage of 3 pin plug sockets.
- Wiring from different systems not segregated.
- Telephone wires / aerial passing alongwith power wiring.
- Wiring getting hot.
- Elec. Accessories used for supporting / keeping personal articles.
- Conduits carrying conductors not electrically continuous with earth.
- Sundry items kept in front of switches, obstructing accessibility.
- Part of the installation / bldg. Giving shock.
- Energy meter not being tested.
- Portable appliances are not connected effectively to earth.
- Plug tops not being used.
- Too many tapping from plug points.
- Single-phase portable appliances connected without earth wire.
- Cable connecting the portable appliances not adequately insulated.
- Portable appliances connected between phase & earth.

4.6 Earthing(in residential buildings):-

- Earth resistance high.
- Earthing system not effective.
- Earth wire of inadequate size.
- Records of earth test not being maintained.
- Earth testing not being done every year.
- Electrical apparatus not provided with earth connection.
- Appliances connected between phase & earth.
- Earth point not brought in / connected to plug sockets.
- Electrical conduit not continuous with earth.
- Earth wire loose dangling.
- Earth chamber not provided.
- Earth pit could not be located.

5.1 Electrical Installations in Industrial buildings(O.H. bare wire service lines):-

- Same as for residential buildingsunder para 4.1 above.
- Service line touching very close to metallic roof at its entry point.
- Insulated wire has not been used for the service line into the bldgs.
- Service line passing over pipe lines, metallic structures without adequate vertical / horizontal clearance.
- Service line crossing road / pathway not adequately guarded.

5.2 O.H. insulated wire service line:-

- Same as for residential buildings under para 4.2 above.
- Service line rubbing against metallic parts of the bldg.
- Service line not lead in through pipe.
- Joints seen in the service line.
- Insulation worn out.
- Service line inside the bldg. Not clamped rigidly.
- Service line too long. Requires additional support.

5.3 Feeder cables for industrial buildings:-

- Cable entry not sealed.
- Cable armour not effectively connected to earth (Compression glands).
- Cable not supported or fixed rigidly in the bldg.

5.4 Control switches sub panels main panelsfor industrial buildings:-

- Switches are not marked to indicate the circuits controlled by it.
- Indication lamps, ammeters, voltmeters not working.
- Enclosure to switches panels not effectively earthed.
- Holes and gaps seen on the enclosure.
- Clearance required under IE Rules not available in front behind and side of the switches.
- Switches are installed behind the panel.

- Space around the switches are being used as rest shed / site workshop, place for sleeping, storeroom etc.
- Sundry articles, dumped on the way & in front making accessibility difficult.
- Trenches open.
- Metallic & other sharp objects, oil, cotton waste, water etc. seen in the cable trenches.
- Trenches not filled with sand.
- Danger board not provided.
- First aid box, fire extinguishers, sand buckets not provided near the main power entry panel of heavy industrial load bldg.
- No volt coil kept tied / jammed.
- Fuses not properly rated.
- HRC fuses not used.
- Fuses bypassed.
- Switch handle missing.
- Switches installed in such a location as to make operation difficult.
- Live parts exposed.
- Temporary/loose/dangling wires seen.
- Switches not fixed rigidly.
- Protective devices not functioning.
- Seepage of water seen on elec. Machine & control.

5.5 Machinery and their controlfor industrial buildings:-

- Machinery installed close to switch panel, making access to the panel difficult.
- Sundry stores seen near machine control making access difficult.
- Space around & behind the switch panel being used as a resting-place.
- Plug tops not being used.
- Swarf dumped/seen on/near the machine & control.
- Elec. Machine & control not provided with two independent connections to earth.
- Switch to put off the machine not provided on or near the machine or provided in an accessible position.
- Live parts, exposed.
- Flexible wire running over metallic scrap.
- Danger boards not provided.
- Protective devices not functioning.
- Fuses not properly graded.
- Levers of no volt coil jammed / tied.
- Earth leakage relay not provided.
- Chattering noise in the starter / control.
- Connections for machine lighting taken between phase & earth.
- Men sitting close/leaning on control panel / switches.
- Accessories being used for hanging other items or keeping personal & other articles or being used as a work shelf/bench.

- Cable connecting the machine not protected mechanically.
- Cable not supported.
- Proper three / four pin plug tops not being used.
- Ty/loose wire seen.
- Flexible wires of adequate size,insulated, & with required number of cores not being used for portable appliances.
- Machinery in explosive process bldgs. do not confirm to STEC regulations.
- Seepage of water seen on elec. machine & control.
- Water line/steam line installed close to machine & control.
- Floor of the control panel machine not level.
- Control panel lifted to one side.
- Wiring worn out at places.
- Inspection lamps connected between line earth.
- Inspection lamp of 230V being used in production area.
- Leads of inspection lamp too long.
- Too many joints seen on inspection lamp leads.
- Earth wire not provided along with inspection lamp.
- There is no space in front of gantry crane control unit on the top for maintenance person to work.
- Live wires accessible to the overhead gantry crane operator from his cabin, also while climbing into the cabin.
- Ladder installed on the same side as bus bars of gantry crane.
- Operator sitting in the control cabin on a planket in an unsafe manner.

5.6 Earthing in industrial wiring installations:-

- Machinery & control boxes not provided with two independent connections to earth.
- The earth wire is not of adequate size.
- Earth pits could not be located.
- Earth chambers not provided.
- Conduit pipes not continuous with earth.
- Portable appliances (metallic part) not continuous with earth.
- Earth wire not taken for portable appliances.
- Earth connections not provided in 3-pin/4-pin plug socket.
- Earth wire seen out.
- Earth wire not rigidly fixed.
- Earth wire of Aluminium in contact with floorings/walls without separators.
- Earthing not being checked.
- Record of earth test not being maintained.
- Earth test results not satisfactory.
- Line earth not brought to the control board.
- Building earth and line earth not linked up.
- Metallic enclosure to bus bars/machinery are without earth connections.

- X-ray machine in the hospital is not provided with addl. Earth pit.
- Cable armour not effectively connected to earth or bear continuity with enclosure of machine and their control.

ANNEXURE -F

GENERAL SAFETY PRACTICES IN ELECTRICAL WORK

B.1 EXERCISE CARES.

B.1(a) Place yourself in a safe and secure position to avoid slipping, stumbling or moving backward against live conductors or apparatus. Do not rely for protection upon the care assumed to be exercised by others.

B.1(b) In the event of near approach of a lightning storm, all out door work on electrical system should cease.

B.1(c) Make a habit of being cautious. Be on the lookout for danger notice places, danger flags, warning boards and signals etc. Warn others when they seem to be in danger near live conductors or apparatus.

B.2 PERSONAL APPAREL.

B.2(a) Use of overalls, dangerees, jumpers and coats having metal buttons, metal straps and similar metal fitting should be avoided. Bone buttons may be used. Buttons should be sewed in place with thread. Loose clothing should not be worn.

B.2(b) While working on live conductors, do not roll up sleeves as dry cloth gives some protection against shocks.

B.2(c) Do not wear shoes with nailed soles. Shoes should have sewn soles, or preferably rubber soles.

B.2(d) Do not wear suspenders and arm bands with metal buckles or other metal parts. These might come in close proximity to live parts and cause serious, if not fatal injury.

B.2(e) Metal key chains, or metal lepers for key rings or watch chains should not be worn on the outside of clothing. There is always a possibility that they may come in contact with live conductors or live apparatus.

B.2(f) While welding, wear goggles, safety glasses or any other protection as instructed by the person-in-charge depending upon the type of work handled.

B.3. TREAT EVERYTHING AS LIVE.

B.3(a) Treat all electrical conductors and apparatus always as live and consequently dangerous to human live, unless it is positively known to be dead and properly earthed and take precautions accordingly.

B.4 THINK BEFORE YOU ACT.

B.4(a) Think carefully before you act. Make sure you are right. Watch out for the other man and make sure he is right.

B.4(b) Never speak to any person working upon live mains or apparatus, unless the person doing the work is aware of your presence.

B.5 DANGEROUS VOLTAGES

B.5(a) All voltages are dangerous. It shall be borne in mind that even low voltage shock may be fatal.

B.5(b) Every person in-charge of work on any mains or apparatus shall ensure himself that the same is free from dangerous leakage or induction and has been effectively earthed locally before permitting men to work upon it.

B.6 DANGEROUS AREAS

B.6(a) When working in areas which contain or may contain live mains and apparatus, fix danger notice plates, barriers rails or other guarding arrangement for the working area. Do not store materials within high voltage enclosures or low voltage areas.

B.7. WARNING BOARDS

B.7(a) Warning boards shall be placed by the person in-charge on all switchgear before men are permitted to work and should only be removed by the person who has placed them. It is desirable that the person issuing the permit shall place one warning board on the switch energizing the mains for each permit issued so that he can be sure that all the permits to work are returned when he has to charge the mains.

B.8 VISITORS AND UNAUTHORISED PERSONS.

B.8(a) Visitors and unauthorised persons shall not be allowed to proceed in the vicinity of live mains and apparatus, unless accompanied by an authorised person who will be responsible to ensure that these instructions regarding safety are strictly complied with.

B.9 WORKING IN DAMP SITUATIONS.

B.9(a) Extra precautions should be taken when working in abnormality damp area.

B.10 USE OF TONG OR CLIP ON AMMETERS.

B.10(a) These shall not be used on high voltage conductors, unless the conductors are lead sheathed. On low voltage conductors, all persons not accustomed to the handling of tong or clip on ammeters, shall be warned by the person instructing them of the necessary precautions to be observed before being allowed to use it.

B.11 WARNING THE PUBLIC.

B.11(a) When either accidentally or otherwise, live mains and apparatus constitute a danger to persons in a public area, a person shall be detailed to stand by personally warn the public until the danger has been removed.

B.12 PORTABLE ELECTRICAL APPARATUS.

B.12(a) All portable electrical apparatus shall be regularly examined, tested and maintained to ensure that the apparatus and leads are in good order.

B.12(b) Ensure that all portable appliances are provided with 3 pin plug and socket connections and that the metal work of the apparatus is effectively earthed.

B.12(c) All loose wiring, such as flexible cables for portable lamps, tools and trailing cables and other portable and transportable apparatus, shall be tested / checked visually regularly at frequent intervals to ensure safety.

Format 1A, 1B & 1C

{Ref. Para 1.16(c)}

Format 1 A (SUMMARISED POSITION)**{Ref. Para 1.16(c)}**

S. No.	DATE OF AUDIT*	TOTAL OBSERVATIONS POINTED OUT.	No. OF POINTS SETTLED TILL LAST MONTH.	POINTS SETTLED DURING THE MONTH	No. OF POINTS PENDING FOR SETTLEMENT.

*To be furnished chronologically.

Format 1 B (COMPLETION REPORT FOR THE MONTH OF ……)
{Ref. Para 1.16(c)}

S. No.	DATE OF AUDIT	OBSERVATIONS No.	LOCATION.	OBSERVATION DETAILS	CORRECTIVE ACTION TAKEN

Format 1 C (LIST OF PENDING OBSERVATIONS/OBJECTIONS)
{Ref. Para 1.16(c)}

S. No.	DATE OF AUDIT	OBSERVATIONS No.	LOCATION.	REMEDIAL ACTIONS SUGGESTED	PDC

{All above formats as per OFB letter No. 411/CEI/COS, Dtd.:- 20/08/2014}

Schedule-III(From the CEA Regulation 2010)

Handling of live (hot) electric supply lines and apparatus
[Ref. Para 3.15]

Precautions to be observed:-

(1) Hotline Maintenance trained personnel only are designated to do work on line.
(2) Work permit will be taken from the terminal substations at each end of the line.
(3) Work shall be performed with proper planning and- prior understanding and clarity.
(4) Favourable climatic condition for hotline operations is sunny weather.If the weather forecasts rain or thunderstorms work will not begin.
(5) Organisation of work shall be discussed among the members and responsibility of each team member fixed.
(6) Before going to the work site all equipment and tools shall be inspected and checked forcorrect operation.

(7) Auto re-closure shall be in 'OFF' position for the line at both ends.

(8) The work procedure shall be discussed with the team member at thetower location and the responsibility of each member shall be properlydefined.

(9) The land in close vicinity to the tower shall be cleared to provide a sitearea for the required tools.

(10) All cleaned hot sticks, strain carrier and other -assemblies shallbe- kept on the hotline tool rack to avoid ground contact.

(11) Wear helmet, safety shoes and safety belt shall compulsorily be used.

(12) All hot sticks and ladders shall be cleaned and checked for integrityby the hot sticks Tester.

(13) All linemen in the hotline team shall be equipped with personalprotective equipment during the work.

(14) No live-line team members on-the tower and conductor shall wearany metallic chain, wristwatch or ring to avoid any circulating current.

(15) The team linemen will wear conductive socks; boots, helmets and hand gloves. The 'hot-end' lineman shall wear complete bare hand suit.

(16) Tarpaulin sheet should be laid on the work area.

(17) A light vehicle shall be kept nearby during entire work period.

Tools normally required for hot line maintenance operation:

The following tools conforming to relevant Indian Standard or equivalent specifications shall be used in on-line working.

(1) Wire tongs
(2) Wire tongs saddle
(3) Tie sticks
(4) Strain link sticks
(5) Roller link sticks
(6) Suspension link sticks
(7) Auxiliary arms
(8) Strain carrier
(9) Gin poles
(10)Cum-a-along clamp
(11) Safety equipment like conductor guards, X-arm guards,insulator covers, hand gloves etc.
(12) Hot sticks

Safe Working Distance

The following safe working distances shall be observed:-

Phase to Phase	Safe Clearance
kV	Meter

11	0.61
33	0.71
66	0.91
110	1.02
132	1.07
220	1.52
400	2.13

COMPARISON BETWEEN THE IR RULES 1956 & THE CEA REGULATIONS 2010.

IE Rules' No.	Subject	CEA Regulations' No.	Change / Comments
2	Definitions	2	Not seen the definition for Inspector. But with, - Qualifications, Powers and Functions of Chief Electrical Inspector and Electrical InspectorsRules, 2006 - the "Inspector" is already defined as *Chief Electrical Inspector or Electrical Inspector as the case may be*.
3	Authorised person to look after the installation	3	# 3(2) A register is to be kept with the plant wherein the names of the designated persons and the purpose for which they are engaged. # 3.3(1) The person engaged need to have certificate of competency or electrical work permit, issued by the appropriate Govt.
Nil		4	Register of the designated persons appointed under regulation (3) shall be checked by the Electrical Inspectors. If he find the qualification is notadequate, he can recommend to remove the person. *(But, the base of the qualification is not clear. It might be depending upon the nature of theplant, etc. which is followed at present.)*
5	Entry and Inspection	Nil	Nothing specified with new regulation. But with rule-7 of Qualifications, Powers and Functions of Chief Electrical Inspector and ElectricalInspectors Rules, 2006 it is already defined.
3(6)	Electrical Safety Officer	5	(a) Suppliers of Electricity (including generating, transmitting & distributing companies) & (b) Every factory registered under factory act, 1948 having connected load > 250kWshall appoint *Electrical Safety Officers*, who need to conduct periodical inspection of the installation, get them tested and keep record. Theserecords are to be made available to the Electrical Inspector, if and when required.
Nil	Safety measures for operation &maintenance of electric plants	6	(New addition)
Nil	Safety measures for operation &maintenance of transmission & distribution systems	7	(New addition)
Nil	Keeping of reports & inspection there of	8	*Electrical Inspector* has to supply to the generating company or the licensee, a report format to record maps, plans & sections relating to supplyor transmission of electricity. Electrical Inspector has to conduct random checking of such records.
21	Deposit of maps	9	No change
22	Deposit of printed copies	10	No reasonable change
Nil	Plan for area of supply to be made and kept for inspection	11	The map of the licensee shall be checked by Electrical Inspector as per regulation 11(1).

IE Rules' No.	Subject	CEA Regulations' No.	Change / Comments
29	General safety requirements pertaining to construction, installation, protection, operation and maintenance of electric supply lines and apparatus	12	A sub-regulation 4(4) regarding the installation of the electrical equipment above MSL.
30	Service lines and apparatus on consumer's premises	13	No change
31	Switchgear on consumer's premises	14	The word cut-out is replaced with switch gear
32	Identification of earthed and earthed neutral conductors and position of switches and cut-outs therein	15	No change
33	Earthed terminal on consumer's premises	16	The word cut-out is replaced with switch gear in the definition of the 'point of commencement of supply of electricity'.
34	Accessibility of bare conductors	17	Change is there with the sub-regulation (c) that the safety measures specified with relevant Indian Standards are to be considered.
35	Danger Notices	18	
36	Handling of electric supply lines and apparatus	19	Two sub-regulations (5) & (6) are seen added newly mentioning about earthing, painting & identification of the panels/switch gears.
37	Supply to vehicles, cranes, etc.	20	No change
38	Cables for portable or transportable apparatus	21	No change
39	Cables protected by bituminous materials	22	No change
40	Street boxes	23	No change
41	Distinction of different circuits	24	No change
41A	A Distinction of the installations having more than one feed	25	No change
42	Accidental Charging	26	No change
43	Provisions applicable to protective equipment	27	No change
44	Instructions for restoration of persons suffering from electric shock	28	No change
44A	Intimation of Accidents	Nil	Section-161 of Electricity Act, 2003 & Intimation of Accidents (Form and Time of service of Notice) Rules, 2004
45	Precautions to be adopted byconsumers, Owners, occupiers,electrical contractors, electrical workmen andsuppliers	29	No change (every electrical works to be carried out by a licensed electrical contractor)
IE	Subject	CEA	Change / Comments

Rules' No.		Regulations' No.	
46	Periodical inspection and testing of installation-	30	# Sub-rules 2(a) & (b) regarding the steps to be taken for the non-remittance of inspection fee are seen removed. # Sub-rule (3) fixing the responsibility of the consumer in maintaining the installation free of danger is seen deleted.
47	Testing of consumer's installation	31	To the existing content a point is stressed that the test report furnished by a consumer which is duly signed by a licensed electrical contractor could be accepted without further testing by the supplier.
47A	Installation and Testing of Generating Units	32	The capacity above which to be inspected by the Electrical Inspector before commissioning will be notified by the appropriate Govt. as per the provisions of sub-section (1) of 162 & clause (x) of subsection (2) of 176. (In short, the powers to be exercised and the functions to be performed by the Inspectors are yet to be notified by the State Government.)
48	Precautions against leakage before connection	33	No change
49	Leakage on consumer's premises	34	No change
50	Supply & use of electricity	35	Some minor changes. The word energy is replaced with electricity. New word 'inverted' added.
50A	Additional provisions for supply and use of energy in multi-storied building(more than 15 meters in height	36	With the following important additions. All the other sub-clauses remain unchanged. # The connected load & voltage above which Electrical Inspector is to be inspected will be notified by the Appropriate Govt. # The height of the emergency push button is now not more than 1.7m, but with IER, this limit was 2.75m.
51	Conditions applicable to installations of voltage exceeding 250V	37	No change
52	Appeal to Inspector in regard to defects	38	the sub-rule(3) to endorse with the certain notices is seen deleted.
53, 54 & 55	Rule-53 regarding the cost of inspection & test, Rule-54 about the declared voltage & Rule-55 about the declared frequency are not seen defined with the CEA Safety Regulations, 2010.		
56 & 57	Rules 56 & 57 related with meters has seen removed, due to the exclusive regulations under CEA (Installation and Operation of meters) Regulations,2006.		
58	Point of commencement of supply	Nil	It is already defined through regulation-16
59	Precautions against failure of supply, Notice of failures	39	No change

IE Rules' No.	Subject	CEA Regulations' No.	Change / Comments
60	Test for resistance of insulation	40	No change
61	Connection with earth	41	No change
61A	Earth leakage protective device	42	No change
62	Systems at medium voltage	Nil	Seen deleted
63	Approval by Electrical Inspector	43	# the voltage above which Electrical Installations need to be inspected by the Electrical Inspector will be notified by the Appropriate Govt. # With rule the period of recommencement of supply after an installation was disconnected, after which permission from Electrical Inspector is needed was one year. But, with the regulation this period is reduced to six months.
64	Use of energy at voltage exceeding 650V	44	# As in the case of regulation-43 the period specified for recommencement of supply after disconnection is six months. # The minimum safety working clearances which shall be maintained for the bare conductors or live parts of any apparatus in outdoor substations excluding overhead lines of installations of voltage exceeding 650V is explained with Schedule-VII of CEA Safety Regulations, 2010. # The fire-fighting system for transformers explained with sub-rule 2(f)(ii)(c) is now redesigned through sub-regulation 44(2)(ix) # 44(2)(x)(f) – Use of Fire Retardant Low Smoke (FRLS) is newly added. # 44(5) is explaining minimum safety working clearances which shall be maintained for the bare conductors or live parts of any apparatus in outdoor sub-stations excluding OH lines HVDC installations. The Schedule-VIII gives the clearance details. # 44(6) - there shall not be tapping of another transmission line from the main line for 66kV and above class of lines.
64A	Interlocks and protection for use of electricity at voltage exceeding 650V	45	# 45(2)(vii) – Bus-bar and LBB protection for 132kV and above. In IER, it is 220kV & above. # 45(2)(viii) - for generating station & substations connected to the grid at 200kV & above, disturbance recorder need to be provided. # 45(2(ix) - Distance protection and carrier communication shall be provided for all lines connecting to 400/220kV substation.
65	Testing, Operation and Maintenance.	46	A major change is there that; the failures of transformers and reactors above 20MVA or MVAR need not be reported to the Electrical Inspector as mentioned with the repealing sub-rule 65(8)
66	Metal sheathed electric	47	Not any reasonable change.

	supply lines. Precautions against excess leakage.		
67	Connection with earth for apparatus exceeding 650V.	48	Not any reasonable change.
68	General conditions as to transformation and control of energy	49	Not any reasonable change.
69	Pole type sub-stations	50	No change
70	Condensers	51	No change
71	Supply to tube sign installations of voltage exceeding 650volts but not exceeding 33kV	52	Only one change that the height of the emergency fire switch shall be 1.7m instead of 2.75m as in the case of regulation-36.
72	Additional provisions for supply to high voltage boilers	53	No change
73	Supply to X-ray & high frequency installations	54	No change
74	Material and strength	55	No change
75	Joints	56	Here a modification is that within a span, only one joint can be permitted [56(1)], whereas with rule it is 2.
76	Maximum stresses: Factors of safety	57	Not any reasonable change.
77	Clearance above ground of the lowest conductor	58	# Sub-regulation-58(5) is added for HVDC Line clearances and # Sub-regulation-58(6) gives a diagram with schedule-X for Ground clearances.
78	Clearance between conductors and trolley wires.	59	No change
79	Clearance from buildings of lines of voltage and service lines not exceeding 650Volts	60	# An important sub-regulation 60(1) added that an OH line shall not cross an existing building as far as possible and no building shall beconstructed under an existing overhead line. # The vertical and horizontal clearances are explained through a diagram under schedule-X through sub-regulation 60(5). (All the otherclauses remain the same.)
80	Clearances from buildings of lines of voltage exceeding 650Volts	61	# 61(1) - OH line shall not cross an existing building as far as possible and no building shall be constructed under an existing overhead line. # 61(4)- for HVDC Line clearances. # 61(5) - The vertical and horizontal clearances are explained through a diagram under schedule-X. (All the other clauses remain the same.)
81	Conductors at different voltages on same supports	62	Same content of the rule with an addition direction to comply with regulation-69.
82	Erection of or alteration to buildings, structures, flood banks and elevation of roads	63	63(7) – Time period to carry out the alteration extended to 2 months from one month.

IE Rules' No.	Subject	CEA Regulations' No.	Change / Comments
82A	Transporting and Storing of material near overhead lines	64	# 64(4)- No flammable material shall be stored under the electric supply line, # 64(5)- No fire shall be allowed above underground cables, # 64(6)- Firing of any material below electric lines shall be prohibited. (All the other clauses remain the same.)
83	Clearances: General	65	Totally new. # 65(3) – No cutting of soil within 10 meters from the tower structures of 132kV and above is permitted without the permission of the owner of the structure. # 65(4) Construction of air polluting units within 500m of lines of 220kV and above is prohibited.
84	Routes: Proximity to aerodromes	66	Not any reasonable change.
85	Maximum interval between supports	67	Not any reasonable change.
86	Conditions to apply wheretelecommunication lines and power linesare carried on same supports	68	Not any reasonable change.
87	Lines crossing or approaching each other	69	# 69(iv) HVDC clearances # 69(ii) Guarding is made mandatory for lines of voltage not exceeding 33kV when cross a road or street. (All the other clauses remain thesame.)
88	Guarding	70	Not any reasonable change.
89	Service-lines from Overhead lines	71	No Change
90	Earthing	72	No Change
91	Safety and protective devices	73	73(1) – OH line shall be protected with earth guarding itself. In rule it is 'a device approved by Inspector'
92	Protection against lightning	74	With rule-92, it was directed to connect a vertical ground electrode to the junction of the earth mat. With regulation-74 connection to a separate vertical ground electrode or junction of the earth mat is enough.
93	Unused overhead lines.	75	The time limit for removal of the unused overhead line is enhanced to 30 days from 15 days.
Nil	Laying of cables	76	# 76(1) – No underground power cable of voltage exceeding 33kV shall be laid without a minimum underground depth of 1.2m. # 76(2) – No underground telecommunication cable shall be laid without a minimum separation distance of 0.6m to the underground power cable of voltage exceeding 33kV.
Nil	Protection against electromagnetic interference	77	The owner of every overhead power line of voltage level 11kV or higher shall submit proposal for obtaining Power Telecommunication CoordinationCommittee clearance to ensure safety of the personnel and telecom equipment.

IE Rules' No.	Subject	CEA Regulations' No.	Change / Comments
94	Additional rules for electric traction	78	If the voltage exceeds 650V permission from Electrical Inspector is required before commissioning.
95	Voltage of supply to vehicle	79	No Change
96	Insulation of lines	80	No Change
97	Insulation of returns	81	No Change
98	Proximity to metallic pipes, etc.	82	Two new clauses added with the existing clauses of the rule.
99	Difference of potential on return	83	No Change
100	Leakage on conduit system.	84	No Change
101	Leakage on system other than conduitsystem	85	No Change
102	Passengers not to have access to electric circuit	86	No Change
103	Current density In rails	Nil	Seen deleted
104	Isolation of sections.	87	No Change
105	Minimum size and strength of trolley wire	88	No Change
106	Height of trolley-wire and length of span.	89	No Change
107	Earthing of guard wires.	90	No Change
107A	Proximity to magnetic observatories andlaboratories	91	No Change
108	Records	92	No Change
109 to 116	Safety requirements of mines & oil fields	93 to 100	No Change
Nil	Earthing metal	101	Newly added
118	Voltage limits	102	No Change
119	Transformers	103	No Change
120	Switch gear & terminals	104	No Change
121	Disconnection of supply	105	No Change
122	Cables	106	No Change
123	Flexible cables	107	No Change
124	Portable and transportable machines	18	No Change
125	Sundry precautions	109	No Change
126	Precautions where gas exists.	110	No Change
127	Short firing	111	No Change
128	Signalling	112	No Change
129	Haulage	113	No Change
130	Earthing of neutral points	114	No Change
131	Supervision	115	No Change
132	Exemptions	Nil	Seen deleted

IE Rules' No.	Subject	CEA Regulations' No.	Change / Comments
133	Deviations	116	(1) The Central Government or State Government, as the case may be, by order in writing, allow deviations in respect of matters referred in these regulations except regulation 30. (2) The Electrical Inspector or the inspector of mines may, by order in writing, allow deviations in respect of matters referred in regulations 12 to17, 28, 35(2)(3)and(5), 36(3), 37(i)to(iv), 41(xii), 43, 44(2), 46, 52 to 54, 57 to 61, 65, 72, 74, 78 to 91, 102, 107(6), (8) and (10) and 114. *Explanation*:- Every order allowing the deviations by the Electrical Inspector or the Inspector of Mines under sub-regulation (2) shall be placed before the Central or State Government which may disallow or revise such deviations.

RESTRICTED **COPY NO.**

HIGH EXPLOSIVES FACTORY

KHADKI, PUNE – 411 003

SAFETY MANUAL – 2019

PART – I, II & III

(UPDATED VERSION OF SAFETY MANUAL- 2010)

ISSUED BY	APPROVED BY
(V.B.KURIL) CHIEF SAFETY OFFICER	(V.K.TIWARI) GENERAL MANAGER
PLACE: KIRKEE	15.10.2019

F O R E W O R D

In any manufacturing organization which is progressive, Safety Management assumes an important position. Statutory requirements and obligations apart, we have to lay stress on safety in the light of enormous loss of manpower, material and income along with the ignominy of failure to honor commitments on account of accidents.

1.1 The human misery and the social repercussions due to accidents and hazards related to production can question the very existence of and erring organization.

2.0 We, in the High explosives Factory Kirkee, have been maintaining high safety standards for the last many years and efforts are on for bringing about improvements in the safety system.

2.1 The fact that High Explosives Factory, Kirkee has been successful in obtaining latest **IS/ISO 9001 : 2015 for QMS, IS/ISO 14001 : 2015 (EMS) , IS /ISO 45001 : 2018 (OHSMS) , IS / ISO 50001 : 2011 (EnMS)** Certification adds to the responsibilities on the Safety point and it becomes the bounden duty of all officers, staff and workman of the factory to put in their best efforts to remove unsafe conditions and prevent unsafe act and practices.

3.0 **HEF received "Golden Peacock Occupational Health & Safety Award" for year 2019, which has been communicated to all by twitter and displayed on OFB web portal.**

4.0 Spelling out the Safety policy and laying down standards of safety becomes the first and foremost step towards effective safety management. Efforts have been made, therefore, to make this Safety Manual comprehensive and exhaustive. This is updated version of Safety Manual issued in year 2010.

4.1 It is hoped that the same will go a long way in informing, educating and instructing the employees at all level for bringing total Safety Management in this factory with a view to achieving zero level accidents in future.

KIRKEE
DATED : 15 Oct. 2019

(V.K. TIWARI)
GENERAL MANAGER
HIGH EXPLOSIVES FACTORY
KIRKEE, PUNE - 411003

SAFTEY POLICY

The officers, Staff and Workmen of
High Explosives Factory, Kirkee
are committed both, in letter and spirit to provide a
'SAFE AND HEALTHY'
working environment for all the employees.
Safety is given prime importance
and our motto is
'SAFETY FIRST AND PRODUCTION MUST'.

IMPLEMENTATION

The Management ensure provision of Safety Equipments and gadgets to employees engaged in various hazardous operations.

i) All production process are covered by detailed standing Instructions specifying clear Dos & DONTs, which are duly published and explained to all concerned.

ii) Plants are provided with latest Safety Equipment like automatic cut-off switches warning systems etc. conforming to stipulated standards.

Periodic testing of all plants, Machineries and Equipments by suitable competent personnel will be ensured.

iii) Usage of PPE's will be insisted upon during the processes will continue to be carried out to ensure good health of the work force.

iv) All plants, Machineries and Equipments installed will work safely and periodic preventive maintenance carried out timely and adequately.

Work permit system as laid down for undertaking maintenance work in specified areas will continue to be followed scrupulously.

v) Prohibition of banned article in dangerous areas like synthetic clothes, tobacco, watches, match-box etc., will be rigidly implemented.

In case of serious violations of safety guidelines and procedures are noticed, Safety Section will have the right to order suspension of production till the deficiencies rectified by the concerned production sections.

IMPROVEMENTS

i) Every effort will be made to continuously improve the safety standards by encouraging suggestions through various participative forms like the Section Safety Committee and the Central Safety Committee at the apex level.

ii) Periodic in-house training courses on Safety, House Keeping and General Welfare will be conducted to inculcate safety consciousness amongst all the employees.

iii) Suggestions scheme will be maintained to encourage and reward innovative suggestions aimed at enhancing the quality of Safety Standards.

FEED BACK FOR IMPROVEMENTS

i) A full-fledged safety department exclusively dealing with safety measures will continuously monitor the implementation of safety measures and ensure prompt feedback for any shortcoming.

ii) Apart from the above, a team of officers nominated by the General Manager will make regular periodic checks of different work areas and identity short-coming for immediate remedial actions.

iii) Regular Safety Audit/Surveillance by COS, OFB, CFEES New Delhi, RCS(WR), REI and team of Officers from AFK, OFDR and HEF will continue to be carried out periodically to review the working of the factory vis-à-vis the safety standards.

SAFETY AUDITS

HEF has system of six level of safety audits

LEVEL	FREQUENCY	CONDUCTED BY
I	MONTHLY	FACTORY OFFICERS
II	HALF YEARLY	OFFICERS FROM SISTER FACTORY
III	YEARLY	RCS (WR), PUNE
IV	YEARLY	CFEES, DELHI
V	HALF YEARLY	REI, RCS (WR), PUNE
VI	MONTHLY	QAE (ME)/HEF

WE BELIEVE THAT WHEN IT COMES TO SAFTY THERE IS NO COMPROMISE

EMPLOYEES INVOLVEMENT

1) Participation in Section Safety cell.
2) Participation in Production Safety Committee.
3) Reporting of Unusual incidents.
4) Awareness for the work.
5) Taking care for himself and his colleagues.

I N D E X

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INTRODUCTION

It was in the year 1939 that Indian Ordnance Factory laid the foundation of Chemical complex at Kirkee. The factory was aptly named as High Explosives Factory, Kirkee due to setting up of the main production streams consisting of TNT & CE. In the past 80 years of its march, the factory has met production commitments, grown considerably in size progress of technology, updating of items of production and general outlook.

STATIC INFORMATION

AREA	:	265.56 ACRES
LENGTH OF PERIMETER	:	4.6 KM
MANPOWER	:	931 NOS.
GROUP A	:	25
IOFS	:	20
OTHERS	:	05 (S.O - 02, CMO - 01, AD(OL) - 01, ALWC- 01)
GROUP B	:	122
NGO's	:	178
NIE	:	177
IES	:	428 (Direct IE s : 285)

ACTIVITIES :
PRODUCT RANGE OF HIGH EXPLOSIVES FACTORY IS AS UNDER

PRIMARY EXPLOSIVES	LIQUID PROPELLANTS
LEAD AZIDE	G-FUEL & O- FUEL (Oxidiser)
BASIC LEAD AZIDE	
MERCURY FULMINATE	AMMUNITION STORES
TETRAZENE	SLAB DEMOLITION TNT
LEAD STYPHNATE	HAND GRENADE No 36M MK
Composition RD-1303	RIFLE GRENADE No 36M MK1
Composition RD-1337	CRT 51 MM AUG. CHARGE
	CRT 81 MM AUG. CHARGE
	CRT120 MM AUG. CHARGE
	CE PRIMER
HIGH EXPLOSIVES	
TRI NITRO TOLUENE	OTHER STORES
TETRYL(CE 14 /100)	2,4-DNT
HNS	SOAP SULPHITE
PEK-1(Plastic Explosive)	LIQUID DETERGENT

1.1 The factory feels proud for its achievements in planning, experimenting, establishing and putting on production new items like **Rifle Grenade 36 M Mk1, Augmenting Cartridges for Mortar Bomb 81mm, 120mm & 51mm, CE Primer, Slab Demolition** and also in the process of IRD new plant under erection and commission for development of **Ammonium Perchlorate,** and Combustible Cartridge Case for BMCS M 92 Module. At present factory has production items ranging from Acids , Initiators, High Explosives, Liquid Propellant for missiles 'G' Fuel & RFNA, explosives for Civil Trade, Hand Grenade, Rifle Grenade 36 M Mk1, Augmenting Cartridges for Mortar Bomb 81mm, 120mm & 51mm, CE Primer and other diversified products.

MODERNISATION APPROACH

LONG TERM:

- **Process automation with adoption of Industry 4.0 :**
- **Bldg. No. 223 for Nitration of TNT**
- **Bldg. No. 48 for Nitration of CE**

SHORT TERM:

- **Process Automation with trade assistance**
  Automatic filling, weighing, sampling, packing, printing & conveying of TNT boxes .
- **Process Automation in-house**
  Process for chemical treatment of red water developed.

2.0 What one should observe when he / she join the factory?

Within a day or two of his / her joining factory he / she should go through the following rules and get conversant of the same.

(1) RULE AND REGULATIONS OF HEF, KIRKEE 1994.

This comprises General Instructions and Rules regarding admission, searching, care and supervision of manufacture, precautions to be observed in connection with clean and danger buildings explosives substances, protection against fire and procedure to be adopted in case of fire and accidents.

(2) Standing Instruction on Fire Orders

He / She is given a first aid & fire fighting preliminary training by HEF Fire Brigade.

(3) Disaster Management

(4) Security Instructions

(5) Standing Instructions of various sections.

2.1 What he/she should observe when he/she is posted to section?

He should go through all the Standing Instructions pertaining to the section, where he is posted and get conversant with the same. He should ensure that all the rules and regulations of HEF as per HEF 312 (1954) are strictly adhered by him.

2.2 What he/she should observe when he/she enters the danger areas?

i) He/She should not enter the danger area unless he/she is authorized by danger area pass by HOS of concerned section.
ii) He/She should strictly follow the danger area rules and regulations.

2.3 What is expected of you as process plant operator?

Occurrence of an accident with natural culmination of a series of events or circumstances which invariably occur in a fixed and logical order. One is dependent on other and follows the other. If the series is interrupted by elimination of one of the several factors that comprise it the accident can be avoided. The knowledge of the factors in the accident sequence guides and assists in selecting the point of attack in prevention work. It permits simplification, expansion of safety work into underlying field of human behavior or limitations and helps in organizing and introducing most suitable control measure.

2.3.1 From this point of view our factory is mainly divided into two major sections viz Danger and Non-danger area emphasizing thereby on minds of people in factory the probable risks distinctly, admission to danger area is restricted to those who have to enter it for specific duty/duties after showing "Danger Area Entry Pass" to the D.B. attendants at the gates. A list of prohibited articles is displayed at Danger Area gates and if one has any of these, is expected to deposit them at gate and then enter. During course of duty when one has to move in Danger Area it is expected that he/she should know and ensure the following:

2.3.2 At gate and shift room.

i) Has a specific job in danger area
ii) Has a pass / token to go.
iii) Knows that wooden pegs in shift room are meant for hanging clothes and not Tiffin carriers.
iv) Must change his private clothes and wear D.B. suits provided.
v) Has no loose/metallic articles like wrist watch, ring comb, knife etc. with him.

2.3.3 In a process building he should.

i) Checkup that fire classification board and alarm card are conspicuously displayed.
ii) Fire fighting equipment is available and is in good condition. Sprinkler system, if provided for the building is O.K.
iii) Foot baths are filled with fresh water and people are dipping their feet in.
iv) Ensure that none is stepping in with private foot wear but is using D.B. Shoes / Chappals provided.

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v) Entry / Exit door are free from obstructions and kept wide open.

vi) S.I. Use List etc. are displayed properly. First Aid Box is O.K.

vii) He is confident and authorized to take over the charge of process.

viii) Details of process operations in progress are made know to him by staff in charge at the time of handing over and taking over. All articles are also handed over and taken over is good condition.

ix) Steam water, compressed air, c/w pressures are in accordance and as stipulated in S.I.s.

x) Building and surroundings are clean, swept wastes and other wastes are put in bins provided.

xi) Workers are wearing projective equipments like gloves, goggles, boots, gumboots etc.

xii) Provisions laid down in S.I. are strictly adhered to and violation if noticed / brought to notice and is rectified immediately.

xiii) Process work is going smooth in a planned manner and workers are busy in doing the jobs given to them. They are conversant with their jobs. No short cuts are practiced encouraged.

xiv) The man limit of building is not exceeded.

xv) The explosives stock in building is within the stipulated limit and action is taken to shift / transport the explosives immediately from process building.

xvi) Accumulation of fine dust of explosive is wiped off from time to time.

xvii) Earthing connections are in order and confirm from section office that they have been checked periodically and declared O.K.

xviii) Every one working in building is well trained and is conversant in taking actions in case of fuming, Fire / power off, thunder storm, sudden stoppage of plant / part of process etc.

xix) At no time the process is left unattended.

xx) All people working in building are always alert (and not sitting or relaxing).

xxi) Instruct all not to walk beneath acid pipe lines particularly beneath flanges.

xxii) Nitrous fumes are highly poisonous - if inhaled affects , respiratory system, immediate first aid should be given and hospitalized

2.4 What is expected of you as maintenance man?

2.4.1 Machines are dangerous as they are designed to change the shape and form of materials. Whenever a man and machine meet, the possibility of accidents is always there. To safe guard workers who operate, carry out maintenance it is necessary to make both the machine and man safe.

2.4.2 Under various provisions that can be thought of to prevent accidents are :-

1. Guards: - As laid down in provisions of Factories Act the moving parts of prime movers, fly wheels, transmission machines are required to be securely guarded. The statutory requirements are given in sections 21, 27 and 35 of the Act. The various type of guards are fixed guards, trip guard, Automatic guards, photo / electric guard two hand control etc.
2. Use of proper tools, tongs and belts.

3. Emergency stops.
4. Works dress.
5. Use of protective equipment's/gadgets e.g. gloves, goggles, shields, shoes helmets etc.
6. **General precautions to be taken.**
   i) No unauthorized man should operate a machine.
   ii) No job to be undertaken if not confident enough to do it. Await advice from seniors if in doubt.
   iii) No short cut methods to be adopted.
   iv) Extreme care to be taken when machinery / items contaminated with explosives are to be handled.
   v) Ensure that machine is isolated, power supply is cut off before starting job of repairs / maintenance.
   vi) Ensure that the machine is properly earthed and see that earting connections are restored after the job is completed.
   vii) Preventive maintenance is always better than attending break downs. Adhere to P.M. schedule.

2.5. What is expected of you as welder?

2.5.1 Welding is a very common operation in an industrial set up. Manual welding is a very a very common operation in an industrial set up. Many young people take up this trade and are seen working. But very few know the dangers concealed in this bright job. For safe working one must ensure . . . .

2.5.1.1 Electric Arc Welding.

1) 440 AC armored cable for supply from 440 V socket point (with plug) to the transformer of arc welding set must be adequately insulated and well protected without any joint.
2) Both welding lead and welding return cables must be of the same conductivity, well insulated and protected without any joint. Welding return cable should be connected direct to the job.
3) Two separate effective earthings for electric arc welding transformer set and for the joint.
4) Electrode holder must be well insulated.
5) Welder must wear welding shield crome leather apron, 18" long crome leather gloves, shoes with rubber sole and safety belts if he has work at heights.
6) Welding operation must be done under well protected shed away from solvents, flammable and combustible materials and moisture and explosives.
7) Welder's helper also must wear protective equipment.
8) The welding operation should be done in an isolated zone by placing a screen nearby for eye protection of other people.
9) Fire fighting equipment e.g. extinguisher and hydrant hose should always be kept ready.

2.5.1.2 GAS WELDING :-

a. Acetylene gas cylinders must be secured in vertical position to eliminate

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decomposition of dangerous hydrocarbon gas acetylene.

b. Job must be done under shed with adequate ventilation.
c. Oxygen cylinder also should be well secured and protected.
d. Lead pipes should be checked for leaks. Adequate dog-clips should be used. (Test pipe for leaks by soap water and not by naked flame).
e. Main valve, regulating valve, pressure gauges must be well protected.
f. Gas torches should be well maintained to eliminate leaks and crack.
g. Keep gas cylinders, torches always cool.
h. No combustible materials, oil grease, paint cotton waste and flammable materials should be kept nearby the job.
i. Gas cylinders should be handled with extreme care. The valves should be properly capped. Cylinders should not be rolled.
j. Use of protective equipment is a must.
k. Show a long handle flame before actual start of job.
l. Fire fighting equipment, running hose water to be kept ready nearby.

2.5.1.3 General - Welding Fumes :-

In addition to the risks enumerated above the concealed danger from poisonous fumes evolved during the operation are normally over looked.

The welding fumes cannot be classified simply. The composition and quantity are both dependent on the alloy being welded, the process adopted for welding and the electrodes used. On examining it is observed that –

i. Metals and alloys like Al. Titanium produce little fumes but an intense radiation which produces ozone gas is most poisonous – hence the welding jobs are to be done in protective, inert gas atmosphere e.g. Argon.
ii. Ferrous alloys generate considerable fumes and can produce flammable, toxic gas carbon monoxide. Arc welding on it is done in oxidizing atmosphere.
iii. Some coated flux and electrodes are formulated with fluorides and fumes associated with them contain significant amount of fluorides.
iv. During lead burning fumes produced because of molten heated lead are poisonous in nature. But these are slow acting and show effects at a later stage.

Thus to avoid the effects of fumes use of protective equipment's e.g. gas masks, protective shields, working a place where free and plenty of water, milk would help to dilute and make the inhaled fumes less effective.

2.6 What is expected of you as Rigger (Heavy Gang Leader)?

2.6.1 Many accidents take place between the time the piece of heavy material is slung for lifting and time it is safely set down. These accidents can be avoided if……

a) The man in charge of operation – the rigger has got proper knowledge and ability to do the job.
b) The equipment used for operation has got adequate capacity.

c) The equipment selected is in proper order and work worthy condition.
d) There is good understanding between the workers and the leader regarding allocation of work, order given etc.
e) The workers wear personnel protective equipment.
f) Factors influencing the operation e.g. weight of object to be lifted, size shape, distance to be moved, purpose of moving obstacles on way, condition of road / pathway on which it is to be moved. Anticipated movement of object horizontal, vertical, inclined, area available for lifting and unloading and other factors like type of building – explosive manufacturing / Acid manufacturing etc. if are given a pre – thought and job is planned accordingly.
g) The job is carried in a methodical and disciplined way.

2.6.2 DO's and DONT's for safe operation :-

2.6.2.1 DON'T's

i) Do not lift or transport a load until all personnel are clear.
ii) Do not allow any inexperienced man to operate a hoist
iii) Do not pickup load beyond the stipulated load limit of the hoist and also up to the extreme limit.
iv) Do not tamper with part of hoist – lengthen load chain, repair damaged chain or hook.
v) Do not give jerks in lifting and lowering loads.
vi) Do not use hoist ropes or chain as sling.
vii) Do not divert attention from load while operating.
viii) Do not leave suspended load un-attended.
ix) Do not keep sharp contacts between hoist and post, hook and hoist body.
x) Do not get disturbed and change your decided line of action for getting comments / suggestions.

2.6.2.2 Do's

i) Do study the instruction warning, information about the hoist.
ii) Do inspect, get repaired if need be and test the hoist periodically Time to time.
iii) Do keep the load chain / rope etc. clean and well lubricated.
iv) Do make sure that the load when lifted or lowered clears neighbouring stockpiles machinery or other items.
v) Do train the workers in your gang to have good understanding and smooth working.

2.7 What is expected of you as stores man.?

The ideal thing any industry would like to achieve would be to eliminate storage altogether. One would wish that raw materials would be obtained just when they are required and finished product will go out immediately as they are produced. But this can never be achieved. Stocks of raw materials, spare machinery, parts of machinery items, packages, other supporting chemicals etc. have to be maintained for the efficient production activity. Safety in storage and material handling does have a vital role in bringing down cost, maintaining quality and continuity of production.

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The main objects of storage of materials are :-

a. It must be available when required.
b. It must not deteriorate in quality.
c. It must not contaminate other products.
d. It should not endanger life and property.
e. It should not be lost either by leakage, pilferage, neglect.

2.7.1 To meet these objectives one has to know the properties of materials involved, the hazards and dangers it can cause conditions that can spoil and deteriorate it. The materials accordingly have to be grouped differently and stored suitably. Keeping this in view stores has to be planned giving due consideration to selection of site, right type of construction of buildings, electrical installations, segregation of dangerous, inflammable toxic materials, fire fighting equipment handling equipment and finally training of employees expected to do the jobs safety in handling storage of materials.

2.7.2 From safety point and in general it can be stated that-

i) Know the material that is to be stocked/handled.
ii) Give due respect to it depending on its nature.
iii) Handle with care, use protective appliances wherever need be.
iv) Exhibit the stock on date correctly, check them periodically.
v) Ensure Fire Fighting equipment is available to meet emergency.
vi) Adhere to stores preservation methods to increase life of store.
vii) Keep your store room neat and clean and without any obstacles.
viii) Be careful in opening drums. Use proper tools to open and close the drums.
ix) Do not hammer, throw down drums/ cylinders containing inflammable liquids/gases.
x) Handle the explosives packages with due care. Slight negligence may cost very high.
xi) Mark each item separately and store it.
xii) Clean empty drums properly before handing over for disposal/repairs.
xiii) Avoid spillage of material. If flooring gets dirty because of spillage, clean it immediately.
xiv) Always maintain an "Escape gap" between Explosive Van and Trolley, while loading a Explosive Van.
xv) In case of any doubt consult your seniors- do not take any action if you are not confident enough.

2.8 AS THE SUPERVISOR / SAFETY STAFF ENTERS EXPLOSIVE STORAGE HOUSE OR MAGAZINE, HE SHOULD SEE THAT:

2.8.1 Fire alarm card is conspicuously displayed and proper fire classification symbol boards are provided.

2.8.2 That the water tub at the clean barrier is clean and is filled with water.

2.8.3 That employees who work bare-foot wash their feet in the water tub provided. No person enters clean/danger building with footwear other than the ones provided for use.

2.8.4 That all exits are free from obstruction and doors are opening outwards and not kept bolted from inside.

2.8.5 The explosive limit is within the sanctioned limit. Stacking of explosives/ammunition packages is in accordance with magazine regulations/safety regulations and group compatibility.

2.8.6 At least 0.6 m space is left all-round the stack of packages and packages are stacked neatly and not in a haphazard way.

2.8.7 Temperature inside the explosive store house or magazine is as required and is recorded correctly and regularly.

2.8.8 Inside of the room/building is maintained in clean condition.

2.8.9 Adequate ventilation is provided

2.8.10 There are no fire hazard inside or outside the magazine (dry grass or combustible material, only cotton waste, paint, timber and textile scrap on the traverses or in the vicinity).

2.8.11 LP and earth continuity system has been tested up to date (As per relevant standing Instructions).

2.8.12 Building is not leaking.

2.9 **BEFORE HANDING OVER PLANT/MACHINERY FOR REPAIRS AND PRIOR TO TAKING OVER AFTER REPAIRS THE SUPERVISORY / SAFETY STAFF SHOULD SEE THAT :**

2.9.1 Plant/ equipment /floor is thoroughly cleaned and free from Explosives / dangerous/inflammable materials. Use destructive solution wherever required.

2.9.2 Dirty area board is displayed before allowing maintenance people to start work.

2.9.3 Required HEF – 18 (revised II) form (s) pass out form properly filled, has (have) been received from section (s) concerned and are duly vetted

2.9.4 Safety requirements stipulated in the pass out form are being adhered to / followed during maintenance operation.

2.9.5 Required HEF form (s) has (have) been received from repair section by concerned section and that repairs are satisfactory and machine / equipments is in working order.

2.9.6 Plant / equipment is thoroughly cleaned after maintenance / repair and all unwanted things have been removed.

2.9.7 The building has been checked and “passed in” by safety section before use.

2.9.8 Any other instructions issued from time to time by Group Officer / Divisional Officer (SF) regarding repairs, erection of new machine and modifications are also rigidly followed

2.10 **BEFORE RETURNING SCRAP / EMPTIES TO STORES /OTHER SECTIONS, SUPERVISORY SAFETY STAFF SHOULD SEE THAT**:-

2.10.1 The empties / scraps are free from explosive by carrying out physical check irrespective of the prior examination by safety staff.

2.10.2 Their storage and mode of storage is properly spelt out.

2.11 **FOR CONVEYANCE OF EXPLOSIVES BY ROAD THE SUPERVISOR /**

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SAFETY STAFF SHOULD SEE THAT.

2.11.1 All provisions contained in STEC pamphlet No. 2 are enforced. Salient points are:

2.11.2 No. road vehicle driven by steam or producer gas and no trailer other than an articulated one is used for transport of explosives.

2.11.3 Vehicle is not to be refueled within an enclosed explosive area.

2.11.4 No mechanically driven vehicle except those specifically approved for the purpose are allowed within the magazine.

2.11.5 Covered vehicles are normally be used. If these are not available, open vehicle may be used by adequately covering the explosives by tarpaulin.

2.11.6 **For conveyance of Group D explosives.**

a) Vehicle should be of covered type.
b) Should be fitted with quick action cut off to the fuel feed pipe as near the driver's seat, but not so close as to be involved in a fire therein.
c) Fuel tank is carried under the driver's seat only.
d) The inside of van body is not of ferrous material unless covered by non – sparking material or at least 2 coats of approved paint.
e) Wooden floor boards and other wooden structures are treated with "flame retardant."
f) Cab is separated from body of vehicle by a fire resisting screen carried down to within 30 cm of the ground, clear space of about 15 cm being provided between screen and body. Whole of exhaust pipe is carried in front screen.
g) No opening in the body of vehicle except door at the back which is fitting closely.
h) Vehicle is in good mechanical condition (road-worthy) with electrical fittings/ fuel system etc. in good working order.
i) Vehicle is neither fitted nor carried with any lamp other than electric lamp.
j) No fuel is carried in on the vehicles excepting in the tank.
k) Maximum quantity of explosives taken do not exceed **6000 kgs.(NEC**), subject to the condition that the gross weight of the load in no case exceeds that authorized load to be carried in the vehicles.
l) Vehicle is adequately escorted.
m) Normally explosives of one group only are to be loaded. When a full load cannot be made from one group, mixing of group may to done as under :-
   i) Explosive lorries - Group A, B, F, bulk explosives belonging to C & D.
   ii) All explosives except Group A, B, F and bulk explosives belonging to C& D in General Service Vehicles (of these C & D were inescapable).
n) No explosive is carried in cab.
o) All journeys are completed during day time only.
p) Speed does not exceed 30 km inside the factory and 40 km outside the factory. A loaded vehicle is not left unattended.
q) During loading / unloading precautions are taken for fire prevention / accident.
r) Fire class symbol is also displayed by the side of the red flag.
s) It must also be ensured that all instructions contained in Standing Instructions are strictly followed.

2.12 **WHEN TRANSPORTED IN HAND TROLLEY.**

2.12.1 Approved sealed boxes / containers are transported in cage trolley, stipulated rubber wheel.

2.12.2 Stacking in such a manner as to enable the men to see well ahead of trolley line.

2.12.3 Load is properly stacked and suitably secured to prevent possibility of toppling of trolley / materials.

2.13 CONVEYANCE OF EXPLOSIVE SAMPLES INSIDE FACTORY.

2.13.1 Sample of explosives are conveyed in approved safety containers only and proceeded and followed by flag holders carrying red warning flags wherever stipulated.

2.13.2 Under no circumstances explosives / ammunitions, are carried as head / shoulder load or under the armpit.

2.14 TRANSPORT OF INFLAMMABLE MATERIALS BY ROAD - THE SUPERVISOR / SAFETY STAFF SHOULD SEE.

2.14.1 That the barrels etc. are wrapped all round by gunny bags and bags kept wetted with water.

2.14.2 Only one person is allowed to travel in the rear of the vehicle to keep the gunny wet always.

2.14.3 A protective barrier is made, by placing sand bags around the containers.

2.14.4 Care is taken to avoid direct exposure of the barrels / containers to Sun / heat.

2.14.5 No refuelling is done with the engine on.

2.14.6 3 foam extinguishers are placed in the vehicle in an easily accessible position

2.14.7 The barrels / containers are placed properly so that these do not roll / topple while the vehicle is on the move

2.14.8 No lighter, matches or smoking materials are carried.

2.15 FIRST AID

2.15.1 The staff should ensure appropriate updated practical knowledge of the first aid to be rendered in the case of unfortunate accidents.

2.15.2 Staff should see that the first aid boxes and stretchers are available in the authorized buildings / spots and their locations are known to everybody.

2.15.3 The first aid should contain the periodically updated authorised items in requisite stocks. The name of the first - aider is to be painted on the first aid box.

2.16 Instilling safety consciousness amongst workers :-

2.16.1 Staff should take adequate measures to ensure implementation of the provision of the standing Instructions and Safety Regulation.

2.16.2 Do's and don'ts stipulated in the standing Instructions are to be explained to the junior staff and IEs on periodical basis, preferably with the aid of local language.

2.16.3 Staff should take adequate measures to understand the reasons for safety stipulations made in relevant GSD.

2.16.4 He should ensure that he himself follows S.I. scrupulously. Practicing the safety stipulations is the best method of enforcing implementation by junior staff and IEs.

3.0 ACCIDENTS - CAUSES AND CONTROL.

With years of experience and analysis of data collected, it is now established fact that accidents are events caused in an industry. They are caused because of unsafe / hasty actions, unsafe mechanical, electrical or physical conditions. The basic theory of accident occurring may be briefly stated as :-

i) A personal injury occurs only as result of an accident.

ii) An accident occurs only as a result of an unsafe action or exposure to an unsafe mechanical or physical condition or both.

iii) Unsafe actions or unsafe mechanical or Physical conditions exist only because of faults on the part of persons.

iv) Faults of persons are acquired from the environment and the reasons or causes for the faults are :-

- a) Anatomical of psychological unsuitability.
- b) Improper psychological characteristics.
- c) Lack of knowledge or skill.
- d) Improper mechanical or physical environment.
- e) Improper of safety regulations caused by anxiety, haste and adoption of short cut without proper guards.

The unsafe actions are generally as follows:-

- a) Operation without authority, failure to secure or warn.
- b) Operating or working at unsafe speed.
- c) Making safety devices inoperative.
- d) Using unsafe equipment, hands instead of tools/ equipments.
- e) Using given equipment, unsafely.
- f) Unsafe loading, placing, mixing, combining, pumping, blowing.
- g) Taking unsafe position or posture
- h) Distracting, teasing, abusing, startling etc.
- i) Failure to use personnel protective devices.
- j) Overconfidence because of regular acquaintance.
- k) Under estimating the damaging capacity of the product/machine being handled.
- l) General slackness- easy going tendency.
- m) Short- cuts device to finish the job early.
- n) Indulging in something else – lack of concentration on work spot.
- o) Unexpected breakdowns, failures of machines, power etc.

Bear in mind “Self by own efforts” – Accident to the bread winner results in punishment to innocent dependents.

3.1 Accident Prevention Programme

3.1.1 The first step in any accident prevention programme is elimination of various hazards whilst designing the process. If these were not possible the nest best step would be to control.

3.1.2 The physical, mechanical and chemical hazards in work environments by suitable engineering design. But when this also is not possible or able to give full proof protection

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to workers in process buildings or working elsewhere the third line of defence has to be resorted to this being the personnel protective equipments. These protective equipments cannot eliminate hazard or stop an accident taking place. These equipments merely set up a barrier against the hazards whereby preventing or minimizing an injury.

3.1.3 In selection of these equipments the following points are to be borne in mind.

i) Type of hazard to be faced.
ii) Selection of right type of personnel protective equipment.
iii) Availability of correct equipment in good condition at the work- spot.
iv) Training of workers to use the equipments.
v) Convincing the workers that the equipment if used will protect them from hazard.
vi) Making it a habit with the worker to use the equipment.
vii) Degree of protection needed.
vii) Ease and comfort with which it can be used and freedom of movement with equipment worn.
viii) Availability and accepted standards of materials of construction of equipment and their performance.
ix) Maintenance problems of these equipments.
x) Periodical checkup.
xi) Good Earthing.

The personnel protective equipment can be used to protect :-

i) Eyes - Goggles, shields.
ii) Ears - Earplugs, Ear. Muffs.
iii) Face - Plastic shields, welding helmets and shield, PVC hood wear.
iv) Head - Safety helmet.
v) Hands - Gloves (Rubber, PVC, Asbestos, leather cotton, canvas etc.)
vi) Feet - Shoes(with non-skid soles, Rubber Soles, steel toes, legging & Skin guards).
vii) Gonerd - Safety Belts.
viii) Respiration - Gas masks, Respirators of sorts, duties etc.

4.0 SALIENT PROVISIONS OF FACTORIES ACT.

A small piece of legislation i.e. The Indian Factories Act, 1881 mainly protecting children below the age of 7 years by prohibiting their employment in factories, restricting hours of work to a maximum of 9 hours per day and fixing rest intervals as also providing for four weekly holidays in a month was enacted by the Govt. subsequently the Indian Factories Act 1891, was passed on the basis of recommendation made to the Government of India by the Factories Commission appointed in 1890. This act modified the earlier Act 1881. With the advent of electricity in the early 19th century and the First world war of 1914 - 1919. Electricity gave considerable impetus to industries which started functioning during the day and night. The Act was amended in 1922. However, a Royal Commission was appointed in 1929 to enquire into the report on the conditions of labour of industrial undertakings and plantation in British India on health, nature and standard of living of workers and on the relations between the employer and the employee. As a result of recommendations made by the Royal Commission, a new enactment entitled "The Factories Act, 1934" was passed and brought into force from 1st January, 1935. Then

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came the present Act in 1948, which included many important provisions such as provisions for safety of the employees such as fencing machinery in motion, prohibition of young persons on dangerous machines, casing the new machinery, special measures for hoists, lifts lifting machine, lifting tackles, revolving machinery, and proper maintenance of floors stairs and other means of access, pits, sumps, excessive weights were made. There are also provisions for protection of eyes, precaution against dangerous fumes, explosives and inflammable dust, gas, etc. precaution in case of fire, safety of buildings and machinery, etc. With rapid industrialization after the 2nd World War, it was very much essential that the new factories act with the provision of safety is enacted and brought into force. As for as safety is concerned the following are the main features of Factories Act, 1948.

i) Fencing of machinery: - It should be ensured that all the machineries which are in motion are securely fenced to avoid any accident.

ii) Hoists and lifts, lifting machines, chains, ropes and lifting tackles: - This should be in sound mechanical condition and periodically tested.

iii) Pressure plant/**Vessel**: This should be periodically tested by external and Internal examination. At least once in two years pressure vessels should be hydraulically tested & **externally examined by competent person Half yearly as per Maharashtra factory rule 1963.**

iv) Floors, stairs and means of access: - These should be of sound construction and shall be kept free from obstructions.

v) Pits, sumps openings in floors etc. : - These should be securely covered or securely fenced to avoid any source of danger.

vi) Protection of eyes: - For protection of eyes by reasons such as exposure to excessive Light, risk of the injury to the eyes from particles or fragments thrown off in the course of the process effective screens or suitable goggles shall be provided.

vii) Precautions against dangerous fumes: - No. person shall enter any confined space until all practicable measures have been taken to remove any fumes which may be present. Suitable breathing apparatus, reviving apparatus and belts and ropes should be kept ready for instant use. No person shall be permitted to enter in any factory boiler furnace, boiler flue chamber, tank vat, pipe or other confined space for the purpose of working or making any examination therein until it has been sufficiently cooled by ventilation or otherwise to be safe for persons to enter. No portable electric light or any other electric appliance of voltage exceeding twenty four volts shall be permitted for use inside any chamber, tank, vat, pit flue or other confined space; and if any inflammable gas, fume or dust is likely to be present in such chamber, tank, vat, pit, pipe, flue or other confine space, no lamp or light other than that of flame- proof construction shall be permitted to be used therein.

viii) Explosives or inflammable dust, gas, etc. :- Where any manufacturing process produces dust, gas , fume or vapour of such character and to such extent as to be likely to explode on ignition, all practicable measures shall be taken to prevent any such explosion by –

a) Effective enclosure of the plant or machinery used in the process.
b) Removal or prevention of the accumulation of such dust, gas, fume or vapour.
c) Exclusion or effective enclosure of all possible sources of ignition.

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All practicable measures shall be taken to restrict the spread and effects of the explosion by the provision in the plant or machinery of chokes, baffles, vents or other effective appliances

a) Before the fastening of any joint of any pipe connected with the part or the fastening of the cover of any opening into the part is loosened, any flow of the **hazardous liquid**, gas or vapour into the part or any such pipe shall be effectively stopped by a stop – valve or other means :

b) Before any such fastening as aforesaid is removed, all practicable measures shall be taken to reduce the pressure of the gas or vapour in the part or pipe to atmospheric pressure;

c) Where any such fastening as aforesaid has been loosened or removed effective measures shall be taken to prevent any explosive or flammable gas or vapour from entering the part or pipe until the fastening has been secured or as the case may be securely.

4.1 PROVISIONS RELATING TO HAZARDOUS PROCESS (Sec 20 , 1987)

Sl. 41-A. Constitution of Site Appraisal Committees – (1) The State Governments may for purpose of advising it to consider applications for grant of permission for the initial location of a factory involving a hazardous process or for the expansion of any such factory, appoint a Site Appraisal Committee consisting of –

a) The Chief Inspector of the State who shall be its Chairman ;

b) A representative of the Central Board for the Prevention and Control of Water Pollution appointed by the Central Government under section 3 of the Water (Prevention and Control of pollution) Act , 1974 (6 of 1974) ;

c) A representative of the Central Board for the Prevention and Control of Air Pollution referred to in section 3 of the Air (Prevention and Control of Pollution) Act, 1981 (14 of 1981);

d) A representative of the state Board appointed under section 4 of the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974);

e) A representative of the State Board for the Prevention and Control of Air (Prevention and Control of Pollution) Act, 1981 (14 of 1981)

f) A representative of the Department of Environment in the State.

g) A representative of the Meteorological Department of the Government of India;

h) An expert in the field of occupational Health and

i) A representative of the Town Planning Department of the State Government, not more than five other member who may be co-opted by the State Government who shall be –

We are also governed by Maharashtra Factories Rules 1963 since HEF is located in the state of Maharashtra. It incorporates various provisions of Factories Act 1948 with an

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amendment of Act 20 of 1987.

In addition the following are incorporated :

Handling of toxic and inflammable solvents: e.g. Acetone, Alcohol, phenol and other substances.

i) Medical examination – The persons should be periodically examined.
ii) Protective clothing – Will consist of suitable apron, hand gloves, head cover to be washed daily.
iii) Prohibition of smoking – Caution with regard to electrical installation FLP fittings.
iv) Floor or work rooms, washing facilities bathing facilities, cloak room.
v) Fire fighting appliances – Maintain in good condition and easily accessible when required.
vi) Means of escape in case of fire – At least 2 separate exits provided.
vii) Cautionary notices – Explaining dangers to which workers are exposed due to the manufacturing processes being carried out in language understood by majority of workers.

Handling / manufacture of corrosive substances –

Sulphuric Acid, Nitric Acid Phosphoric Acid, Ammonia, Liquid Chlorine etc.

i) Flooring – Corrosion and fire resisting material should be the consideration.
ii) Protective equipments – Suitable protective wear for hands, feet, suitable apron, face shield, chemical safety goggle and respirators.
iii) Water facilities – At a height of 2 m pipe of 20mm dia. fitted with quick acting valve so that in case of any injury the injured can be thoroughly flooded with water.
iv) Cautionary notice – Printed in a language understood by the majority of the workers e.g. danger, corrosive substances cause severe burns and vapours will be extremely hazardous. Use protective wear, in case of contact immediately flood with water for 15 minutes. Get medical attention quickly.
v) Transport – Containers for corrosive substances labelled. Quantity of 10 lit. or more suitably crated.
vi) Devices for handling corrosive substances – Suitable tilting or lifting devices should be used for emptying jars or carboys and other containers of corrosive substances.
vii) Corrosive substances shall be handled by suitable scoops and not by hand.
viii) Opening of valves – Valves fitted to containers holding corrosive substances which do not work freely shall not be forced open.
ix) Prevention of splashing - All flange joints on pipe line under pressure shall be provided with guards to prevent splashing of leaky material due to gasket failure.
x) Cleaning of tanks, stills – in cleaning all safety precautions should to taken. Before undertaking repairs the equipment shall be made free of adhering acids by washing.
xi) Storage – While storing the compatibility of the acids will be seen so that wild reactions are avoided. While pumping / filling overhead tanks, vats it shall be ensured that no spillage / over flow takes place. Every container having a storage capacity of 20 lit. or more, pipe line , valves and fittings used for storing shall be examined thoroughly every year for finding defects and register shall be maintained for examination.
xii) Fire extinguishers – Adequate number of suitable type of fire extinguishers and other fire fighting equipments shall be made available and sufficient number of workers

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trained in fire fighting practices.

5.0 RISKS WITHIN THE H.E.F. AREA :- EXPLOSIVES

5.1 Explosives are substances, individually or mixed with one another, which are in a meta-stable state and are capable of undergoing a rapid chemical reaction without the participation of external reactants such as atmospheric oxygen. The reaction can be initiated by impact, friction, heat, spark detonation. For military purposes, explosives are normally divided into two classes viz. Propellants (low explosives) and high explosives (Primary / secondary explosives) HEF manufactures High Explosives such as TNT, CE and Initiators. These material undergo instantaneous detonation or decomposition.

5.2 In order to promote the safe storage and transport of international system of classification has been devised. The system consists of 9 classes (1-9) of which class- I comprises ammunition and explosives. Class – I is divided into hazard divination 1.1. , 1.2., 1.3, 1.4 and 1.5 according as far as HEF is concerned the explosives manufactured / stored therein belong to hazard division 1-1 which has a mass explosion hazard. The major hazards of this division are blast, high velocity projections and flame. The severity and range being determined by the quantity of explosives involved. There may be a risk from heavy debris propelled from the structure in which the explosion occurs or from the crater.

5.3 The Indian Explosives Act 1884 (IV of 1884) as modified from time to time regulates the manufacture, possession, use sale, transport and importation of explosives in India. The act is operated by the Ministry of Industry, Department of Industrial Development through the Chief Controller of Explosives in India. Section 14 (a) of the Indian Explosives Act exempts the Defence Services from the provisions of the above Act except in so for as it effects the reporting of accidents and enquiries leading in exercise of powers conferred by the above section, rules have been framed for the conveyance of Military Explosives belonging to the Defence Services by the Storage and Transport of Explosives Committee (STEC) in consultation with the various interested parties and incorporated in Military Tariff.

6.0 INSIDE SAFETY DISTANCES :-

This inside safety distance between a building or stacks, containing explosives belonging to Categories UNHD 1.1. and 1.3 and other building or stacks containing explosives within the Enclosed Explosives Area is defined as the distance which will prevent the direct propagation of explosion from the building or stack to the explosives in the other building or stack by missiles, flame or blast . The minimum distances should not be expected to prevent explosives being rendered unserviceable as a result of the destruction of buildings or the overthrow and scattering of open stacks when an explosion occurs in another building / stack.

6.1 OUTSIDE SAFETY DISTANCES :-

6.1.1 The outside safety distance between a building or stack containing explosives belonging to Category UNHD 1.1. and UNHD 1.3. and other building or stacks containing explosives within the Enclosed Explosives Area is defined as the distance where the ignitions or explosion , of the complete contents of the building or stack, will not cause severe structural damage by flame or blast, to the standard type of civilian

dwelling house. This distance does not exclude the risk of broken glass, displaced is also applicable to places of worship and other building or places where people may assemble.

6.1.2 Enclosed Explosives Area is the area within the protective fence. At HEF we term this area as Danger Area where there is no protective fence; it will be taken as being the area within a radius of 45 meters from a building or stack containing explosives

6.1.3 Damage to building or vehicles or injuries to individuals outside the enclosed explosives area may be caused by blast, missile or flame.

7.0 EXPLOSIVES STORAGE

7.1 As magazine is an explosives storage building where observance of clean conditions is necessary, the construction of which embodies certain special features and intended primarily for the storage of explosives of group A and B. A building used for storage of explosives of groups C to S and where clean conditions are not observed, is known as Explosives store – house.

7.2 Selection of the proper site for the construction of explosives storages must be done with due care taking into consideration the following :-

i) Suitability of the ground for building.
ii) Elimination of places with underwater courses.
iii) Elimination of places with continuous rock strata because of the possible transmission of shock wave to excessive distances.
iv) Location confirming to the safety distance regulation.

7.3 The main principles to be kept in view in the construction of explosives store- house and magazines are :-

a) Protection against penetration of debris, comparative low velocity fragments and lobbed.
b) The elimination of flammable materials and those liable to produce dangerous missiles or fire bands from the structure.
c) The maintenance of a suitable uniform temperature and efficient means of ventilation.
d) The avoidance of direct sunlight falling on any ammunition or package containing ammunition / explosives.
e) Construction should be such that walls are stronger than roof so that in case of an explosion, pressure build up finds relief first through the roof. Lateral throw of missiles as well as spread of flame would thus be reduced to the minimum.
f) Protection from termite attack.

7.4 The following are the general features of explosives storage.

i) The plinth level of the building should be above the general flood level in the area.

ii) The entire building must be damp-proof,

iii) **Floor**:-The floor should be constructed of well rendered cement. It should be treated with sodium silicate, MUST be even and free from cracks and crevices and strong enough to support a load of 10 tonnes per square meter. When the floor is cast in panels, the joints MUST be carefully prepared and finished to achieve a smooth finish and to avoid chipping.

iv) **Walls: - The** walls MUST be made stronger than the roof: 0.45 meter brick or equivalent should be considered as the requirement of walls of explosives storages. As far as possible the materials used should be such that in the event of an explosion they will not from dangerous missiles. Brick, concrete, RCC and stone are the most common material. In this connection it will be noted that brick pulverizes easily but not stone. Therefore use of stone for wall construction should be restricted to traversed storages. In the case of Bunker type of storages an inner wall of RCC of 0.22 meter thick and an outer wall of brick of 0.22 meter thick, with 0.0125 meter thick water- proofing material in between the two is recommended. The interior surface of the wall should be smooth and even. Plastering / grinding is acceptable.

Height of the wall :- The height of the wall should be such that there will be a clearance of 0.6 meter between the top of the explosives stack (which may be up to 3.75 meter) and the wall height to facilitate handling of the explosives packages and for providing adequate clearance from the roof. For this purpose the reduction in the clearance at the soffits of the beams may be ignored. In building storing aircraft bombs, sea- mines, etc. where stack height are low, the building height may be reduced to 2.5 meter as convenient Clearance required for working of 1 tone and 3 ton quantities, if provided, MUST be taken into account in determining the actual height of the wall.

v) **Roof: -** The roof should be in camber and of well rendered RCC construction, 0.125 meter thick, with a slope of 1 in 8 either side to ensure effective drainage of water from the centre. The roof MUST be rendered effectively lead-proof.

vi) **Entrances / Passage**: - Ways – Traversed Buildings: - The entrance passage ways should be suitably designed to provide the maximums convenience for mode of service i.e. rail, road and tractor. It must also be so located as to facilitate quick escape in an emergency. At the same time the disposition of entrances should be such that fragments from inside the building arising from an explosion are contained and entry of external fragments is reduced. This could be achieved by providing curved entrances or traverses in front.

vii) **Doors**: - Quick receipt and issue of explosives and the use of material handling gear are the main considerations in deciding the number of doors, their sizes and disposition. Explosives building MUST be provided with at least two doors for use as alternative exits in the event of fire or explosion. In the case of Bunker type storages, two sets of doors are provided with a lobby in between. The door at the outer and of the lobby is to be of grill / collapsible type. Doors should open outwards, be fire – resistant materials, e.g. lining with asbestos cement sheets or rendered fire resistant by painting with approved paints. In the case of Bunker type storages, suitable recesses may be provided in the walls of the lobby to take door flaps in open position to prevent damage to doors from moving vehicles.

viii) **Windows**: - Windows should not be provided for explosives storages. If

necessary, clerestory windows (CSW) of fixed type may be fitted.

ix) **Ventilation**: - All explosives Building should be fitted with adequate number of ventilators to create effective ventilation when needed. They should be well baffled to prevent entry of rodents and reptiles. There should also be facilities to open and close the vents when required. Provision of two sets of vents, one at about 0.3 meter from the floor on one side of the wall and another set at higher level, at about 3.75 meter from the floor on the opposite wall seems to aid the creation of good draught and may be adopted.

x) **Approach Roads to Explosives Storages**: - Approaches to above ground explosives storages, served by road, should be by means of individual loop roads, leading from the main road. In the case of rail served storages, subject to practical working considerations a number of storages may be served by one spur.

8.0 PNG GAS : SAFETY FOR PNG GAS

PNG (Piped Natural Gas) is being supplied through 24 x 7 hrs. Piped Natural Gas is available as an alternative to LPG / Furnace oil. PNG is prefers by many as it is cost effective when compared to LPG.
M/s MNGL, PUNE is authorized supplier of PNG as per gas sale agreement signed between HEF & MNGL, DTD: 25/11/2015.

8.1 What is PNG?

Piped natural Gas is Methane. It is much lighter when compared to LPG. PNG is also flammable. Since it is lighter than air and has a high dispersion rate then LPG, it is not hazardous as LPG in case of a leakage.
Fire Hazard: PNG is an odourless gas, but ethyl mercaptan is added as it provides easy detection by the users in case of a leakage.

8.2 Fire Safety Precautions while using PNG.

1. Ventilation: Make sure the room has enough ventilation. Open door and window, so that in case of any leakage, the gas would be dis appear quickly.

2. Leakage: A distinctive, odour is added to the gas for easy identification. Also, if there is hissing sound near a pipeline, it may indicate leaking natural gas.

- If there the leakage, close valve that supplies to Boiler/ Furnace and seek the help of Gas supplier MNGL. Do not light a match or lighter or any naked flame.
- Do not move an electrical appliance or turn off or on an electrical appliance.
- If you are going away for a long time, close all the valves that supply gas. This prevents accumulation of gas in room at your absence.
- If any leakage is observed in PE (Poly-ethylene) line, inform to MNGL immediately and do not allow any vehicle near the leakage.

3. Digging: PNG is supplied underground gas lines that runs to house. So, in case of any digging work is taking place around your house / pipe line inform the gas company immediately. If you suspect any potential damage to the gas line, call the gas supplier immediately.
Digging near PNG pipe line about three meter is prohibited, if required necessary NOC will be taken from ME & Safety section. Further ME section will inform to MNGL regarding digging work and as per MNGL recommendation / instructions, safety section will provide permission accordingly.

4. Asphyxiation: Prolonged exposer to natural gas may lead to carbon monoxide poisoning any eventually death by Asphyxiation. If there is yellow, large and un-steady flame in your gas burner or if there is a pungent odour when you are using the gas, the three could be presence of carbon monoxide.in such cases, contact your supplier immediately. It's also advisable to install carbon mono oxide in Boiler House

8.3 Maintenance:

Maintenance plays a key role in preventing accidents due to, leakage and exposer to carbon mono oxide.

a) Get gas burners checked regularly by qualify technician.
b) If there is any damage or repair to the gas appliances, have this check only by the qualify technicians.
c) Do not store or use any flammable products in the same house/ room near the PNG.
d) If there is yellow, large and unsteady flame, call the gas company immediately.

PNG gas, like any other inflammable material, need us to be cautions and aware. It can be a boon also a bane if we are not aware and careful. Treat all inflammable materials utmost caution.

MNGL Emergency contact No. 9011676767.

8.4 Boiler House:

In Boiler House Dual burner are being used for all 05 Nos. of Boilers and fuel for the same are Furnace Oil and PNG. From June 2017, HEF is consuming PNG as fuel for Boiler continuously. M/s MNGL, PUNE is authorized supplier of PNG as per S.O. No.17180136LP, Dtd.:- 30/10/2017 and gas sale agreement between HEF & MNGL DTD: 25/11/2015.

The boiler is heart of process plant. Loss of steam production can cause reduced throughout puts or even unscheduled. It is critical for the boiler house to perform as reliable & safety as possible.

8.4.1 In case of Fire in PNG pipelines in Boiler House,

Duty of Boiler Attendant:

1. Shut down all working Boilers.
2. Close all valves of Gas Train and main outlet valve of MRS.
3. Inform to I/C Boiler House, Higher Management.
4. Inform to MNGL, Pune on emergency No. 9011676767.
5. Inform to Fire Brigade.

6. Do fire fighting by using DCP Fire Extinguisher available nearby.

Duty of Boiler In-charge:

1. Inform to M/s MNGL on emergency No. 9011676767.
2. Inform to HOS/DVO/ME
3. Inform to all production section, for quick necessary action.
4. Inform to Main Gate, so that M/s MNGL, quick response time with vehicle get inside factory premises.

Duty of Main Gate/ Security:

1. Inform to higher authorities.
2. Give permission to quick response team of MNGL to get inside the factory.

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1.0 CLASSIFICATION OF MILITARY EXPLOSIVES

1.1 The STEC under the Ministry of Defence are responsible among other things. Safety conditions in the storage and transport of Military explosives held by Defence Services. Accordingly, a classified list of Military explosives incorporating the generic nomenclature indicated thereof and the other conditions of conveyance as included in the military Tariff has been drawn up to enable the services to use it practically without reference to Military tariff while transporting their explosives

1.2 The principle governing the classification of explosives currently followed are mainly as UK patterns and wherein explosives are classified under 14 distinct explosives groups broadly based on the
(a) nature of Explosives
(b) Characteristic of explosives
(C) Whether they are boxed or not carry their means of ignification or not.

1.2.1 However they suffered from many shortcomings like dissimilar items placed together. In the 54th STEC meeting it was decided to adopt new system based on UN classification system of explosives.

1.3 The UN committee of experts on Explosives tariff have desired International System of explosives. This consists of 9 classes of which class-I comprise ammunitions and explosives. Class-I is divided into hazard divisions 1.1., 1.2, 1.3 and 1.4 according to type of hazard.

1.4 HAZARD DIVISIONS

1.4.1 Safety distance view point
i) Hazard division - 1.1
ii) Hazard division - 1.2
iii) Hazard division -1.3
iv) Hazard division -1.4

1.4.2 DEFINITIONS OF THE HAZARD DIVISIONS.

1.4.2.1 Hazard Division 1.1:- Comprises items which have a mass explosion hazard. The major hazards of this division are blast, high velocity projections and flame. The explosion will result in severe structural damage, the severity and range being determined by the quantity of explosives involved. There may a risk from heavy debris propelled from the structure in which the explosion occurs or from the crater. It embraces both Cat Z and ZZ explosives.

1.4.2.2 Hazard Division 1.2:- Comprises items which have a projection hazard with minor explosion effects but not a mass explosion hazard. Items burn and explode progressively, a few at a time. A considerable number of fragments, fire brands and unexploded items may be projected; some of these may explode on impact and cause fire

or vicinity. It includes Cat X ammunition of calibre 20 mm and above.

1.4.2.3 Hazard division 1.3:- Comprises items which have mass fire hazard and either a minor blast hazard or a minor projection hazard or both but not a mass explosion hazard. Some items burn with great violence and intense heat emitting considerable thermal radiation. Others burn sporadically. They may form dangerous fragments. Firebrands and burning containers may be projected. It includes Cat. Y explosives.

1.4.2.4 Hazard Division 1.4 :- Comprises items which present no significant hazard. It includes items which are primarily a moderate fire hazard. They do not contribute excessively to a fire. The effects are largely confined to the package. No fragments of appreciable size or range are to be expected. An external fire does not cause the simultaneous explosion of the total contents of package of such items. Some but not all of the above items are called Safety Class Ammunition. These items are so packaged or designed that any hazardous effects arising from accidental functioning are confined within the package unless the package has been degraded by fire in which case all blast or projection effects are limited to the extent that they do not significantly hinder the fire fighting or other emergency response efforts in the immediate vicinity of the package. It includes part of Cat X explosives.

1.4.3 **COMPATIBILITY GROUP: -** There are 12 compatibility groups A, B, C, D, E, F, G, H, J, K, L AND S.

1.4.3.1 In order to identify the kinds of ammunition and explosives deemed to be compatible and those which may have to be segregated to promote safety in storage and transport, they are classified into 12 compatibility Groups A to H, J, K, L and S. group I is omitted to avoid possible confusion between the alphabet I and the Roman numerical 'I' Group S is given a distinct letter since it corresponds to a unique possibility for mixed storage. All items in compatibility Group have similar characteristics and risks. With the exception of compatibility Group L, all items in any one group are compatible with one another in storage and in every mode of transport. Though the various compatibility Groups are to be segregated for storage and transport, few Compatibility Groups like C, D and E are permitted to be stored together. Besides the Safety Class ammunition could be stored and transported with all groups except Group A and L.

1.4.4 **FIRE DIVISION – DESCRIPTION**

The divisions into which explosives and ammunition are divided are:-

1.4.4.1 **FIRE DIVISION : 1**

These explosives are susceptible to explosion an masse. The explosion may in severe structural damage and severity and range being determined by the amount of high explosives involved. There may be a risk from heavy debris propelled from the structure in which the explosion occurs. Possibility of major hazard to the nearby surrounding area is there due to the blast flame and high speed surrounding area is there due to the blast flame and high speed fragments.

1.4.4.2 **Fire division :- 2**

These explosives do not explode en masse but have projection hazard and minor

explosion effects these may be exposed to fire for some time before exploding.
Though the risk of mass explosion is not involved but small sporadic explosions may occur with increasing frequency as the fie takes hold. These burn and explode progressively. A few at a time. There is fragment hazard. A considerable number of small and large hot fragments fire brands, unexploded and self – propelled items may be projected some of these may explode on impact and propagate fire or explosion. Blast effects are limited. These explosions may give rise to toxic and corrosive hazard.

1.4.4.3 Fire division :- 3

The explosives when under fire pose serious and mass fire hazard with minor explosion or no explosion. These would not explode a masse. These are readily ignited and burn fiercely emitting intense heat and thermal radiation over a wide area but necessarily does not explode. These may give rise to dense smoke with, in some instances, toxic effects during burning. These are entirely free form explosions. These items do not form dangerous fragments. Fire brands and burning containers may be thrown around. These are low explosives i.e. solid and liquid propellants.

1.4.4.4 Fire Divisions :- 4

These explosives present not significant hazard. These have a moderate fire hazard. An external fire would not cause the mass explosion of a package of such items. There may be risks of toxic substances in them and may evolve toxic fumes when they burn (Explosives belonging to UN compatibility Group K).

1.5 HOW CAN ONE BE SAFE?

1.5.1 As far as safety in HEF is concerned two broad aspects should be kept in mind for assessing the risk involved and to what extent precautions can be taken to avoid such risk

1.5.2 Risk within the HEF area - These are normally from explosives processed / stored, inflammable and other dangerous material, steam and dangerous fumes etc.

1.5.3 Risk from HEF to the areas outside HEF: - These are normally from effluents emanation from various processes inside HEF and polluted fumes from the stacks of the process plants. Risks are also involved from the explosions to the surrounding residential areas.

1.5.4 It should be noted that all arrangements have been made to ensure that the above risks are eliminated to the extent possible for safe working.

1.6 PERSONNEL ELECTRO STATIC CHARGES :-

1.6.1 The area of particular concern is that in which human electrification readily takes place as a direct result of the clothing system. Whenever a human being is exposed to a situation where static electricity can be generated by either rubbing or stripping of the clothing worn, a problem can exist.

1.6.2 The bodies of personnel can accumulate static charges in excess of 10,000 volts during periods of low humidity, creating a hazard in area that contain explosives flammable dust , gas or vapour.

1.6.3 A person wearing garments made of synthetic fiber and insulated form earth by footwear can acquire static voltage of many kilowatts in his body and thus human body becomes source of hazard in buildings where explosives are handle / processed. Unsafe condition

of human body can be checked by personnel tester. If the overall resistance of human body exceeds 6 Ohms, the meter indicates unsafe condition. The personnel tester is designed to work on A.C. 50 cycles, single phase 230 – 250 volts, which has been stepped down to 200 V and further smoothened and reduced to a safe constant voltage by means of a bleeder circuit. The indicating meter used has got a range of 300 micro amp. and marked into two zone (below / Micro ohm). Maximum of antistatic precautions are required to be taken when the initiatory explosives with a spark sensitivity of less than 0.02 J are exposed and handled. Conducting or antistatic flooring in the buildings containing initiatory explosives helps dissipation and conducting a way of accumulated electrostatic charges.

1.6.1 STATIC EARTHING IN EXPLOSIVE BUILDING

1.6.1.1 Among the safety measures / precautions which are adopted during the processing / handling of explosives, the most essential precaution is considered as Static Earthing of all metallic parts, with which the explosives come into contact, for dissipation of static electric charges. Present convention is to keep the electrical resistance of earthing system of explosives process plants and equipments at minimum possible so as to prevent accumulation of static electrical charges. Depending upon the physical situation at site, earthing of static earthing system in combination with or separately from earthing of lightning protection system and lighting / power supply system can be done. In the event of the earthing system not being efficient, there is likely to be flash back. Earth continuity test of all the static earthing in explosive building at least once in six month is essential. During such inspection and testing static earthings system, bonding and earthing of all metallic parts of explosives process plants and equipments are thoroughly checked to ensure continuity of conducting system. Care is also taken that all belts used for the motors driven by pulley installed in explosives Bldg. are manufactured by material having sufficient conductivity to drain away static charges e.g. antistatic rubber belt also all the motors in explosives Bldg. are adequately earthed. Drive belts and conveyer belts made of non-conducting materials such as leather, rubber or synthetic materials may generate the electro- static charge due to contact and separation occurring between them and their pulleys or idler roller (s). The charging may occur with conducting or non-conducting pulleys or rollers of equal magnitude but opposite polarity to that carried by the belt. As a precaution sliding carbon brush are provided on the shafts of the pulleys and the carbon brushes are properly earthed for dissipation of static charges.

1.6.1.2 During the periodical inspection and testing of static earthing system including those of L.P. system and electric light / supply system in explosive Bldg. the Bldg. are required to be vacated and passed out by safety inspector as free of explosive so that necessary testing can be carried out by electrician to ensure continuity of conductivity of the system too. However, occasions may arise sometimes where it becomes un-practicable to vacate the Bldg. free of explosives during testing of earthing systems. In such case, testing jobs can be carried out with certain safeguard viz.

i. Providing barriers / screen: between explosives and the area in which testing will be carried duly demarcated with a minimum clearance of one meter between explosives and area.

ii. No spillage of explosives or exposed / unsealed explosives in demarcated area.
iii. Distance between the explosives stack and electric lines to be kept at maximum and on no account it should be less than 50 cm
iv. Testing points for connecting instruments should be well removed from stacks preferably outside a room or store – house.
v. All power lines, conduits and junction boxes should be under observation during the test and fire fighting equipment should be immediately available on the spot at the time current or voltage loads are applied.
vi. Immediately following testing of power lines all test equipments (Meggers ammeters , etc.) must be removed from the explosives store house

1.6.1.3 **Earthings** :- should be in accordance with the requirements of Indian Electricity Rules, 1956 and code of practice IS : 3043 - closing of site for earth electrodes is an important factor so as to secure optimum soil resistively and ensure dissipation or electrostatic charges from the system to the earth. Normally wet marshy ground containing refuse such as ashes, cinders and brine waste is considered as most ideal site for installing earthing electrodes. Salt treatment of the soil by top dressing or pouring salt solution down electrodes pipes and use of coke around the earth electrode can effect substantial reduction of earth resistance.

1.6.1.4 **Humidification** :-

Humidification involves addition of moisture to the air to increase its relative humidity and is resorted to reduce generating of electrostatic charge in the buildings where explosives viz. Lead Styphnate which are highly sensitive to shock and friction very prone to electrostatic charges are handled / processed. As otherwise, there is risk of generation of electrostatic charges in dry air conditions and the consequences of flash over of charges on the explosives. There are various methods of obtaining required humidity in explosives building.

1.6.1.5 **Steam JET humidifier** :-

Low pressure steam is admitted in a controlled fashion directly into the air stream to add moisture to the air. This system can give high relative humidities but has a tendency to increase the space inside temperature due to the steam latent heat, or add to the cooling load on the air- conditioning plant. At the Lead Syphnate manufacturing units at High Explosives Factory, Kirkee the required humidity of minimum 80% is maintained by live steam at low pressure into process areas for dissipations of the accumulated electrostatic charges. This method, is also an accepted practice even in U.K. and although deemed somewhat crude and also the relatively high temperature in the bay, coupled with high humidity is not comfortable for the operator, in the interest of safety it is considered safe to rely on the practice of humidification by live steam by which minimum 80% R.H. can be achieved for dissipation of electrostatic charges.

1.6.1.6 **PERIODIC INSPECTION AND TESTING OF PROTECTED ELECTRICAL FITTINGS , ENCLOSURES INSTALLED IN EXPLOSIVES BUILDING** :-

Protected electrical fittings like flame-proof dust-tight lighting fittings and motors may require change of gaskets, washers glands and other joints after these have been installed

in explosive dust laden and flammable corrosive vapours locations fatter some time. These protective equipments and fitments may have to be subjected to certifying tests after replacing the glands washers etc. if the need arises, prior to their reinstallation. These should be inspected and tested no less frequently than once in a year for the DT enclosures / fittings and FLP motor / fittings installed in the explosives process building and once in two year from those installed in storage locations / buildings.

Conducting and anti-static flooring should be tested at intervals of 3 and 6 months initially. Subsequently, thereafter these can be tested once in 12 months. In buildings where there is a high static hazard these tests should be made at more frequent intervals.

All the inspection and testing records should be maintained in a register and show to Safety Audit Officer at the time of inspection.

1.6.1.7 LIGHTNING PROTECTION TO EXPLOSIVES BUILDING :-

Lightning protection required for building / structures / installations should be in accordance with I.S. 2309 as amended from time to time.

i) Aluminium may be use in lieu of copper in lightning protection system above ground.

ii) Galvanised iron may be used in lieu of copper below ground or above ground.

iii) The resistance to earth must not exceed the following :-

At the time of installation :- 7 Ohms.

During periodical tests :- 10 Ohms

On completion of the installation or of any modification the resistance of each termination or section thereof shall, if possible be measured and the continuity of all conductors and the efficiency of all bonds and joints shall be verified.

Normally annual measurement of earth resistance shall be carried out but local circumstances in the light of experience may justify increase or decrease in this interval but it should not be less than once in two years. In the case of structures housing explosives or inflammable materials, the interval shall be six months.

Earth resistance shall be measured in accordance with IS- 3043-1966. The actual procedure adopted for the test shall be recorded in detail so that future tests may be carried out under similar conditions. The highest value of resistance measured shall be noted as the resistance of the earth termination. The results of the test together with the condition of the soil and detail of salting or other soil treatment should be recorded.

If the resistance to earth of lighting protective or any section of it exceeds the lowest value obtained at the first installation by more than 100 percent, appropriate steps shall be taken to ascertain the causes and reports shall be carefully recorded.

The record shall also contain particulars of the engineer contractor or owner responsible for the installation and upkeep or both of the lightning protective system. Details of addition or alterations to the system, and dates of testing together with the test results and reports, shall be carefully recorded.

If the resistance to earth of lighting protective or any section of it exceeds the lowest value obtained at the first installation by more than 100 percent, appropriate steps shall be taken to ascertain the causes and to remedy defects, if any.

The ohmic resistances of the lightning protective system complete with air termination, but without the earth connection should be measured and this should be a fraction of an ohm. If it exceeds one ohm, then there shall be some fault either electrical or mechanical, which shall be inspected and the defect rectified.

For this the system is best divided into convenient section at testing points by suitable joints. A continuous current of about 10A shall be passed through the portion of the system under test and the resistance verified against its calculated or recorded value. Suitable portable precision testing sets for the purpose should be used.

1.7 HOUSE KEEPING IN EXPLOSIVES BUILDINGS :-

1.7.1 Greatest care must be taken to keep the building; plant and machinery therein, perfectly free from dirt and grit and from accumulation of unnecessary materials.

Floors, platforms, shelves and any other part of the building or plant where there is likelihood of dust collecting, are to be frequently cleaned by sweeping or washing. During hot, dry and / or windy weather all floors except in cases where dampness is objectionable are to be kept damp by sprinkling water as required.

1.7.2 Grass should never be allowed to grow long in the vicinity of Danger Building or on traverse bunds. It should be cut from time to time and cut grass removed from the site promptly without allowing to dry.

1.7.2.1 **GRASS: -** Grass including sand binder should be weeded out within a perimeter of 2 m and up to a distance of 15 m all round a building, grass and undergrowth should be kept controlled / short. Controlled / short The evergreen creeper /plant called " Ipomoea Palmata " be grown since it acts as weedicide and prevents soil erosion by acting as an effective binder with the soil.

1.7.2.2 **SHRUBS** :- No shrubs other than that evergreen variety like Ipomoea Palmata is permitted up to a distance of 15 m from an un-traversed building and up to the limit of outer end of a traverse in case of a traverse in case of a traversed building.

1.7.2.3 **TREE: -** No tree is permitted up to a distance of 15 m or a distance equal to the height of the tree whichever is more in case of an un traversed building. No tree is permitted within and upon the traverse of a reversed building. No tree should be within the zone or protection of LP system of any explosives buildings.

1.7.3 It is necessary to promote arboriculture in explosives areas.

1.7.4 Greatest care must be taken to keep the buildings plant and machinery, explosives building perfectly free from dirt and grit and dorm accumulation of unnecessary materials. Floors, platforms, shelves and any other part of collecting are to be frequently cleaned by sweeping or washing. During hot, dry and / or windy weather all floors except in cases where dampness is objectionable are to be kept damp by sprinkling water as

required.

1.7.4.1 In building classed as ' Clean ' the fastenings of windows, hinges and bolts should be of brass and exposed structural iron or steel should be covered or painted. All doors and windows should be made to open outward. When work is in progress all doors and windows should remain open.

1.7.4.2 The materials for door hinges, bolts, locks and keys of explosives building should be as under :-

a) Process buildings laboratories. :-

i) Door hinges, bolts hasps and staples copper alloys or aluminium or alloys of aluminium containing not more than 1% of magnesium.

ii) Locks and keys - both of copper alloys.

b) Magazines :-

i) Door hinges, bolts and other fittings – copper alloy or aluminium or alloys with magnesium content not exceeding 1%.

ii) Locks and keys both of galvanized iron,

C) Explosives store houses :-

i) Door hinges and bolts - galvanized iron.

ii) Locks and keys - both of galvanized iron.

1.7.5 The ground around danger building is to be watered in dry weather and at other times if necessary and kept free from rubbish and other inflammable materials.

1.7.6 A barrier will be provided and painted in 'RED' to differentiate clean and dirty area. On the barrier the words 'CLEAN AREA' will be painted.

1.7.7 The explosive limit assigned to each danger building must not be exceeding on any account. No unauthorized explosives shall be introduced in any Danger Building. All Danger Building shall be provided with ' USE LISTS' to indicate list of articles other than explosive permitted inside the building / traverse for day to day use, the quantity of explosives permitted and the number of men permitted inside the building at any time.

1.7.8 Before going to work in any Danger Building, all workmen must take off their private clothes in the appointed change room and change into the Danger Building or other special clothes provided. These clothes are to be taken off when work is over and left in the shift rooms before the men leave the factory. Workmen will not wear their D.B. clothing in any dirty area, unless nature of their work makes it necessary.

NOTE: - Danger Building clothing may be worn on under garments which should not contain any objectionable material.

1.7.9 No. alterations to D.B. clothing are permitted. These cloths will be washed frequently (once in a week) to ensure cleanliness and care will be taken that if does not become impregnated with explosive substance.

1.7.10 All buttons on the clothing of personnel employed in D.B. shall be of cotton / bone / plastic. If it is of metal they should be covered with fabric so that no metal is exposed.

1.7.11 Trousers must never be tucked at the ankle.

1.7.12 Persons wearing garments made from synthetic fibers like Terylene , nylon etc. shall not enter any Danger Building nor they should handle explosives or inflammable solvents.

1.7.13 Sticks, umbrellas, overcoats etc. are not to be taken into Danger Building

1.7.14 No cotton cloth or waste is to be used in these buildings for any purpose nor should any such material be found lying around or inside these buildings.

1.7.15 No person (Staff or Workmen) normally working in the Danger Building are to wear or carry articles of iron, steel or other metal, unless specially authorized to do so. These forbidden articles will include keys, coins , rings pocket knives , watches and the like. Clothing must not have metal buttons or buckles.
Note :- The above mentioned articles will be left in the private lockers.

1.7.16 Before entering any Danger / Clean building employees who do not wear boots or shoes of any kind are to wash their feet in the water buckets or sumps provided for the purpose at the " Clean " barrier. Those who wear boots or shoes must either change them for magazine shoes or put on over boots. These magazine shoes or over-boots are not to be taken off for any purpose inside a clean danger building except in certain danger building where men should be barefooted.

1.7.17 The magazine shoes or boots provided must be put on and taken off on the "Clean " boards provided on the dirty side of the " Clean " barrier. The turnips of trousers must be turned down. They must be tucked inside the overshoes, if practicable. Danger Building or other special clothes must be brushed free from dust and foreign matter. The member of staff or senior workmen in-charge of each building of process will ensure that this is done.

1.7.18 Ordinary torches shall not be used in Danger Buildings. Flame proof touches will be provided whenever required.

1.7.19 In the event of a thunder storm, Staff in-charge of Danger Building will suspend any operations whose risk may increase due to the thunder storm. In extreme cases any personnel other than those required to attend to cover the safety requirements of building may be evacuated from the building.

1.7.20 Receptacles of all kinds and packages for explosives, whether full or empty, are not to be roughly handled or dropped. They are to be lifted clear from place to place, they are not to be pushed slid, dragged along or sharply put down. They should not be exposed to sunlight.

1.7.21 Workers in danger Building are to report immediately to the nearest member of the staff anything unusual or dangerous in the machinery or apparatus or in the appearance of material or in the conduct and behaviour of their fellow workers.

1.8 PLANT AND MACHINERY CONTAMINATED WITH EXPLOSIVES PROCEDURE FOR CLEANING FOR REPAIRS.

1.8.1 General :-

1.8.1.1 No repairs will be undertaken on any plant, machinery or other articles contaminated with explosives, save as stated in Rules and Regulations of the Factory 1954 unless they are cleaned and freed from explosives and certified fit for repairs by Safety section or his representative on Form No. H.E.F.-18(Revised–II).

1.8.1.2 Head of production section are responsible for ensuring that such items are cleaned and free from explosive as laid down in para 2 of the S.I.s, before handing over for repairs.

1.8.1.3 Plant and machinery that cannot be thoroughly freed from explosives until they are dismantled should be dismantled carefully by Repairs sections in the presence of staff in-charge of plant, after the plant has been inspected and passed by Safety Section or his representative for dismantling.

1.8.1.4 Irrepairable part of plant etc. contaminated with explosive would be disposed off, under the direction of Safety section

1.8.1.5 No plant, machinery or any items from building shall be removed to workshop unless it is passed out by representative of Safety section, as free of explosives on H.E.F. 0-18 (Revised –II)

1.8.1.6 In all cases of doubt regarding methods of cleaning etc. reference should be made to Safety section.

1.8.1.7 If the repairs involve the use of flame the plant / building concerned will be free from inflammable vapours.

1.8.2 **<u>METHODS OF CLEANING</u>** :-

	Nature of Contamination	Method of Cleaning
1	T.N.T.	1) Steam or boil in water until free Nitro-bodies. NOTE :- The use of sodium carbonate or any other Alkaline sodium in the cleaning of TNT plant is strictly prohibited.
2	D.N.T.	1) Same as T.N.T.
3	Nitrobenzene	1) Wash well with hot water or steam as necessary. 2) Wipe to dryness with rag either dry or soaked in benzene as necessary.

4	C.E.	1) Remove as much or the C.E. as possible by water washing. 2) Remove last traces, if any left over with a rag soaked in Acetone.
	NOTE :- a)	In Buildings where nitric acid, mixed acid or acidic CE are present, acetone cleaning will be carried out only after much of the acidic CE as possible been removed. In no circumstances will acetone be taken into these buildings in container.
	b)	Acetone should on no account be allowed to come in contact with nitric acid, mixed acid or acidic CE.
	c)	The use of sodium carbonate or any other alkaline solution in the cleaning of CE plant is strictly prohibited.
5	P.E.K.- 1	1) Remove as much of the explosive by scraping with wooden / horn spatula.
6	Mercury Fulminate	Treat with sodium thiosulphate solution, as laid down in relevant S.I.s
7	Lead Azide	1) Treat carefully with sodium nitrite and acetic acid. 2) Wash with water and wipe out with a cloth calico / cambric to dryness.
8	Lead Styphnate	1) Treat with ammonium acetate acidified with acetic acid, till all styphnate is dissolved.
9	Styphnic Acid : (Ref SI No.16)	1) Wash thoroughly with hot water or alternately with a 10% solution of $NaHCO_3$, followed by hot water. 2) Wipe to dryness with a cloth calico / cambric.
10	D.N.R.	Same as Styhphnic Acid.
11	RD 1337/RD 1308: (Ref : SI No.27 / SI No. 33)	Treat with 20% HNO_3 solution and wash with hot water as in relevant S.I.s.
12	Tetrazene	Treat with20% NaOH solution and wash.
13	G – Fuel	i) Xylidene ii) TEA iii) G - Fuel To be washed with 10% Hydrochloric acid solution followed by cold water wash and steam wash.

14	RD1303(Ref : SI no.26)	1) Treat with ammonium acetate acidified with acetic acid, till all styphnate is dissolved. 2) Wash with water and wipe out with a cloth calico/cambric to dryness.
15	BASIC LEAD AZIDE: (ref : SI no.42)	1.) Treat carefully with sodium nitrite and acetic acid. 2) Wash with water and wipe out with a cloth calico/cambric to dryness
16	Ammonium Perchlorate	i) Clean contaminated floor surface with water. Move away incompatible products (organic materials, reducing agents), if any. ii) Spillage near FBD, Vibrosieve and Blender collected in HDPE drum as contaminated waste AP and is disposed by burning at CE burning ground as per SI. No. 160.

1.8.3 Acetone should on no account be allowed to come in contact with nitric acid and mixed acid.

1.9 Important precautionary measures :-

1.9.1 The use of iron or steel in any form is strictly forbidden in the construction of packages intended for explosives in Group A and B. fittings screws, fastening etc. are made of copper or a copper alloy. Packages with iron or steel fittings will not be allowed in magazine in which explosives in Group A and F are stored.

1.9.2 The use of iron or steel in the construction of packages for explosives in Group – S is only permitted if such iron or steel is tinned, galvanized or kept efficiently protected with paint or varnish.

1.9.3 The packages for certain of the explosives in Group – D (especially those containing ammonium salts) should have iron or steel fittings in any part which is liable to be in contact with explosive, but such iron or steel must be efficiently coated with painted or varnish.

1.9.4 The use of materials (including paints, etc.). Containing lead or Lead compounds is strictly forbidden in the construction of packages for dinitro resorcinol, dinitophenol, exploders P.P. exploders shell picric acid picric powder (P.P.), potassium dinitro phenate, shellite discs, sodium picrate or styphnic acid. “Lead free” condition are also observed, as far as practicable, in the construction of packages for tetryl and composition exploding where actual contact with the explosive is possible. A paint containing a non – Lead pigment, but not necessary “Lead free” may be used for the exterior of boxes when such contact can effectively guarded against.

1.9.5 All packages containing explosives will have their contents clearly marked on them and will be examined to ensure, as far as possible, that they comply with the above

regulations, before being taken into a magazine or explosives, storehouse. They must be properly closed and free from grit and other objectionable substances.

1.9.6 Defective packages will not be taken into magazines or explosives storehouses. The damage must first be repaid or the contents repacked.

1.9.7 Empty packages should not be kept in a magazine or explosive storehouse in which explosives are stored.

1.9.8 Dunnage requisite for stacking the authorized explosive quantity may be retained in the building whether in use or not. If not actually in sue the dunnage will be stored tidily and kept clean.

1.9.9 Whenever a magazine, explosives storehouse or other building, used for a storage or explosives is emptied, it will be immediately washed out and cleaned so that all traces of explosives may be removed.

1.9.10 Any defects either to the interior or exterior or exterior of a magazine or explosives storehouses will be promptly reported and received immediate attention.

1.9.11 Explosive Limit Boards – Each building scheduled for the storage or handling of explosives will be furnished with an Explosives Limit Board in a cons-picuous position near the entrance on which will be shown the net explosives quantity, in kgs., under each Category, permitted within the building.

1.9.12 All keys of building will be labelled and deposited in safe place when not in use.

1.9.13 Explosives in store will, as far as possible, be stacked and segregated by nature, type batch , Lot No., a card showing the designation, etc., being attached to each stack or pile.

1.9.14 Stacking of packages – Packages will be securely stacked in such a way as to ensure :-

i. Protection against injury by damp.
ii. The free circulation of air.
iii. Ease of access.
iv. The visibility of all essential identification markings.
v. Away from direct sunlight.

1.9.15 Stipulation of grouping of explosives given in ESG pamphlet No.2 or year 1987 should be strictly followed.

1.10. SAFETY PRECAUTION FOR ELECTRICAL INSTALLATIONS AND APPARATUS FOR BUILDING AND AREA CONTAINING EXPLOSIVES.

1.10.1 Permanent electrical installations for the purpose of providing lighting, air- conditioning and power are an approved integral feature in the construction of the building designed for the manufacture, filling, assembly and storage of explosives and ammunition. If defective in design, erection or operations of such installations are liable to constitute serious risks and therefore special considerations must be given to their design, construction, erection and maintenance. They are as given under :

1.10.1.1 In all cases installations must be designed and installed to ensure that any over-heating or sparking whether in normal use or under faculty condition is confined within the approved housing of the wiring systems and electrical item concerned.

1.10.1.2 The circuits for all installation must be provided with excess current and earth leakage protection necessary to isolate the circuit concerned as quickly as possible in the event of a fault developing.

1.10.1.3 Use of certain materials may have to be restricted in the construction and equipment of building designed to contain explosives e.g. Lead to be excluded when picrite is exposed and copper when Azide explosives are exposed. In building where ammonium Nitrate is handled, all iron and steel fittings used in electrical installations must be effectively protected against corrosion.

1.10.2 All building s containing explosives are divided into 3 categories according to the nature of explosives which are stored or handled in the building. Electrical installations, equipment and apparatus are afforded the same category as the building in which they are installed or used.

i) **Category 'A'**:- This category comprised explosives storehouses, laboratories or processes buildings in which explosives may give rise to flammable vapour in the building. For such building electrical installation equipments and apparatus to comply with flame-proof (FLP) electrical fittings to IS specifications 2148-1962 be used. Apparatus and equipment should be certified as intrinsically safe.

ii) **Category 'B'**:- this category comprises magazines, laboratories or process building in which there may be exposed explosives of any Group except Group L or where explosive dust but not flammable vapour may be present. For building in this Category all electrical installations equipments and apparatus to comply with dust – tight (DT) requirements.

iii) **Category 'C'**:- This category comprises all other explosives storehouses, laboratories and process building. For building in this category where intrinsically safe apparatus of any class may be used, explosives dust hazard is not significant dust-proof (DP) or any other protected type of electrical fittings could be used.

1.10.2.1 Totally enclosed (TE) electrical fittings could be employed in installations where no flammable vapour or explosives dust present. Corridors/ Verandah of explosive building could be provided with TE fitting.

1.10.2.2 The surface temperature of any electrical equipment or installation is not to exceed the following limits:-

a) Categories A and B buildings - 100° C
b) Categories C buildings - 120° C

1.10.2.3 All electrical installations, equipment and apparatus such as flame- proof (FLP) dust – tight (DT) dust proof (DP) and Total Enclosed (TE) shall be certified by the Director Central Mining Research Station Dhanbad as suitable for use in such buildings.

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1.10.2.4 The electricity supplied to the building containing explosives may be either direct or alternating with a voltage to earth not exceeding 250 volts. On this basis a 500 V 3 wire D.C. system or a 440 volts 3 phase 50 cycles, 4-wire A.C. system may be employed provided the mid-wire or neutral conductor is connected to earth in accordance with the Indian Electricity Act and Rules. All feeder cables shall be paper insulated Lead sheathed double steel armoured or PVC insulated similarly armoured and must terminate outside the building.

1.10.3 **SITING OF ELECTRICAL INSTALLATIONS** :-

i) Electrical main generating stations should be sited beyond.
ii) Electrical Sub – station should be sited beyond process ISD.

Wiring Systems:- The following wiring systems are permitted in categories A, B and C building ;-

i) Screwed metal conduit systems enclosing PVC cables.
ii) PVC insulated, multi-covered wire armoured cables.
iii) Paper insulated, Lead covered steel wire armored cables.
iv) **XLPE insulated steel wire armored cable**

Additionally, an approved non- metallic conduit system enclosing cables may be used in Category 'C' building only i.e. TE standard.

1.10.4 **FLEXIBLE CABLE AND FLEXIBLE CONDUITS :-**

1.10.4.1 Flexible conduits should not be used in hazardous location involving gas, vapour, liquid or dust laden atmosphere, as large quantities of dust enter the flexible conduits and dust light enclosures to which the flexible conduits are attached securely.

1.10.4.2 Flexible cables can be used where cable leads require to be terminated on machineries which are in motion or in the state of vibration with suitable compression glands, the cases other than those mentioned in (1.10.4.1).

1.10.5 **CONTROL OF ELECTRICAL SUPPLY CIRCUITS : -**

1.10.5.1 The supply of electricity to a building or underground site containing explosives is to be controlled by one or more master switches should be in close proximity to each other, identified and are to be cable of isolating every conductor entering the building or underground site including the neutral.

1.10.5.2 All circuits are to be provided with protection against overload and earth leakage.

1.10.5.2 All final sub- circuits are to be controlled by switches ensuring complete isolation of each conductor from the supply. Lighting circuits may be controlled switches within the building or underground site provided they conform to categories of installations.

1.10.6 **EARTHING SYSTEMS** :-

1.10.6.1 A common system of earthing and bonding will be employed for all metallic enclosures of electrical wiring and equipment, major metalwork in the structure of building and

lighting and electrostatic projection system. The metallic sheathe and armouring of the mains supply cables, metallic pipes, rails or grids entering the building, will be bonded to the earthing system at the point of entry or exit outside the structure of the building and will also be earthed at a point 250 feet (75 M) away from the building.

1.10.6.2 There are three types of electrical earthing system, viz. lighting protection, power and lighting and static which are provided in an explosive buildings these electrical systems are provided with individual systems of earthing.

1.10.6.3 Common grounding is always desirable as it would equalize the various grounding in or about a protected structure to minimize the possibilities of a side flash from one grounding system to another. Combined earthing of LP, lighting and power supply and dissipation of static could be permitted depending upon the physical situation at site.

1.11 STATIC ELECTRICITY HAZARD IN EXPLOSIVES BUILDING (FEW POINTS) :

1.11.1 Static Electricity, by definition "electricity at rest" consists of opposite electrical charges that are usually kept apart by insulators. Such charges may vary in magnitude and may reside on conductors or non- conductors and initially result from the transfer of electrons between unlike substances. Separation of substances may leave an excess of electrons on one, and a lack of electrons on the other, with the result that both surfaces are mutually attractive.

1.11.2 The principal hazard created by static electricity is that of a spark from a build-up electrical charge which can cause combustion or explosion of explosives, vapours, gases or dust

1.11.3 The problem associated with static electricity can be greatly minimized by draining off the charges to prevent accumulation of charges of sufficient energy to cause ignition.

1.11.4 With most conductive materials or devices, bonding or grounding / earthing can be used to drain off static electricity as far as it is generated.

1.11.5 With non-conducive materials, the static charges can be minimized

a) Draining the static charge from the material through the use of grounded static collectors.
b) Providing an ionized atmosphere around the materials.
c) Maintaining high relative humidity in the atmosphere near the materials.

1.11.6 As far as explosives is concerned, explosion from spark produced by static electricity is the hazard involved. Most of the explosives are liable to collect static electricity, when processed/handled in quantity, the degree of the charge depend on the quantity and natures of the explosive. Every explosive has a limit of electric charge above which it is liable to go off. Electrostatic voltages, which are developed on explosive material due to friction, sliding or handling are dangerous as these can ignite explosives unexpectedly causing serious hazards if sate limits are crossed.

1.12 PROTECTION AGAINST LIGHTNING:-

1.12.1 The fundamental principle for the protection of buildings against lightning is to provide a conduction path between the general mass of earth and the atmosphere above the building by which a lightning discharge may enter the earth without producing dangerous potential differences in or near the building and also without passing through a non-conducting part of the building, for example parts which and made of wood, brick, tile, stone or concrete.

1.12.2 The presence of explosives or highly inflammable materials in a structure may increase the risk to persons or to the structures and the vicinity in the event of a lightning stroke. For this reason higher degree of protection is required for these structures.

1.12.3 Integrally mounted system comprising air termination network of horizontal and vertical conductor of sufficient height to avoid all risk of flash over from the protective system to the structure to be protected. The supports of the network should be adequately earthed. The earth terminations of each protective system should be interconnected by a ring conductor and the resistance value of the earth termination network should be maintained permanently at 10 ohms or less.

1.12.4 While designing the lightning protective system of an explosives building, the space within which a lightning conductor provides protection against a direct lightning stroke by diverting the stroke to itself is important. For a single vertical conductor, this zone is described as a cone with its apex at the higher point of the conductor and with a protective angle between the side of the cone and the conductor

1.12.5 Explosives factories require higher degree of protection. If one horizontal conductor only is used the protective angle adopted should not exceed 30". If two or more parallel horizontal conductor are installed, the protective angle to be applied may be as much as 45" within the space bonded by the conductor, but it should not exceed 30" outside that space. The possibility of any point within such a zone of protection being struck by lighting is remote.

1.12.6 IS code of practice IS-1960 lays down design, installation, testing and maintenance of lightning protective system?

1.13 ELECLTRICAL SAFETY

1.13.1 Electricity is our most versatile form of energy. Failure to take suitable precautions in its use, however, creates conditions which are certain to result in bodily harm or property damage/or both. Although there have been many advances in the control of electrical hazards, industry still has many injuries and fatalities from preventable causes.

There are, certain hazards in the installation, maintenance and use of electric wiring and equipment. Control of most of these hazards is neither difficult nor expensive, but ignoring or neglecting them may lead to serious accidents.

1.13.2 The safety considerations require the electrical equipment should be able to withstand dielectric-stresses due to the supply voltage and temperature rise due to passage of current at the same time & provide no hazards to the persons handling the equipment. The requirements are verified through suitable tests, viz. High voltage and insulation strength, the temperature rise test for checking the current carrying capacity, etc. to render electrical installations safe from the possibility of non-current carrying parts becoming alive, protective measures like earthing may be required.

1.13.3 Safety in electrical maintenance may require action in two direction; firstly, proper design, selection, installation, preventive maintenance of the equipment and lines and secondly, compliance with general safety procedures.

1.13.4 Based on analysis of accidental (electrical) studies conducted in this field, the electrical hazards common in transmission and distribution system may be divided into three principal categories.

1.13.4.1 Shock to persons/living creatures.

1.13.4.2 Ignition of combustible material due to sparking.

1.13.4.3 Damage to the equipment as a result of overheating/stressing due to abnormal flow of current.

1.13.5 SHOCK

1.13.5.1 Electrical shock is the sudden and accidental stimulation of the body nervous system by an electric current. Though the flow of the current depends upon the voltage, the damaging factor in electric shock is the magnitude of current.

1.13.5.2 Current less than 6 milliamps may not do any harm. Currents above this cause the adults to loose controls of the muscles affected and results in collapse, unconsciousness and death depending upon the period of contact.

1.13.5.3 The passage of current affects the rhythm of the heart which fails in its function and steps blood circulation leading to lack of oxygen to the brain and tissues. Alternating currents are more dangers, in this respect, that the direct currents as the DC can only affect the rhythm of the heart, if these are applied at a vulnerable instant of the heart cycle. Against this, the cycle effect of the AC affects the heart cycle.

1.13.5.4 Shock intensity and its effect also depend on current path, frequency and duration. Relatively large currents can pass from one leg to another. Currents with frequencies of 20 to 100 cycles are most hazardous. The 50 cycle frequency, in commercial use in India, is especially dangerous, since it is closed to the frequency of the heart rhythem. Higher frequencies are less hazards, as these flow along surface, rather than the conductor or body.

1.13.5.5 The effect of shock may be different for different persons due to the resistance of the body. A human with dry skin has an electrical resistance of 10 ohms. An accidental contact of a dry finger involves a resistance of 400,000 ohms which may be only 15,000 ohms when finger gets wet.

1.13.6 CAUSES OF SHOCK

1.13.6.1 Contact with bare energized conductor

1.13.6.2 Contact with an energized conductor on which the insulation has deteriorated or the insulation of which has damaged to the extent that it has lost its protective value.

1.13.6.3 Contact with an electrical equipment or tool that may fail and the housing gets charged.

1.13.6.4 Contact with an equipment that may have electric charge.

1.13.7 TREATMENT FOR ELECTRIC SHOCK

1.13.7.1 In most cases of electric shock and collapse, it is the lungs and diaphragm (*the thin sheet of muscles which lies below the lungs) that stop working and there is a very good chance of revival by applying quickly artificial respiration. Methods of artificial respiration generally used are:-

1.13.7.01 Arm-lift chest-pressure method (Silvester's method).

1.13.7.02 Hip-lift back-pressure method.

1.13.7.03 Arm-lift back-pressure method.

1.13.7.04 Mouth to mouth method.

1.13.7.05 While rendering artificial resuscitation, violent operations should be avoided as injury of the internal organs may result from excessive and sudden pressures. In case of severe shock, respiration is seldom established within a period of an hour while 3 to 4 hours or more might be found necessary to restore normal breathing. It is, therefore essential that in all cases of electric shock where the condition of the patient is doubtful or the patient is unconscious or not breathing, artificial respiration should be continued until death is diagnosed by a physician or until rigo-mortis meets in.

1.13.7.06 The most important thought to be borne in mind is the quickness of giving artificial respiration. Immediately after removing the man from live conductor first aid should be given within 2 to 3 minutes; because on this depends the mortality rate (MR)

$$\text{Mortality Rate:} \quad \frac{1}{\text{Speed of starting Resuscitation}}$$

1.13.7.2 **Removal from contact.**

If the person is still in contact which the apparatus that has given him shock, shout for help and switch off the electric circuit at once. If it is not possible to switch off the circuit quickly, no time should be lost in removing the body contact with the live conductor. The victim's body should not be touched with bare hands instead rubber gloves are not available, the victim should be pulled off from the live conductor by his coat, shirt etc. if they are not wet or with any other dry cloth or even dry newspaper folded into 5 or more thickness. Wooden rods or broom handles may also be used to raise the body or to detach it from the live conductor. A good plan is to stand on dry board or stool or on few layers of thick newspaper bundles or even dry sacking and remove the victim from the live conductor.

1.13.7.3 If the patients are smouldering, the sparks should first be extinguished. The doctor should be immediately called. When breathing is stopped, the patient should not be placed in such a position which may bring pressure on the burns he may have sustained. He should not be exposed to cold. Cold water may be given in small quantities in case of electric fire or asphyxia and smelling salts may be administered in moderation. Stimulants should not be administered unless recommended by doctor. Artificial respiration without interruption until natural breathing is restored, should be continued. The patient should not be removed from his place until he is found breathing normally and then also removed in lying position. A brief return of spontaneous respiration is not a certain indication for terminating the treatment. The patient after temporary recovery of respiration, stops breathing again in many cases, therefore, the patient should be watched if normal breathing stops, artificial respiration should be resumed at once.

1.13.7.4 When the patient revives, he should be kept lying down and not allowed to get up or be raised under any circumstances without the advice of a doctor. If the doctor has not arrived by the time patient has revived, he should be given some stimulant, such as tea or drink or hot ginger, coffee etc. First aid treatment should be given to all the burns.

1.13.7.5 Use of undersized conductor has been a cause of overheating and fire. Throwing of wastes, carrying metal wire by people living in upper floors have led to short circuiting of bare live conductors passing below. The resultant spark-over had been the cause of serious fie to adjoining buildings. Such metallic pieces sometimes also provide current leakage path leading to a electrocution.

1.13.8 **DAMAGE TO EQUIPMENT**

Transformer oil and other liquid used for cooling and protection of electrical equipment, could also be a cause of equipments bursting due to production of gases with resultant high pressures. This normally happens if the equipment is not isolated during faulty conditions resulting in heavy currents or spark-over due to contacts becoming loose even during normal use.

1.13.9 **SHOCK PROTECTION AND SAFETY PRECAUTIONS**

1.13.9.1 Insulating parts, of electrical equipment which a person will come in contact as a routine, like; knobs, dials, handles, control buttons, switches etc.

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1.13.9.2 Insulating personnel, by providing insulating rubber mat in front of electrical equipment to be operated.

1.13.9.3 Electrical equipment to be kept in an isolated place to avoid unauthorized or untrained personnel approaching the same.

1.13.9.4 Marking- Points of access to hazardous electrical equipment to be marked with suitable warnings and to clearly indicate its functional aspects to avoid mal-operation.

1.13.9.5 Avoid using loose clothes while working.

1.13.9.6 People working on overhead lines, must use safety belts, helmet, proper ladders to be used.

1.13.9.7 Portable tools must have 3 wire cord having guard wire permanently connected to the tool frame and means of grounding at the other end to avoid any chance of electrical shock, while working. Rubber gloves, insulation of pliers handles to be inspected each time before start of work.

1.13.9.8 Proper earthing of the premises. For this periodic earth tests should be taken and record maintained.

1.13.9.9 Street lighting circuits to be properly earthed, including stays.

1.13.9.10 Under no circumstances any deviation from safe practices should be tolerated which would otherwise result in unnecessary hazards and danger to workman or apparatus.

1.14 GENERAL SAFETY PROCEDURE

1.14.1 It is important that all work shall be carried out under the personal supervision of a competent person. All work on major electrical installations should be carried out under "Permit-to-work-system". No work should be commenced on live mains, unless it is specifically intended to be so done by specially trained staff.

1.14.2 All mains and apparatus to be worked upon (for low and medium voltage system) shall be proved dead, earthed and short circuited. Warning boards should be provided besides taking into consideration all safety precautions.

1.14.3 Observe minimum distance from the exposed live high voltage mains or apparatus as per system/equipment voltage.

Voltage upto	6.6 KV	distance 2.565 M
Voltage above	6.6 KV and Upto 11 KV.	distance 2.59 M

1.14.4 Fire extinguishers, properly insulated should only be issued for fire fighting near exposed live conductors. When using fire hose, it should be ensured that the jet of water does not come into contact with live conductors. It is dangerous to throw a stream of water, a wet

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blanket or a stream from ordinary soda-acid-type extinguishers or live mains or apparatus.

1.14.5 One person should not go along to attend work. There should be two persons of require equal cadre.

1.14.6 Proper illumination should be ensured at all the times.

1.14.7 Safety poster in the form of DO and DO NOT should be exhibited at important locations.

1.14.8 Periodic inspection of installations, distribution system and workman safety equipment tools should be rigidly followed.

2.0 FIRE FIGHTING IN ABOVE GROUND SITES.

2.1 For the purpose of fire fighting, "above-ground sites" are those where the explosives are above ground levels, it includes those when part of the explosives may be below ground.

2.2 Success in fighting fire involving explosives is very largely dependent on action being taken before the fire can develop and the availability of copious water supply. For fires involving metallic powders (MP Class) dry sand should be used as extinguishers. Water, foam, chemical extinguishers (CO_2) CCL_4 etc. shall not be used. Where petrol is present or involved foam instead of water should be used.

2.3 In all fires first aid action plays a very important role and can even save disasters. In any fire, the drill given in the S.I. No. 7 chapter III SMI- 1 should be scrupulously followed, a few useful points from the drill are given below for ready reference.

2.3.1 Anyone noticing a fire should immediately shout "Fire, Fire" to attract attention of others and simultaneously take action to put out the fire by using fire buckets or sand bucket as available / as required.

2.3.2 Inform of the occurrence to HOS/any other responsible staff member.

2.3.3 Inform fire station immediately on phone and send the fire alarm card of the building or of the nearest building through a messenger.

2.4 Negligence or mistakes in tackling small fires may lead to big fires. Prompt and correct fire fighting action in the initial stages may save serious catastrophe. This is more important in case of fires involving explosives. The procedure for fighting fires for building containing different fire class of explosive are as below:

2.4.1 FIRE DIVISION 1 - ACTIONS

2.4.1.1 A fire involving items of fire division 1 is fought during incipient stage with all available means and without awaiting specific instructions. In general, ammunition without its means of initiation and ignition can be exposed to a fire for several minutes

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before it explodes. Initiators, igniters, propelling charges and rocket motors are extremely sensitive to fire. A fully developed fire is not fought unless it is known: (i) what types of ammunition or explosives may be exposed to a fire before they explode (ii) how long the ammunition or explosives may be exposed to fire before they explode; (iii) how long the ammunition or explosives have been exposed to fire

2.4.1.2 If detected before the explosives are involved, prompt action with first-aid fire fighting equipment should be taken to prevent development of a serious fire and mass explosion. If drenchers are provided, they are to be operated immediately.

2.4.1.3 The fire alarm must be operated immediately and the fire brigade called. All non-essential personnel are to be evacuated from the scene of fire to a safe position. (inhabited building distance)

2.4.1.4 On arrival of the fire fighting service, action should be directed towards preventing the explosives from becoming involved. Once the fire reaches the explosives, then a mass explosion can be expected and the primary concern must be for the safety of personnel from blast, heavy debris and high speed fragments, and secondly, to avoid loss or damage to fire fighting equipment where practicable.

2.4.1.5 Fire fighting operation must only be carried out from a sufficient distance (process building distance) and from behind substantial cover such as that afforded by traverses or moulds.

2.4.1.6 Following a mass explosion, action is to be confined to preventing the involvement of adjacent buildings or stacks by the application of cooling water sprays on them. When the adjacent buildings are well within the range of burning debris or sparks, the head of the establishment is large, no time should be lost in doing this. If operated directly as the risk of penetration by hot fragments is apparent.

2.4.2 FIRE DIVISION 2 - ACTIONS

2.4.2.1 A fire involving items of fire division 2 is fought at once during the incipient stage with all available means and without awaiting specific instructions. Fire division 2 ammunition does not explode immediately after fire reaches it. Usually explosions from these fires can be expected only after the ammunition has been heated for an extended period of time (10 to 40 minutes).

2.4.2.2 If detected before explosives are involved, prompt action with 'first-aid' fire fighting equipment should be taken to prevent the development of a more serious fire. In drenchers are provided they are to be operated immediately.

2.4.2.3 The fire alarm must immediately be sounded and fire brigade called. All non-essential personnel shall be evacuated from the scene of the fire to a sufficiently safe distance (inhabited building distance).

2.4.2.4 The action of the fire fighting services is to be directed towards preventing the explosives from becoming involved, but if this proves unsuccessful then fire fighting operations

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must be continued from behind suitable cover such as afforded by traverses / mould or substantial buildings using copious supplies of water with spray nozzles. Water should be freely applied in order to cool those items which may be started by hot fragments, fire-brands, lobbed items and self- propelled stores.

2.4.2.5 If drenchers are provided in adjacent buildings, they are to be operated immediately if any risk to the buildings is anticipated.

2.4.3 FIRE DIVISION 3 - ACTIONS

2.4.3.1 A fire involving items of Fire Division 3 is fought at once during the incipient stage with all available means and without awaiting specific instructions. If, in the incipient stage, the fire cannot be controlled, the scene of fire is evacuated at once.

2.4.3.2 If the fire is detected before explosives are involved, prompt action with 'First – Aid' fire fighting equipment should be taken to prevent the development of a more serious fire. If drenchers are provided they are to be operated immediately.

2.4.3.3 The fire alarm must immediately be sounded and fie bridge called. All non- essential personnel shall be evacuated from the scene of the fire to a sufficient safe distance (inhabited building distance).

2.4.3.4 The action of the fire fighting services is to be directed towards preventing the explosives from becoming involved, but if this proves unsuccessful then fire fighting personnel should continue to concentrate on subduing the fire plus preventing its spread to adjacent buildings or stacks.

2.4.3.5 The fire fighting staff can fight the fire before and after the explosives become involved as there is no great risk of explosion. The fire is likely to be fierce with the evolution of intense heat radiation. Fire fighting staff must use protective clothing's and self-contained breathing apparatus to stand the intense heat radiation and evolution of dense smoke which may have the risk of toxic effects. Copious water should be applied freely in spray form with spray nozzles fitted to hoses.

2.4.3.6 In process buildings, especially those where potentially hazardous operation pose an instantaneous mass fire propagation condition and the risk to personnel and vital plant machinery/equipment is grave, it is essential that an automatic fire fighting device incorporating high speed 'ultra violet' detectors be installed to actuate the water / foam spray/drenching system.

2.4.4 FIRE DIVISION 4 - ACTIONS

2.4.4.1 Fires involving items of Fire Division 4 are fought in all cases and with all available means.

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2.4.4.2 If fire is detected in the incipient stage, prompt action with 'first-aid' fire fighting equipment, should be taken to prevent the fire developing. The fire alarm must be sounded immediately and the fire brigade called. All non- essential personnel are to be evacuated from the scene of the fire to a safe distance (inhabited building distance).

2.4.4.3 The action of the fire fighting services is to be directed towards preventing the explosives from becoming involved, but if this proves unsuccessful fire fighting personnel should continue to fight the fire taking advantage of any available shielding e.g. buildings, adjacent stacks, brick wall etc.

2.4.4.4 Copious water should be applied freely in a form which will provide for effective fire fighting, consistent with the need for protection of fire fighters. It may be possible to approach the fire at a range which will allow use of water spray.

2.5 AMMUNITION REQUIRING SUPPLEMENTARY SYMBOLS.

Ammunition containing explosives and toxic or pyrotechnic agents requires special attention and different fire divisions depending on the kind and quantity fought in accordance with the fire division(s) involved taking into account the precautions indicated by the supplementary symbols.

2.6 LIQUID PROPELLANTS / FUELS

2.6.1 Fire division symbol 3 should be displayed in the building where liquid propellants/fuels are handled and stored. Wherever necessary, supplementary symbol/s would also be affixed at prominent places in those buildings.

2.6.2 Liquid propellants/fuel due to their inherent hazardous properties like toxicity, corrosive fumes, inflammability, etc. require special attention while fighting fires. To effectively and safely combat fires involving these fuels, fire fighters must have knowledge of their burning characteristics and the specific hazard which may be encountered. Since the smoke and fumes from such fires are generally toxic, fires should be approached and fought from the upwind side, fire fighters should wear full of approved type.

2.6.3 Copious water in a fog form should be used for fighting fires. In case of propellants / fuels which are not miscible with water and would not respond to water spray, the automatic foam AFFF type sprinkler system must be used. For a very fast fire action response, it is recommended that ultra violet or infra red sensors should be incorporated in the automatic deluge system of water /foam spray.

2.7 METALLIC POWDERS

2.7.1 Metals are sometimes used in a powder form was ingredients of explosives compositions and hence stocks may be located in explosives areas. These constitute a special risk because they are capable of burning fiercely and reacting violently with water.

2.7.2 A separate crescent symbol should be displayed on the buildings where metallic powers are processed and stored along with 'apply no water' supplementary symbol.

2.7.3 As soon as fire is detected, the 'first-aid' fire fighting measures must be applied to prevent the development of fire, the fire alarm must be sounded and the fire brigade called.

2.7.4 The extinguishing agents to be used on metal powder fires are sand, powdered graphite, powdered asbestos powdered talc, soda ash and lime stone, suitable chemical dry powder may also be used in bulk form or from portable extinguishers having low velocity, long reach discharge applicators, subjects to the dry chemical being non-hygroscopic and not unduly toxic.

2.7.5 The extinguishing agent should be carefully spread on to the fire, starting from outside the burning area and working towards the centre, using long handled scoops or shovels. The utmost care is necessary to avoid any disturbance of the burning powder until it has cooled below its ignition temperature.

2.7.6 Water and other extinguishants like foam or chemical extinguishers (carbon dioxide, ethyl bromide, and carbon tetrachloride) must not be used. A notice to this effect, together with a water prohibited supplementary fire symbol shall be conspicuously displayed at each building, where these powders are used or stored.

2.8 ACTIONS - SUMMARY

2.8.1 A summary of fire fighting actions for different fire division's symbols is given as Annexure – II for the convenience / ready reference of the fire fighting services. These actions may be displayed at prominent places like fire fighting stations, security office, etc. along with the appropriate symbols.

3.0 FIRE FIGHTING MEASURES

3.1 Fire fighting measures within an explosives establishment call for close attention to detail and co- ordination of all available means to ensure that an out-break it tackled immediately and energetically and brought under control as quickly as possible.

3.2 These measures may conveniently be sub-divided :

a) Fire fighting 'first-aid' measures;
b) Establishment measures;
c) Mutual aid scheme;
d) Local /Civil Authority measures.

and are considered as follows :

A) FIRE FIGHTING 'FIRST- AID' MEASURES :

There are adequate provisions within a building containing explosives or in the vicinity of an explosives stack in the open, or underground, of fire fighting appliances and local fire alarms for operation by those on the spot. The prompt use of these appliances may be the means of preventing a more serious incident, and all concern must be trained to be fire conscious and capable of operating the equipment efficiently.

B) **ESTABLISHEMENT MEASURES:-**

i) Establishment measures comprise the provision of fire fighting media and equipment including adequate supply of water from static tanks and / or pressure mains, fixed fire fighting installations, hydrants, hose, mobile fire appliances, adequate supply of foam wherever necessary i.e. fire engines and trailer pumps, fire extinguishers, self contained breathing apparatus, an efficient general fire alarm system, means of communication, protective equipments and clothing's and trained fire fighting personnel.

ii) All appliances and equipments are to be maintained in an efficient condition. Practices designed to test the efficiency of the establishment arrangements should be made at frequent interval (at least once in a month). Special attention must be paid to dealing without breaks of fire during non-working hours. The fire fighting drills should also include reciting of various fire fighting actions by the fire fighting crew.

iii) Capacity of static tanks for explosives storage areas should be 225 KL and be positioned at distance not less than 100 M and not more than 200 m from the storage Magazines. In case of process areas in the explosives factories and laboratories under different service organizations, capacity of static tanks could be 100KL or 220 KL depending on local requirements / conditions. For bomb-dumps of Air Force tank should be of 100Kl capacity.

iv) Hydrants for fire fighting purpose may be provided where adequate pressure and out-put is assured. Hydrants may be installed on 150 MM diameter main branched off to 100 MM in cases where it is meant to feed a single hydrant. For explosives areas, water discharge of 1150 liters per minute at a head of 30 meters should be available from each hydrant when two hydrants are operated simultaneously. In case of units engaged in non- explosive activities, the requirement of head is 20 meters. The location of the fire hydrants should be decided in consultation with Fire Advisor at the time of planning/ siting of the facilities.

C) **MUTUAL AID SCHEME :**

When there are more than one Defence units in a station, the station Commander, who is responsible for security against fire in all the Defence units of the station, shall formulate a scheme of mutual aid by which all fire brigades maintained by the various Defence units in the station may be brought together for fighting a fire, on an alarm being raised by any Defence installation on the outbreak of a fire. The heads of the different Defence installations must fully co-operate and assist the station commander in the successful working of the scheme

D) **LOCAL / CIVIL AUTHORITY MEASURES:**

These measures are those taken by the local fire authority by providing all normal fire equipment and appliances in use by them together with trained fire fighting personnel.

3.3 **CO- ORDINATION OF MEASURES:**

The close and efficient co-ordination of the first three elements A, B and C (listed above) is absolutely essential. With regard to the element D above, the local/ civil authority measures, it is left to the discretion of the station commander and the head of an establishment, who may seek the co-operation. The following instructions will be observed by the head of an establishment:

3.3.1 The head of the explosive establishment shall inform the nearest fire officer of the local civil authority of the presence of explosives. He shall be given particulars of the nature of the fire which he and his party shall be required to fight in case of an emergency. The head of the establishment and the fire officer of the local civil authority, in consultation with the station commander who shall co-ordinate the plan on a station basis. Agreement shall be reached between the two officers on their respective contribution in equipment and personnel towards the overall fire fighting plan and combined exercises arranged where possible.

3.3.2 Agreement shall be reached on the conditions under which civil authority measures would be called upon.

3.3.3 To minimise delay there should be permanent telephone communication between the head of establishment and Fire Officer of the local civil authority, by direct line where possible, particularly at large establishments.

3.3.4 The control of the Fire Fighting operations within an enclosed explosives area when both the Govt. establishment and civilian fire services are operation, shall necessarily be exercised by the head of the establishment.

4.0 **CHEMICAL HAZARD**

4.1 Some substances are not hazardous in their normal state, but become so in contact with others. Other substances are only hazardous when involved in a fire, they may create conditions which make fire fighting difficult or they may contaminate or damage other substances.

4.2 Some of the selected hazardous chemicals have been classified in 9 groups according to the specific hazard which is created so that precautions may be taken in handling, storage and fire extinguishment.

4.2.1 **GROUP – 1**: Explosives.

4.2.2 **GROUP – 2:** Compressed "permanent" liquefied and dissolved gases 2A flammable e.g. Coal gas, Hydrogen, Methane. 2 B Toxic e.g. chlorine, Ammonia, Phosgene.

The long- continued respiration of any gas, except air and oxygen will cause suffocation

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4.2.3 **GROUP – 3:** Substances which become hazardous by interaction. 3A with water e.g. Phosphorus, Potassium Sulphate, Zinc Ethyl.

4.2.4 **GROUP – 4:** Substances giving off flammable vapours. 4A at temperatures below 76^0F (24.4 ^{0}C) e.g. Acetone, Benzene, Petrol.
4B at temperatures between 76^0F and 150 ^{0} F (24.4 ^{0} C and 71.1 ^{0} C) e..g. Amyl Acetate, Paraffin, Kerosene.
Substances giving off flammable vapours at temperatures above 150 ^{0} F (71.1 ^{0} C) are placed in Group -8.

4.2.5 **GROUP – 5**: Corrosive substances, e.g. Acid sulphuric, Acid Nitric, Potassium Hydroxide.

4.2.6 **GROUP – 6**: Poisonous substances.
6A those giving off a poisonous gas or vapour, e.g. Bromine, Carbon Disulphide, chlorinated lime.
6B other poisonous substances e.g. phosphorous, Barium Peroxide, Bromine.

4.2.7 **GROUP – 7** Miscellaneous.

7 A oxidizing agents, e.g. chlorates, permanganate, Barium Peroxide.

These substances, while not necessarily themselves combustible, are strong oxidizing agents. They will augment the rapidity and violence of a fire and may even initiate a fire. In admixture with organic substances they may be sensitive to explosion through heat or percussion, especially if accompanied by friction.

7 B Substances liable to spontaneous heating and ignition. Certain substances and articles treated with contaminated with or containing oils and fats are liable to spontaneous heating and ignition. Therefore, certain oils and fat are included in this group which are not susceptible to dangerous spontaneous heating in bulk, e.g. linseed oil, Tung oil, cod liver oil.

7 C Readily Combustible solids, e.g. camphor, Cellulose Nitrate (celluloid), Sulphur.

4.2.8 **GROUP – 8** :Substances likely to spread fire by flowing from one part of the building to another, namely, all oils, fats and waxes, rubber, lard, bitumen, pitch etc.

4.2.9 **GROUP – 9**: Substances in such a form has to be readily ignitable, namely wood shavings, paper, pieces of fabric, cotton, bags, fiber, down- flock, kapok and similar materials, flour, coal dusts, metal dusts and other dusts and powders.

4.3	Chemical Substances	Group	Summary	Measures of fire Extinction
4.3.1	Acetone	4A	A colourless liquid with a pleasant minty smell. Highly Volatile and Inflammable	water in the form of sprays is the best extinguishing

			miscible with water. Vapours behaviour than air and poisonous. Also known as Dimethyl Ketone, ketone, propane, propanone. E.L. (L) 2.5 %. E.L. (U) 13%.	method CO_2 may also be used
4.3.2	Acetylene	2A	A colourless gas with an ether-garlic smell. Inflammable. Explosive. Soluble in its own volume of water and very soluble in Acetone. E.L. (L) 2.5 %. E.L. (U) 80 %.	Prevent possibility of an explosion by turning off gas supply,if this is not possible by water spray. After danger of explosion has passed. Extinguish the flame with CO2. If the cylinder has become overheated, cooling branches being, Lashed and fireman Withdrawn to a position of safety. Examination of the cylinder, to establish whether it is cool should not be started for at least one hour. When the cylinder has completely cooled, it should be removed and immersed in a tank of water for at least 12 Hours.
4.3.3	Ammonia	2A & 2B	A colourless, pungent smelling gas. Liquifies at 150^{o} C at pressure of 7.4 atmosphere Slightly lighter than air. Very soluble in water. Not readily inflammable, but can form explosive mixture in air if heating and/or compression takes place. E.L. (L) 16%	If unable to remove cylinders from source of heat keep them cool by the use of spray jets player along the full length of the cylinders. High level ventilation as soon as fire situation tactics permit. As

			E.L. (U) 25%	the gas is very soluble in water spray jets should be used to clear the atmosphere. B.A. must be used.
4.3.4	Ammonium nitrate	7A	A white crystalline solid soluble in Water. Can Cause explosions. Decomposes heated to when produce poisonous heavier than air, vapours .	Flood with water but avoid scattering crystals or solutions. No high pressure jets. Remove unaffected containers to cool dry position. Small quantities can be extinguished with Methyl bromide or CTC. Use B.A.
4.3.5	Calcium Carbide	3A	Dark grey Lumps or crystals or colourless transparent crystals. Dangerous when it contacts moisture.	Use absolutely dry sand powder talcum or asbestos. B.A. may be necessary
4.3.6	Calcium Oxide (Quick Lime)	3A	Colourless crystals or a white powder Very caustic. Also known as quick lime .	Wear skin and eye protection. Use dry lime, absolutely dry sand.
4.3.7	Methyl Alcohol (Methanol)	4A	A colourless liquid with a slight rather Pleasant smell, inflammable burns vigorously. Poisonous soluble in water. Also referred to as Methanol, Carbinol, Wood Naptha and wood spirit. E.L. (L) 6% E.L. (U) 36%	CO2, CTC or similar gas, alcohol resistant foam or dry powder Water sprays can be used for dilution B.A. should be worn.
4.3.8	Methylated Spirit	4A	Industrial methylated is water-white and has a characteristic smell Ordinary grade spirits are dyed with methyl violet to render them unpalatable. Inflammable, Soluble in water.	Sprays or alcohol resistant foam or CO2 can be used in small fire. B.A. should be worn.
4.3.9	Nitric Acid (Aquafortis)	5A & 7A	Transparent colourless or, yellowish liquid. Fuming, suffocating, caustic and highly	Dilute the acid with copious water supplies. B.A. and

			corrosive. Explodes in contact with organic materials. Fume very toxic. Not itself inflammable. Also known as aquafortis.	complete protective Clothing must be worm.
4.3.10	Oxygen	2&7A	Colourless, Odourless gas, Liquid when under high pressure Gas and Liquid explodes in contact with oxidisable materials. Liquid dangerous to touch.	Use extinguishing media appropriate to the material burning and take the usual precautions for compress gas cylinders.
4.3.11	Petroleum Spirit	4A	A clear colourless liquid. Very inflammable and explosive. Toxic E.L. (L) 1.4% E.L. (U) 5.9%	Foam, CO2, methyl Bromide, chloro-bromo-methane or dry powder, as necessary.
4.3.12	Sulphur	7C	Yellow crystalls or powder. Dust or vapours Inflammable when mixed with air. Toxic fumes. Also known as brimstone, flowers of sulphur	Large fire can be flooded with water sprays or open ended (Do not disturb the powder or dust, explosion dangers areas. Small fires can be extinguished by smothering with sulphur. B.A must be worn.
4.3.13	Sulphuric Acid (oil of vitriol)	5	A heavy oily colourless liquid Corrosive. Not inflammable, but can ignite carbonaceous materials. Toxic vapours. Miscible with water. Also known as “oil of vitriol.”	Avoid the use of Water unless large quantity of water can be applied to dilute the acid. Smoother with chalk Soda or ashes. Use B.A
4.3.14	Varnish	4A,B	Varnish is a solution of natural or synthetic waxes or resins in solvents or oils.	CO2, foam, CTC or Methyl Bromide, Dam up flowing liquids with sand or Earth.

5.0 GAS AND DUST EXPLOSION

5.1 Danger of explosion caused by mechanical shock as in the case of acetylene cylinders or mechanical failure by reason of faulty cylinders, fire or corrosion.

5.2 Escape of gases which are supporters of combustion e.g. Oxygen, compressed air, Nitrous Oxide etc., those which are flammable such as hydrogen, Acetylene etc., and those which are poisonous e.g. Ammonia, Chlorine, Sulphur dioxide etc.

5.3 Where the presence of free gas is suspected, naked lights of any type should not be used and no attempt should be made to operate electric switches which might spark and cause an explosion of illumination is necessary, spark-proof electric hand lamps may be employed. If these are not available hand lamps or torches should be switched on before entering the suspected premises and switched off only after returning to safe atmosphere.

5.4 It is a characteristic of almost every combustible material that when they are in the form of finely divided power, they present special dangers to those who work with them and to the fireman. These dangers are associated at one and with the possibilities of extremely rapid combustion and at the other of their slow combustion i.e. one end of the scale is a dust explosion, while at the other is the phenomenon of smouldering. Both those require special attention from fire fighting personnel.

5.5 Dust explosion commonly occur in grinding and pulverising mills, in dust extraction plants and "cyclones" in which dusts are collected. Very frequently they are caused by the explosive ingress of foreign bodies and particles of and stone etc., in grinding machinery and by heat or spark.

5.6 Poor house-keeping also contribute to dust-explosion. Collection of inflammable dust on horizontal surfaces of walls and machinery over girders, floor or furniture occur slowly and occasion may arise when some of these dusts are disturbed and become suspended. In the presence of heat, spark or flame, this may give rise to a dust explosion and the chain of explosions capable of destroying the entire building.

5.7 Spontaneous combustion is also an indirect cause of dust explosion, dust heaps may be ignited spontaneously. A dust cloud may be formed and consequent explosions may result.

6.0 PROTECTION FROM NITROUS FUMES

6.1 In all process buildings where operatives may have to work close to open sources of nitrous fumes, atleast one serviceable mask should be provided. The mask should be worn by the operative whenever he approaches the open source of nitrous fumes in the course of normal work. It is the responsibility of the building Incharge to see that this is done.

6.2 Whenever any employee suspects having inhaled nitrous fumes, he should immediately report to the shift Incharge and the latter should immediately send him to the Hospital.

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The shift Incharge should also record the fact of the incident in the log book and inform the Head of Section as well as the Divisional Officer.

6.3 In all cases of suspected nitrous fumes inhalation, the patient should be given immediate treatment and kept under observation in the Hospital for atleast 48 hours before he is released from Hospital.

6.4 All incidents of suspected nitrous fumes inhalation should be subjected to detailed investigation by the Safety personnel and the investigation reports submitted to GM.

6.5 Personnel who have medical history of chest ailments should not be detailed on process which require close approach to open sources of nitrous fumes. Also when any person suffers from any chest ailment, they should keep away from open sources of nitrous fumes.

7.0 SPECIAL PRECAUTIONS AGAINST FUMES AND CORROSIVES ETC.

7.1 Personnel working with acids and dangerous corrosive liquids where there is a risk of personnel injury from splashes or otherwise will wear goggles, gloves and boots. These articles will be examined and washed as necessary.

7.2 No person will be permitted to enter for the purpose of cleaning or any other purpose, any vessel, which has contained acids or other corrosive materials, unless such materials and their fumes have been removed as far as practicable.

8.0 BREATHING APPARATUS

8.1 Before we try to understand what is breathing apparatus, we should fully understand what we breath in and breath out. We will not bother as to why and how we expend oxygen in breathing but only try to understand how much we require per minute.

8.1.1

	We breathe in	We breathe out
Nitrogen	79.04 %	79.04 %
Oxygen	20.93 %	16.95 %
CO2	0.03 %	4.00 %

8.1.2 We breathe harder when we work or do some strenuous exercise that is we consume more oxygen and thus produce more CO2.

8.1.3 The following is a table showing roughly how much oxygen or air we need for different exertions : -

Exertion	Oxygen	Air	Each respiration (air)	No. of respiration per minute
Rest in bed	0.237	7.7	0.457	16.8
Rest standing	0.328	10.4	0.612	17.1
Walking 2 m.p.h.	0.780	18.6	1.270	14.7
3 m.p.h.	1.065	24.8	1.530	16.2
4 m.p.h.	1.595	37.3	2.060	18.2
5 m.p.h.	2.543	60.9	3.140	19.5

1 Cubic ft. = 28.3 litres.

8.1.4 In more strenuous work we require more oxygen or air. What do we expect a breathing apparatus to do for us then?

i) It should give you not less than 2 litres per minute of oxygen or corresponding quantity of air.
ii) It should have arrangement for absorbing or expelling all the excess CO2 created by respiration.
iii) If the wearer required extra supply of oxygen as and when doing more strenuous work, there should be arrangements for extra supply.
iv) The apparatus should not develop undue heat and if it does there should be arrangements to cool it.

8.2 There are two types of breathing apparatus.

8.2.1 **ATMOSPHERIC TYPE :**
Using air of the atmosphere which is provided by the wearer's efforts or by somebody else's efforts

8.2.2 **SELF-CONTAINED TYPE :**
Using compressed air or oxygen from an independent supply carried on the apparatus.

8.3 **ATMOSPHERIC TYPE :**
i) Respirator or air filter type.
ii) Equaliser tube type.
iii) Bellows type smoke helmet.

8.3.1 **RESPIRATOR TYPE :**

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8.3.1.1 The apparatus consists of a mouth-piece fitted with inhalation and exhalation valves. The inhalation valve is connected to a canister containing charcoal, lime, glycerine or any other absorbent.

8.3.1.2 You must have noticed that the general service or civilian respirator is of this type.

8.3.1.3 These are meant for open air where smoke or other obnoxious gases are contained. But in case of fire you may encounter conditions where there may be a deficiency of oxygen. This apparatus cannot be used in such a case. Moreover, the absorbent is suitable for particular types of gases only and not all types. This apparatus is not useful for smoke as it is likely to clog the absorbent filter.
Note : None of the canisters gives protection against coal gas or any other gas containing carbon-monoxide

8.3.2 EQUILISER TUBE APPARATUS :

8.3.2.1 This consists of a mouthpiece with inhalation and exhalation valves. To the inhalation valve is fitted a long tube which trails behind the wearer and the open end of which is kept in the open air. It may also have an air filtrate at the open end. The wearer draws his supply of air from this tube and breathes out to the atmosphere.

8.3.2.2 ADVANTAGES :

a) It is cheap and does not cost anything to maintain.
b) Light in weight.
c) No valves or intricate mechanism to manipulate.
d) Can be used for unlimited periods.

8.3.2.3 DISADVANTAGES :

a) The movement of the wearer is restricted due to the tube and his distance is limited to the length of the tube.
b) The tube may be chocked by falling debris or other causes.
c) The wearer has to put up great effort to breathe. This increases with the length of the tubes.
d) A man has to be left outside to see that the open end is always in free and uncontaminated air supply is available.

8.3.3 BELLOWS TYPE SMOKE HELMET :

8.3.3.1 This is similar to the equaliser tube. The face piece is a hood consisting of a helmet and cow hide flapping all around which is tucked under the tunic of the wearer. In the front there are windows fitted with mica for the wearer to see.

8.3.3.2 Fresh air is fed through a long trailing line by means of bellows operated by hand, foot or machine. The exhalation valve is fitted on the top of the helmet.

8.3.3.3 ADVANTAGES :

It has the same advantages as the equaliser type and the following in addition :

a) The face of the wearer is completely covered so that he cannot be harmed by contact of gases to his face.
b) He gets constant supply of cool air without exerting for it.
c) In case he is trapped he can go back by following the tube.

8.3.3.4 DISADVANTAGES

The same as for equaliser type and in addition :

a) The apparatus is bulky to stow.

Please, however, note that this apparatus has been found very useful in ship's holds and petrol tanks where men have to work for long hours and may not be trained or have no time to attend to the valves and manipulation of a self-contained set.

8.3.4 COMPRESSED AIR BREATHING APPARATUS

8.3.4.1 The cylinder holds 1200 litres of air at 120 atmosphere pressure. It will last : -

Light work	- 77 min	- 15.6 per minute.
Moderate work	- 60 min	- 20.0 per minute.
Heavy work	- 26 min	- 46.0 per minute.

8.3.4.2 The principal parts of the set are : -

1) Compressed air cylinder.
2) Main cylinder valve protected with rubber ring.
3) Carrying frame complete with adjustable shoulder straps and body belt.
4) Main supply tube.
5) First stage reducing valve.
6) By-pass valve.
7) Supply tube connecting reducing valve to face piece.
8) Face piece consisting of : -
   i) Moulded rubber face cover.
   ii) Eye pieces.
   iii) Demand (inhalation) valve.
   iv) Exhalation valve.
9) Pressure gauge with tube.
10) Pressure gauge valve.

8.4 ADVANTAGES :

1. Freedom of movement. You can go as far as you like in a gas-laden atmosphere depending on the contents of the cylinder. You can go in any atmosphere.
2. Extremely simple in assembly and operation.
3. Can be recharged easily. All you need is a small portable compressor. This can be done locally so that you don't have to stock a large number of cylinders.
4. No chemical action is involved. You breathe only air.
5. With this set in, you can speak to each other while working.

8.5 DISADVANTAGES :

1. The duration of the set varies within very wide limits. With more efforts you want more air, the cylinder may then empty out sooner. It is, therefore, useful for very short periods.
2. The apparatus is not very flexible and bending is rather difficult.
3. The apparatus is heavier than oxygen breathing apparatus. Air required is nearly five times that of oxygen.
4. The face piece may not fit all faces.

8.6 SELF CONTAINED CLOSED CIRCUIT BREATHING APPARATUS

8.6.1 The compressed air breathing apparatus was of the open circuit type because you exhaled out to the atmosphere.
In the closed circuit type you rebreathe the exhaled air which is returned to a breathing bag.

8.6.2 As you know the exhaled air contains about 4 parts of CO2 in hundred Air. The oxygen content is, therefore, progressively reduced and replaced by the CO2. In the bag is provided some sort of absorbent for CO2. This will take away the CO2 but the oxygen has to be made good. This is done by re-generating the exhaled air by means of an oxygen supply at pre-determined rate from a cylinder. This supply does not depend on the energy expended by the wearer. The working time of such sets is pre-determined within exact limits.

8.6.3 As the supply of oxygen is regulated, a reserve of breathable air should be maintained. This is done in the breathing bag in which the exhaled air is also returned.

8.6.4 The set that is in common use at present in the army fire services is "PROTO" Mark IV, self-contained oxygen Breathing, Apparatus. The principal parts are : -

1. A steel cylinder, containing 11 cu.ft. of oxygen at 120 atmospheric pressure (311.3 litres at 1800 lbs pressure approx.), fitted with a valve and safety locking bolt. Anti-rust type.

2. The valve group, consisting of (a) reducing valve (b) by-pass valve (c) pressure gauge

valve.

3. Breathing bag of strong vulcanised India rubber. It has two compartments which are connected to each other at the bottom. It is contained in a strong water-proof canvas bags.

4. Inhalation and exhalation valves.

5. Cooler which contains calcium chloride or sodium phosphate.

6. Mouth piece and nose clips.

7. Skull cap.

8. Eye protecting goggles.

9. Pressure gauge.

9.0 TYPES OF EXTINGUISHING MEDIA AND TECHNIQUE OF APPLICATION

9.1 TYPES OF EXTINGUISHING MEDIA :

Generally suitable types of extinguishing media for different risks are as follows : -

(a) Carbonaceous materials, vegetation, paper, saw Dust, cloth, etc.	- Water.
(b) Petrol and oil.	- Foam, dry powder, carbon dioxide or Chloro bromo methane and chloro bromo methane yield toxic vapours and care should be exercised particularly is its use in an enclosed space. Sand may be used in fires in spilled liquid.
(c) Varnishes, solvents, Dope.	- Foam, carbon dioxide or chloro bromo methane. Water for cooling sound containers. Sand may be Useful on fires in spilled liquid.
(d) Electrical	- Carbon dioxide chloro bromo methane or dry powder.
(e) Gas	- Extinguish by cutting off supply. Where extinguishment is desirable and will not create a hazardous situation the flame may be extinguished by dry powder, carbon dioxide, or by water fog which should be directed into the flowing gas. Use water to cool cylinders.
(f) Magnesium and other	- Powdered asbestos, graphite, dry sand and certain

	Metal dusts.	special proprietary powders gently applied.
	(g) Pyrotechnics	- Dry powder, sand, earth.
	(h) Salt baths	- Dry inert powders and dry sand.
	(i) Rubber plastics and celluloid	- Large quantities of water (high pressure water jets).
	(j) Acid	- Large quantities of water (spray branches or open ended hose lines).

9.2 TECHNIQUE OF APPLICATION

9.2.1 Water - Direct the fog or the jet at the base of the flame and keep it moving across the area of fire. Sock out any hot spots after the main fire is extinguished. A fire spreading vertically should be attacked at its lowest point and followed up.

9.2.2 Foam - Where the liquid on fire is in a container, direct the foam rope at the inside edge of the container or at any adjoining vertical surface above the level of the burning Liquid. This breaks the foam jet and allows the foam to build up and flow across the surface of the liquid. Where it is not possible, apply foam from such a range that is falls vertically on the liquid. Do not direct the foam jet directly into the liquid. On fires in falling liquids, apply foam at the base of the flame and work upwards. Foam should be applied from windward side.

9.2.3 Dry Powder Carbon dioxide and vapourising liquids - On fires involving either liquids in containers or spilled liquids, direct jet or discharge horn towards the near edge of fire and with a rapid swooping motion drive the fire towards the far edge until all the flames are extinguished. On fires in falling liquids, direct the jet or horn at the base of the flames and swoop upwards. On fires in electrical equipment, direct the jet or horn straight at the fire. Where the equipment is enclosed, direct the jet or horn into any opening with the object of penetrating the interior.

10.0 <u>INVESTIGATION OF FIRE</u> - FEW POINTS.

10.1 <u>INTRODUCTION</u>

10.1.1 Investigating into the cause of outbreak of a fire is just as important as fighting the fire itself. This has probably even greater significance in the Defence Establishments, as it is well known that Standing Instructions require that every outbreak of fire must be

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investigated into as to its cause, by investigating/enquiry. The purpose of all such investigations is twofold

10.1.2 Firstly, to find out whether the fire has been caused due to negligence on somebody's part, or due to one of the usual common causes i.e. defect in handling processing or storage of the materials involved or defective machineries in use. In such a case, care is taken to see that the defect is remedied and reoccurrence of such an accident in future is prevented.

10.1.3 Secondly, if the fire has not been caused due to ordinary or common causes, then, to find out whether this has been caused deliberately by somebody i.e. a case of sabotage.

10.1.4 It is therefore very important that the Fire Officer possesses sufficient technical knowledge, so that with the help of the same, he may assist the Chief Fire Officer in finding out the cause of the outbreak.

10.1.5 The investigation of a fire is often a strenuous procedure and requires keen observing power, and inquisitiveness about even the apparent insignificant factors. It is for this purpose that this subject is being brought out

10.2 BASIC FACTORS

10.2.1 Investigation of any fire will depend upon three basic factors all of which are inter-dependent.

1. Point of ignition - Where?
2. Time of ignition - When?
3. Cause of ignition - Why?

10.2.2 The third factor can be only arrived at only after satisfactory conclusion of the first and then the second factors

10.3 POINT OF IGNITION

10.3.1 Finding out the points of ignition in most cases is rather not difficult. In case of small fires which may involve only a small room or a small portion of the building, the evidences available after the fire has been extinguished, will usually point out the place where it started. Normally the point of severe charring (in case of small fires) is also the point of ignition.

10.3.2 If, however, the fire has involved a large part of building or more than on floor of the building, then it becomes a very difficult thing to establish the point of origin. Unfortunately, in such cases one has to depend upon circumstantial evidences mainly. However, a systematic approach based on the following points will always help in establishing the place of origin.

a) First man who saw the fire.
b) Portion of building found involved when first noticed.
c) Direction of wind at the time of fire.

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d) Lowest part of the building involved.
e) Chance of fire travelling horizontally.
f) Chance of fire travelling vertically up or vice versa.
g) Type of materials involved, and the arrangement of their storage processing etc.

10.4 TIME OF IGNITION

10.4.1 The time of ignition has considerable bearing about the spread of fire and the directions of the spread, for example during high windy days the spread will be very much faster than during days when there may be heavy showers. In addition the time of ignition also has a relevancy in so far as arson cases are concerned. In general the following points will help in establishing the time of ignition.

1) The first person who saw fire.
2) The extent of fire will first be noticed in relation to the materials stored and their arrangements.
3) Whether any highly inflammable materials etc. are in use or storage.
4) Weather condition at the time of the fire.

10.5 CAUSE OF IGNITION

10.5.1 As has been already pointed out finding out the cause is rather a difficult one. The fire in most cases destroy all evidences pertaining to the origin and therefore one has to depend solely on circumstantial evidences.

10.5.2 In arriving at the cause of outbreak we have first to find out whether the fire has been caused due to one of the common causes may be listed as below : -

1. Carelessness by use of naked flame etc. This is frequently a cause of the fire.
2. Electrically, which accounts for a major percentage of the number of outbreaks.
   The electricity may cause a fire in different ways.
   a) Faulty workmanship – taped joints, worn-out insulation etc.
   b) Overloading of circuit.
   c) Static electricity.
3. Friction in machinery, heated bearings belt drive etc.
4. Spontaneous combustion: A very large number of combustible materials are subject to spontaneous heating and ignition. Common examples are : -
   a) Hay & Straw
   b) Jute, Hemp
   c) Coal
   d) Tobacco
   e) Oil soaked cotton waste and rags.

In case of spontaneous combustion, three conditions are necessary : -

i) A certain amount of moisture.
ii) A certain amount of pressure.
iii) Inadequate dissipation of heat generated.

5. Chemical reactions: This takes place in various ways. To cite a few examples:-

a) Potassium Permanganate coming in contact with glycerine.
b) Phosphorous exposed to atmosphere.

6. Quick dry oil e.g. linseed oil.

10.6 POINTS TO TAKE NOTE OF WHILE ATTENDING OR INVESTIGATING A FIRE.

10.6.1 Colour of Smoke : This may be : -

a) White or grey-indicating free carbonaceous materials involved.
b) Yellow or brown-indicating sulphur or some acid involved.
c) Black-indicating Petroleum Products or rubber involved.

10.6.2 Colour of flame : This may be : -

a) Cherry Red-indicating free carbonaceous materials involved.
b) Bluish or Orange-indicating alcohol involved.
c) Dark Red-indicating Petroleum Products Rubber etc. burning.

11 OCCUPATIONAL HAZARDS OF IMPORTANT PRODUCTS

Item	Occupational Hazard
1. TNT	: Poisoning, Gassing, Burns and death.
2. DNT	: Poisoning, Gassing, Burns and death.
3. INITIATOR	: Poisoning, Death.
4. Liquid Propellants (G-FUEL, O-FUEL)	: Gassing, Toxicity, Acid and burning.
5. CE 14/100, 36/100 CE Crystalline Dense and PEK-1	: Poisoning, Dermatitis, Death.
6. LEAD NITRATE	: Toxic, strong oxidising material, dangerous fire risk in contact with organic material.
7. 36 M HAND GRENADE	: Poisoning, Gassing, Burning and death.
8. Rifle Grenade 36 M Mk1	: Poisoning, Gassing, Burning and death.
9. Augmenting Cartridges for Mortar Bomb 81mm, 120mm & 51mm	: Poisoning, Death.
9. AMMONIUM PERCHLORATE	: Irritate skin, eyes and nose, headache, fatigue, Dizziness, blue colour of skin and lips, may effect kidneys.
10. CE Primer	: Poisoning, Dermatitis, Death.

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SHELF-LIFE OF IMPORTANT PRODUCTS

Sl. No.	Nomenclature	Allotted shelf in filled condition	Remarks
1.	TNT	20 Years	Bulk if unfilled shall be subjected to periodical Inspection every 5 years.
2.	CE Crystalline Dense	20 Years	- do -
3.	HNS	20 Years	Bulk if unfilled shall be subjected to periodical Inspection every 2 years.
4.	PEK-1	15 Years	-
5.	Mercury Fulminate	5 to 10 Years	Being highly sensitive Initiatory explosives bulk to be filled within 21 days of Manufacture.
6.	Lead Azide	12 Years	- do -
7.	Lead Styphnate	20 Years	Being highly sensitive Initiatory Explosives.
8.	Tetrazene	a) 12 years with Lead Azide b) 20 years with Lead Styphnate	- do - - do -
9.	Styphnic Acid	---	To be stored under wet condition. To be used In lead Styphnate, Wet Lead Styphnate,RD1303 manufacture.
10.	'G' Fuel	10 Years.	-
11.	'O' Fuel	10 Years.	
12.	36 M Hand Grenade	30 Years.	
13.	Rifle Grenade 36 M Mk1	30 Years	
14.	CE Primer	20 Years	
15.	Augmenting Cartridges for Mortar Bomb 81mm, 120mm & 51mm	10 Years	

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16.	Ammonium Perchlorate	Infinite	AP being an inorganic compound, theoretically it has infinite shelf life provided it is packed in air tight containers/ bags and stored properly under ambient condition.

13. COMPATIBILITY GROUP & SAFETY CATEGORISATION OF PRODUCTS.

Details as per STEC Pamphlet No. 2

Product	Compatibility Group	Safety Categorisation
1. Initiators	Group A	HD 1.1
2. Composition Exploding	Group D	HD 1.1
3. TNT	Group D	HD 1.1
4. DNT	Group D	HD 1.1
5. HNS	Group D	HD 1.1
6. Slab Demolition	Group D	HD 1.1
7. 'G' Fuel) 8. 'O" Fuel (RFNA))	To be treated) Like Petrol)	HD 1..3
9. 11. 36 M Hand Grenade	Group D	HD 1.2
10. Rifle Grenade 36 M Mk1	Group D	HD 1.2
11. Augmenting Cartridges for Mortar Bomb 81mm, 120mm & 51mm	Group C	HD 1.3
12. Ammonium Perchlorate	Group D	HD 1.1
13. CE Primer	Group D	HD 1.1

14. PHYSICAL CHARACTERISTICS OF IMPORTANT PRODUCTS

TNT

1) Appearance : Light Yellow Flakes.
2) Molecular Weight : 227.1
3) Density : 1.47g/cm (Molten).
4) Melting Point : 80.7oC (Solidification Point).
5) Solubility : Insoluble in Water.

TETRYL (COMPOSITION EXPLODING)

1)	Appearance	: Light Yellow Crystals.
2)	Molecular Weight	: 287.1
3)	Density	: 1.73g/cm
4)	Melting Point	: 129.5oC
5)	Solubility	: Soluble in Ether, Alcohol.

HNS (HEXANITROSTILBENE)

1)	Appearance	: Yellow Crystals.
2)	Molecular Weight	: 450.1
3)	Density	: 1.74g/cm
4)	Melting Point	: 318oC
5)	Solubility	:

LEAD AZIDE

1)	Appearance	: White Colourless crystals.
2)	Molecular Weight	: 291
3)	Density	: 4.8 g/cm
4)	Melting Point	: 350^0 C
5)	Solubility	: Insoluble in water.

DI NITRO TOLUENE

1)	Appearance	: Light Yellow Flakes.
2)	Molecular Weight	: 182.14 g/cm^3
3)	Density	: 1.32 g/cm
4)	Melting Point	: 71°c (Solidification Point)
5)	Solubility	: Insoluble in cold water.

G FUEL : Data Not Available

LEAD STYPHNATE

1)	Appearance	: Crystals, Orange Yellow to dark brown colour.
2)	Molecular Weight	: 450.28 g/cm^3
3)	Density	: 3.09 g/cm
4)	Melting Point	: 235°c
5)	Solubility	: Practically insoluble in water.

TETRAZENE

1)	Appearance	: Roseate Type Crystal/ light yellow Colour
2)	Molecular Weight	: Feather colourless crystals.
3)	Density	: 1.79 g/cm3
4)	Melting Point	: 128-132°c
5)	Solubility	: Insoluble in Water, Ether, Alcohol.

STYPHNIC ACID

1)	Appearance	: Yellow Brown to Red Brown Crystals.
2)	Molecular Weight	: 245.1
3)	Density	: 1.83 g/cm3
4)	Melting Point	: 176oC
5)	Solubility	: Participle soluble in water

MERCURY FLUMINATE

1)	Appearance	: Rhombic Crystal
2)	Molecular Weight	: 284.6
3)	Density	: 4.42 g/cm3
4)	Melting Point	: 160°c
5)	Solubility	: Insoluble in water, slightly soluble in org solvents.

AMMONIUM PERCHLRATE

1)	Appearance	: White Solid/ Orthorhombic Crystalline texture
2)	Molecular Weight	: 117.49
3)	Relative Density – Orthorhombic	: 1950 Kg/M3
4)	Density, Cubic	: 1760 Kg/M3
5)	Bulk Density	: Approx. 1300 Kg/M3
6)	Melting Point	: Explode before melting
7)	Phase Transition	: 240^0C (Orthorhombic to Cubic)
8)	Water Solubility	: 280 gm./lit (30^0C), 900gm/lit (100^0C).
9)	Solubility	: Soluble in methanol, slightly soluble in ethanol & Acetone and almost insoluble in ethyl acetate, ether.

15 SENSITIVITY OF DIFFERENT PRODUCTS :

1. TNT

1)	Lead block test	: 300 cm3/10g
2)	Impact Sensitivity	: 1.5 kp m = 15 Nm
3)	Friction Sensitivity	: upto 36 kp = 353 N pistil load – no reaction

4) Nature of explosion set up by shock: May be violent.

2. DNT : DATA NOT AVILABLE

3. G FUEL : DATA NOT AVILABLE

4. TERYL (COMPOSITION EXPLODING)

1) Lead block test : 41- cm3/10 g
2) Impact Sensitivity : 0.3 kp m = 3 Nm
3) Friction Sensitivity : 36 kp = 353 N
   pistil load - reaction
4) Nature of explosion set up by shock : Not violent.

5. HNS (HEXANIEROSTILBENE)

1) Lead block test : 301 cm3/10 g
2) Impact Sensitivity : 0.5 kp m = 5 Nm
3) Friction Sensitivity : Over 24 kp = 240 N
   pistil load cracking
4) Nature of explosion set up by shock : -

6. LEAD AZIDE

1) Lead block test : 110 cm3/10 g
2) Impact Sensitivity : 0.25 - 0.65 kp m = 2.5 - 4 Nm
   pistil load – explosion
3) Friction Sensitivity : At 0.01 - 0.01 kp = 0.1 - 1 N
4) Nature of explosion set up by shock : Violent.

7. LEAD STYPHNATE

1) Lead block test : 130 cm3/10 g
2) Impact Sensitivity : 0.25 - 0.5 kp m = 2.5 - 5 Nm
3) Friction Sensitivity : At 0.01 - 0.1 kp = 0.1 - 1 N
   pistil load - explosion
4) Nature of explosion set up by shock : May be violent.

8. TETRAZENE

1) Lead block test : 180 cm3/10 g
2) Impact Sensitivity : upto 5 kp m = 50 Nm
3) Friction Sensitivity : upto 36 kp = 353 N
   pistil load - no reaction.
4) Nature of explosion set up by shock : Violent

9. STYPHNIC ACID

1) Lead block test : 284 cm3/10 g
2) Impact Sensitivity : 0.75 kp m = 7.4 Nm
3) Friction Sensitivity : At 37 kp = 353 N
   pistil load - no reaction.
4) Nature of explosion set up by shock : May be violent.

10. MERCURY FULMINATE

1) Lead block test : Not available
2) Impact Sensitivity : 0.1 - 0.2 kp m = 1 - 2 Nm
3) Friction Sensitivity : Not available
4) Nature of explosion set up by shock : Violent

11. AMMONIUM PERCHLORATE

Ammonium Perchlorate is an Inorganic Chemical (Oxidizer).

1) Lead block test : N/A
2) Impact Sensitivity : N/A
3) Friction Sensitivity : N/A
4) Nature of explosion set up by shock : N/A

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1.0 **RISK FROM OVERFLIGHT OF AIR CRAFT**

Explosives storage should normally be sited at as great a distance as possible from air fields, both Service and Civil, so as to preclude –

1.1 The possibility of damage to aircraft which may be on ground or in the process of landing or taking off, from an accidental explosion in the explosives storage.

1.2 Any risk to the explosives storage arising from a crash of aircraft around or near the explosives storages

No aircraft shall cross the sound barrier altitudes/distances less than 900 m over or near any explosives areas.

2.0 **THE MAHARASHTRA FACTORIES RULES, 1963.**

In exercise of powers conferred by the factories Act 1948 the Government of Maharashtra made the above rules. As per clause 14 of these rules manufacture or manipulation of Nitro or amino compounds is declared as dangerous operation. The explosives viz. CE, TNT and Initiator being nitro compound the rules prescribed in the Maharashtra Factories Rules 1963 as per schedule 11 thereof are required to be followed. Salient features of these rules are as follows : -

2.1 Air Space: - In every room in which the said manufacturing process is carried on there shall be atleast 15 cubic meter of air space excluding any space occupied by machinery, equipment or any other article, for each person employed therein shall be taken into account.

2.2 Efficient exhaust draught : - Unless the said manufacturing process is completely enclosed so as not to give rise to dust or fume it shall not be carried on without the use of an efficient exhaust draught when a nitro or amino compound : -

2.2.1 Is introduced into a tank, hopper machine or container or filled into cartridge : or

2.2.2 Is ground, crushed, mixed, sieved or blended?

2.3 Floor or work-rooms : - The floor of every work-room in which the said manufacturing process is carried on shall be –

a) Smooth and impervious to water provided that asphalt or tar shall not be used in the composition of the floor.
b) Maintained in sound condition.
c) Sloping and provided with gutters and
d) Thoroughly washed daily by means of hose-pipe and drain water shall be led into a sewer through a closed channel.

2.4 Waste : -

2.4.1 A suitable receptacle made of non-absorbable material with a tightly fitting cover, shall be provided and used for depositing waste, like cloth, paper or other material solved with nitro and or amino compounds.

2.4.2 All such contaminated waste material shall be destroyed by burning at-least once a week.

2.5 Empty containers: - Empty containers used for holding compound shall be thoroughly

cleaned of their contents and treated with an inactivating agent before being discarded.

2.6 Decontamination of pit, tank etc. : -

2.6.1 Before a worker enters a tank, pit or kettle or any other confined space which contains a nitro or amino compound it shall be thoroughly washed and decontaminated.

2.6.2 No part of the plant which has contained a nitro, or amino compound shall be repaired or opened for repairs unless it has been emptied of such compound, thoroughly cleaned and decontaminated.

2.7 Manual handling : - A nitro or amino compound shall not be required or allowed to be mixed, filled, emptied or handled except by means of a scoop with a handle which shall be thoroughly cleaned daily.

2.8 Protective wear : - The occupier shall provide, maintain clean and in good repair protective clothing and other equipment as specified below : -

2.8.1 Long pants and shirts or overalls with long sleeves and head coverings. The shirt or overalls shall cover the neck coverings. The shirt or overalls shall cover the neck completely.

2.8.2 Rubber gloves, rubber gum boots, rubber aprons and air line respirator.

2.9 Medical examination : - No person shall be employed in any manufacturing / chemical process unless he has been examined by using appropriate clinical skills and if and as required by appropriate tests for the general health status and special and specific effects during the chemical process and found fit for the said process by the appointed doctor as per the requirements mentioned under the various laws and the rules applicable to that manufacturing / chemical process. The person examined shall be re- examined by the appointed doctor at intervals mentioned under various laws and the rules as applicable or at interval not more than 3 months if found necessary and the schedule for such examination of each individual will be prepared in advance by the Safety section based on type of job, chemical/s involved and time and duration of exposure to that chemical/s during manufacturing / chemical process and PPE's and other preventive measures used before, during or after manufacturing or chemical process in consultation with the Medical authorities.

2.10 Washing and bathing facilities : - (1) The following washing and bathing facilities shall be provided and maintained in clean state and in good repair for the use of all persons employed in the said manufacturing process : -

2.10.1 A wash place under cover with clean towels, soap and nail brushes and with atleast one stand pipe for every five such persons having constant supply of water.

2.10.2 50 per cent of the stand pipes provided under item (1) above shall be located in bathroom where both hot and cold water shall be made available during the working hours of the factory and for one hour thereafter.

2.10.3 Clear towels shall be provided individually to each worker if so ordered by an Inspector.

2.10.3 (I) In addition to taps mentioned under item 2.10.1 one stand pipe in which warm water Made available shall be provided on each floor.

(II) Arrangement shall be made to wash factory uniforms/clothes compulsorily

2.11 Washing and bathing : - All workers employed in the said manufacturing process shall carefully wash their hand and face before partaking of food or leaving the factory.

2.12 Foods, drinks, etc. prohibited in workroom

2.13 Non-sparking tools : - Non-sparking tools shall be provided for the purpose of cleaning or repairing machinery or operating any process where vapours of betanaphzhylamine are

evolved.

2.14 The following cautionary placard can be displayed to advise workers : -

2.14.1 Nitro and amino compounds or aromatic hydrocarbons are dangerous. In this factory you have to handle them frequently.

2.14.2 All items of protective wear provided should be made use of to safeguard your health.

2.14.3 Maintain scrupulous cleanliness at all times. Before meal wash hands and feet. A bath before leaving the factory is essential, taking care to wash the head well

2.14.4 If any chemical falls on your body wash it off immediately with soap and water. Change clothing at once, if (soiled) with a cyanotic nitro or amino compound. Contact the appointed doctor immediately.

2.14.5 Do not handle any nitro or amino compound with bare hands. Use a long handled scoop.

2.14.6 Avoid alcoholic drinks as these increase risk of poisoning.

2.14.7 In case of illness contact the Doctor.

2.14.8 Do not chew, eat, drink or smoke in the work room or with soiled hands. Keep food and drink away from the work- place.

2.14.9 If you work with Betanaphthylamine or benezixine or its salts alophanaphthylamine or dianisidine : -

2.14.9.1 Remember that serious effects will follow after a number of years if great care is not taken to observe absolute cleanliness of body, clothes, machinery and tools.

2.14.9.2 At meal time, wash face and hands twice with soap and water to remove all chemicals wear a long-sleeved clean apron while eating.

2.14.9.3 Before leaving the factory take a bath using soap and water twice: after this put on your home clothes.

3.0 ENVIRONMENT MANAGEMENT

3.1 INTRODUCTION

3.1.1 Global concern on environment resulted from the decline in environment quality which has been evidenced by increasing pollution, loss of vegetal cover and biological diversity, excessive concentration of harmful chemicals in the ambient atmosphere and in food chains, growing risks of environmental accidents and threats to support system.

3.1.2 The problem of environmental management is becoming a complex in rural areas and rapid industrialisation is unavoidable due to the prevailing socio-economic situation. So far as industrial water generation is concerned, the laws of thermodynamics and probability clearly indicate that zero discharge cannot be achieved.

3.1.3 This rapid industrialisation has, therefore, a major impact on the environment as it results in the formation of waste products which are released in the environment in the form of waste waters, gaseous emissions and solid and semi- solid residues leading to environmental pollution and degradation. Though nature has endowed the environment with a unique self-purification capacity, yet the quantum of discharge and/or emission from industries has so increased over the last few decades that the problem can no longer be tackled by the self-purification process alone. The urgent need for the enactment of legislation on environmental protection has, there, become evident.

3.2 INDIAN STANDARDS

3.2.1 In 1957, Indian Standards Institution has set up its Waters Sectional Committee (CDC 26) to prepare, among others, standards for industrial and sewage effluents before discharge into inland surface waters, marine coastal areas, on land and into sewers. The sectional committee has, initially brought out two Indian Standards.

3.2.2 The first one (IS 2488) covers in five parts methods of sampling and test for industrial effluents. The Second Indian Standard (IS2490) prescribes in nine parts tolerance limits for industrial effluents discharged into inland surface waters, marine costal areas, public sewers and land for irrigation purposes.

3.2.3 Part 1 of IS 2490 is applicable to all industries as regards tolerance limit for industrial effluents, the IInd part cover specific industries, such as distilleries, tanneries, strawboard industry, electroplating industry, dyestuff and dye intermediate manufacturing industry, coke ovens, phosphatic fertilizers industry and nitrogenous fertilizer industry.

3.2.4 Indian Standard (IS 6582-1971) lays down the bioassay methods for evaluating the toxicity of industrial effluents and waste waters to fish and other aquatic organisms in the receiving water which can help decide whether an effluent can be discharged at given rate without causing direct injury to aquatic fauna and flora.

3.2.5 IS 2296-1974 deals with the tolerance limits for inland sources water subject to pollution and IS: 1967-1976 deals with criteria for controlling pollution of marine coastal areas.

3.2.6 Indian Standard Institution has also prepared codes of practice for the treatment and disposal of effluence emanating from individual industries including distillery industry, cane sugar industry, cotton and synthetic textile industry, dairy industry, electroplating industry, fertilizer industry, tanning industry, viscose rayon industry, petroleum refinery industry, pulp, paper and board industries and steel plant.

3.3 LEGAL ASPECTS OF ENVIRONMENTAL POLLUTION

3.3.1 Minimal National Standards (MINAS) for a particular industry is the effluent standard achievable by the industry by installing pollution control measures which are within the techno economic capability of the industry. Depending on the gravity of the pollution and techno-economic assessment of the requisite pollution control measures the MINAS may be attained in one stroke or in phases. The evolution of MINAS thus remains independent of the characteristics of the recipient environment.

3.3.2 The Central and State Boards for Pollution Control have come to an agreement that under no circumstances MINAS would be relaxed as because the same is techno-economically unacceptable to the industry. On the contrary, at situations where the recipient environment demands stricter quality of the effluent of the industry, the State Boards are required to prescribe standards stricter than MINAS. Comprehensive industry documents are being prepared for a number of industries which will be useful to the industry, the regulatory agencies, the consultants and to all interested in pollution control.

3.4 POLLUTION CONTROL ACTS IN INDIA

3.4.1 There are 49 Central laws and 19 State laws that have a direct or indirect bearing on the protection of environment and chemical safety. Following five acts are specifically

dealing with environment.

1. The Wild Life (Protection) Act, 1972.
2. The Water (Prevention & Control of Pollution) Act, 1974.
3. The Water (Prevention & Control of Pollution) Class Act, 1977.
4. The Air (Prevention & Control of Pollution) Act, 1981.
5. The Environment (Protection) Act, 1986.

3.4.2 The Environmental law appears to be a recent invention and not a sudden creation. Many provisions dealing with the environment are scattered in pieces and are found in the different enactments of this country. However, the above mentioned Acts take control away from some of the earlier legislation on environment embodied under common law, Municipal Acts, the Factory Act, Indian Penal Code, Criminal Procedure Code, etc.

3.5 HAZARDOUS WASTES (MANAGEMENT AND HANDLING) RULES, 1989 (INDIA).

3.5.1 Ministry of Environment and Forests, Government of India have framed Hazardous Waste (Handling and Management) Rules 1989 under Environment (Protection) Act 1986 and brought out Guidelines for Management and Handling of Hazardous Wastes (prepared by National Productivity Council, New Delhi and NEERI) in 1991 and a Guide to manufacture storage and import of Hazardous Chemicals Rules, 1989, recently.

3.5.2 The Environment (Protection) Act, 1986 places on the Central Government the responsibility of laying down procedures and safeguards for handling of hazardous substances and prevention of accidents. Three sets of following rules have been prepared to regulate the handling of hazardous chemicals, hazardous micro-organism/genetically engineered organisms and wastes.

i) Waste water and exhaust gases as covered under the provisions of the Water Act,1974 and the Air Act, 1981 and rules made there under.

ii) Wastes arising out of the operation from ships beyond five kilometres as covered under the provisions of the Merchant Shipping Act, 1985 and the rules made there under.

iii) Radio-active wastes as covered under the provisions of the Atomic Energy Act, 1982 and rules made there under.

3.5.3 The Rules contain definitions, responsibilities and grant of authorization for handling hazardous wastes, power to suspend or cancel an authorization, provisions for suitable and safe packing, labelling and transport of the wastes and mandate for authorised person to publish periodically an inventory of disposal sites within the state for the disposal of hazardous wastes.

3.5.4 Compliance on the part of waste treatment and/or disposal facility operators includes maintenance of records and submission of returns, accident reporting and follow-up. Import of hazardous waste is permitted only for processing or reuse as raw material. The GOI is empowered to grant or refuse permission for such import. The appellate authorities have also been identified.

3.5.5 The Ministry of Environment and Forests, through the Gazette Notification of March 24, 1992, introduced Public Liability Insurance Act Policy which is specially designed to protect any person, firm, association or company who owns or has control over handling any hazardous substance at the time of accident. The hazardous substances include 179 hazardous substances along with 3 categories of inflammable substances. The terms handling means manufacturing, processing, treatment, packaging, storing, transportation by vehicle, use, collection, destruction, conversion, offering for sale, transfer or any other similar form of dealing with hazardous substances. The minimum coverage for any one accident should not be less than the paid-up capital upto a minimum of Rs.5 crores and a maximum of 15 crores for any one year. The consequences of not taking the policy can be imprisonment of not less than one year and six months or a fine of not less than 1 lakh or both. For repeat offenders, provisions for imprisonment of 2 to 7 years and/or a fine of 2 lakhs or more have been provided.

3.6 ENVIRONMENTAL AUDIT

3.6.1 Environmental Audit has become mandatory for industries from the year 1993. According to rule 14 of the Environment (Protection) Rules, 1986, inserted vide Government of India notification dated 13-3-92, every person carrying on any industry, operation or process, requiring consent of Pollution Control Board under the Water (Prevention and Control of Pollution) Act, 1981 or authorisation under Hazardous Waste (Management and Handling) Rules, 1989 is required to submit an environmental audit report for the financial year ending 31st March in prescribed form to the State Pollution Control Board on or before September 30 every year beginning 1993.

4.0 DESTRUCTION OF EXPLOSIVES

During the manufacturing process operations, waste arising which consists of explosives, corrosive and other toxic materials accumulate/leave each process building.

4.1.1 Initiators viz. Lead Styphnate, Lead Azide, Mercury Fulminate, Tetrazene etc. are highly sensitive to shock and friction having very low figure of insensitiveness of 10 to 25 compared to figure of sensitiveness of 106 to 115 in case of TNT. Hence manufacture and handling of initiators are done in small quantities with greatest possible care. In addition to the explosion hazard, initiators are poisonous in nature and care should be taken to maintain clean conditions in handling and to avoid contact with skin or inhalation of dust.

4.1.2 Since Initiators are handled in small quantities, waste arising of initiators consequent on manufacture and other processing are very meagre and such waste arising are not allowed to accumulate and are destroyed by chemical means from time to time. However, virgin Initiators when fail to come up to the specification requirement and are required to be disposed off by destruction, some can be detonated in small quantity or destroyed by burning after desensitization.

4.1.2.1 Tetrazene : - Tetrazene when treated with 20% solution of caustic soda and boiled with live steam gets decomposed. During the manufacture of tetrazene present in wash liquors is destroyed by above method. It should always be ensured that tetrazene contaminated water is treated with 20% NaoH solution and boiled by live steam before letting into the drain.

4.1.2.2 **Mercury Fulminate :** - Its destruction can be done by treatment with aqueous sodium thio-sulphate. All the clothing and equipments and even the gutters through which wash water contaminated with M.F. passes, should be treated by the solution of sodium thio-sulphate. In the storage building, M.F. duly filled in calico bags are kept well immersed under distilled water in porcelain basins. This water is checked for acidity every day and if it is found acidic at any time it is replaced with fresh water in the basin. The water removed should not be let to gutter unless the same is treated by the solution of sodium thio-sulphate.

4.1.2.3 **Lead Azide / Basic Lead Azide:** - Solution of Sodium Nitrite and glacial acetic acid are used for destroying Lead Azide. In the Lead Azide precipitation room, the precipitation pan, stirrer and other equipments are required to be treated with the above solution to remove Lead Azide contamination after each brew. In the Lead Azide sieving room, prior to sieving operation the floor is covered by brown craft paper so that the spillages can be collected and transferred to the pot for destruction by above method. All equipments coming in contact with Lead Azide are required to be treated by the solution of Sodium Nitrite and glacial acetic acid to remove contaminations of Lead Azide. All wash water from Lead Azide building after duly treated with the destruction solution is let into the gutter to a Lead lined brick tank outside the building so that any Lead Azide particle will get settled in the tank and finally get decomposed by the solution before effluent flows into outside drain.

4.1.2.4 **Lead Styphnate / Wet Lead Styphnate / RD 1303:** - Lead Styphnate is destroyed by treatment with warm ammonium acetate solution to dissolve the styphnate. Acetic acid and zinc turnings are added and allowed to remain for atleast two days. All contaminated material, waste styphnate in pots, oversize crystals etc. are treated in this manner. The Antistatic Pots used for drying of dead Styphnate should be kept immersed in the destruction sump and removed after days. The mother liquor and subsequent wash liquors from the precipitating pan are run into the destruction sump via. The filter cloth, filter box and stainless steel drain. This is then treated with concentrated sulphuric acid and iron filings. The filter cloth and cloth with ammonium acetate solution and zinc turnings in an earthenware jar are allowed to stand for 3 days. Then it is put aside in a rubber bucket for burning.

4.2 DESTRUCTION BY DETONATION

4.2.1 Sub-standard batches of Lead Azide can be destroyed by detonation. Detonation is carried out in the destruction ground surrounded by blast well at safe distance of 50 m from surrounding utilities. Not more than one container i.e. a paper mache dubba

containing 120 gms of Lead Azide is detonated at a time. Matches fuze and Safety Fuze No.11 MK-II are used for lighting the dubba so that it penetrates to about 2 cm. The dubba is covered with the lid carrying the fuze.

4.2.2 Care is taken to see that the inner end of fuze is clear of the Azide in the dubba. The operator will light the fuze with matches fuze and walk briskly away to a distance of atleast 50 to 60 m. He should wear ear plugs, fire proof clothings and safety goggles. The above methodology of destruction is not in vogue in this factory.

4.3 DESTRUCTION OF EXPLOSIVES WASTES BY BURNING

4.3.1 All the bulk explosives wastes (TNT, CE, PEK-1 etc.) and explosive contaminated material connected with the manufacture should be kept wetted with water in wooden boxes. The quantities that may be burnt at a time are as follows according to the practice in vogue in H.E. Factory.

Waste TNT explosive / contaminated material connected with manufacture and testing of initiator.	-	100 kg.
Waste CE	-	90 kg.
Waste PEK-1 explosives / contaminated material Connected with manufacture and testing of initiator.	-	28 kg.
Wastes arising out of 'G' Fuel production soaked in saw dust	-	60 kg.

4.3.2 Explosives waste is then spread on the burning ground platform evenly to a breadth of 600 mm and thickness of 40 mm in the case of waste explosives like TNT, CE etc., and 13 mm for PEK-1 contaminated clothing are ripped open to avoid risk of confined explosives already laid in position. Kerosene is now sprinkled over the bed of explosives using a water can for the purpose. Thereafter, a piece of cloth tied to an end of a metal rod (not less than 2.5 m long) is soaked in kerosene and lighted by means of a match box. Further details are contained in S.I.No.33 dated 18-12-91.

4.3.3 Lighting of kerosene-soaked cloth will be done atleast 10 meters away from the waste explosive bed. When the cloth tied to the metal rod has caught fire, the train of waste explosive is lighted from a distance holding the metal rod at its other end and taking into consideration the direction of wind. When the explosives are burnt and the flames die down, the smouldering residues are turned by means of a racker provided to ensure complete burning. At the end of the burning, platform is allowed to cool for half an hour and then water sprinkled. After half-an-hour, the platform is flooded with water, scraped and the residue is buried.

Note : -When more than one burning is required to be done on the same site on the Burning ground platform, a time interval of atleast 2 hours between the completion (watering down) of one end & start (laying cut) of the other should be given.

4.3.4 During burning of waste explosives, it should be ensured that : -

i) When more than one burning are to be carried out in a day, the second and subsequent burnings is conducted at the same burning ground only after profusely watering the site and allowing minimum interval of 30 minutes between watering the site and laying the subsequent bed. The second and subsequent bed should be laid at a minimum distance of 5 meters from the earlier site.

ii) The burning ground and its vicinity upto 15 meters all round should be cleared of grass shrubs and inflammable unwanted materials and thoroughly wet the whole area with water.

iii) All fire fighting precautions as laid down in S.I. should be taken.

iv) Spreading and laying of waste explosives bed should be as per S.I. The bed should be of thickness not exceeding 4 cm. Large size lumps should be removed, broken up and put back.

v) During burning, the operators should take shelter behind sand bags.

vi) Waste explosives burning should not be carried out when there is strong surface wind.

4.3.4 FOR G FUEL : Disposal through MEPL

4.3.5 FOR AMMONIUM PERCHLORATE: Destruction of waste Ammonium Perchlorate is carried out as per provisional SI No. – 160(PO-AC) by burning at CE burning ground (bldg. No. 45).

5.0 TREATMENT OF EFFLUENTS

The domestic sewerage treatment plant and the industrial effluent plant were taken over from Maharashtra Water Supply and Sewerage Board on July 29, 1993. The broad details of treatment is furnished below.

5.1 Pre-treatment of waste waters (MRT & LRT).
(Mercury Removal Treatment & Lead Removal Treatment)

5.1.1 The waste waters generated in the initiator section are treated with sodium carbonate and sodium sulphide and thereby mercury and Lead are removed.

5.1.2 Oil and grease traps : Eight numbers of oil and grease traps are provided with a view to separate the spillage of oil and grease from the main stream of effluents.

5.2 Effluent Treatment Plant

5.2.1 Acidic industrial water is treated in the Equalisation - cum-Neutralisation tank with sodium carbonate solution and thereafter neutralised. Waste water is pumped into the flash mixer where alum solution is added.

5.2.2 Thoroughly mixed waste water is allowed to flow into a clarifloculator where minute particles are brought together to form heavier particles and settled down in the clarifier. The clarified neutral effluent is discharged to the river within the limits laid down in the specification

5.3 The problem of nitro bodies coming from TNT and CE sections are tackled in the following ways : -

i) Local treatment with additional cooling coils for precipitation of nitro bodies.

ii) One of the neutralizing tanks further to precipitator of nitro bodies is filled with Lime Stone for arresting and filtering dissolved Nitro bodies before diverting the same to main stream of ETP.

iii) In CE section 5% KMn04 solution is added to effluents to dissolve nitro bodies.

iv) An additional labyrinth in CE area to arrest floating nitro bodies before effluents go to river.

5.4 Sewage Treatment Plant

5.4.1 The sewerage generated in the factory is pumped to the receiving chamber and then screened and degritted as a first measure. Thereafter it is allowed to flow to the secondary clarifier. The clarified effluent is doused with Chlorine and discharged to the river in conformity with the specification.

5.5 Earthen Open Bond

5.5.1 An earthen open pond is also constructed at ETP site having a capacity of 12,000 m3. The treated effluents from ETP and STP are let into this pond for mixing, dilution and settling. This treated effluent is used for horticulture and the excess quantity is let out to the river.

5.6 The maximum quantity of discharge of effluents per day is –

Industrial effluents	17615 m3
Domestic effluents	385 m3
	18000 m3

5.6.1 The treated sample is tested to MPCB parameters.

5.6.2 PERMISSIBLE LIMITS OF TREATED EFFLUENT

Sl. No.	Category of Discharge		Permissible Limits
1.	Mercury contaminated effluents.	-	Not exceeding 0.01 mg/1
2.	Lead contaminated effluents.	-	Not exceeding 0.1 mg/1

3.	Oil/Grease contaminated effluents.	-	Not exceeding 10.0 mg/1
4.	Acidic effluents from CE/TNT Acid producing units :		
	i) pH	-	Between 5.5 to 9
	ii) Dissolved Oxygen	-	Not less than 5 mg/1
	iii) Suspended solids	-	Not to exceed 100 mg/1
	iv) Ammonical Nitrogen	-	Not to exceed 50 mg/1
	v) B.O.D. (5 days at	-	Not to exceed 30 mg/1
	vi) C.O.D.	-	Not to exceed 250 mg/1
	vii) Modified bio-assay test on fish for 96 hrs for survival	-	90% Survival

6.0 **5.0 AIR POLLUTION : -**

Stack emission monitoring for Building nos.48, 20-21A, 24B, 200, 18, 19A and in building 236 are carried out on daily basis in the morning hours to ensure that the absorbed volume does not exceed the MCPB limits.

The limits are -

For NOx - Max. 300 ppm
SO2 - Max. 600 ppm

In 20 TPD (Bldg. 200) in every shift the tail gas is checked for (NO+NO2) NOx content and absorption system is increased to reduce the emission.

Stack emission monitoring for Building nos.48, 20-21A, 24B, 200, 18, 19A and in building 236 are carried out on daily basis in the morning hours to ensure that the absorbed volume does not exceed the MCPB limits.

The limits are -
For NOx - Max. 300 ppm
SO2 - Max. 600 ppm

In 20 TPD (Bldg. 200) in every shift the tail gas is checked for (NO+NO2) NOx content and absorption system is increased to reduce the emission.

In Bldgs.48 (CE nitration), denitration towers (20-21) and detetrylation Bldg. (24B) the stack emission are sampled to ensure that NOx content is contained by frequent soda solution circulation in absorption tower.

In Bldg. No.236 (Oleum plant) the stack emission is checked for SO2 and chimney height has been raised sufficiently to prevent entry into ambient atmosphere.

In Bldg.No.9 for Boiler Houses the suspended particulate matter and carbon dioxide are tested daily to ensure that the emission adheres to the

prescribed levels.

CO2	-	11.0 to 14.5%
Suspended particulate Matter.	-	150 mg/Nm3

7.0 **GAS CYLINDER**

Since compressed and liquefied gases are contained in the cylinders any rough handling may cause friction and disturb the state of gas inside. Change in state may lead to increase of pressure resulting in bursting off.

Care also has to be taken while opening or closing the cylinder valves. It should not be opened or closed suddenly. Outlet must be opened keeping the cylinder in vertical up-right position.

7.1 A standard colour code. IS: 1955 is observed to identify the gases. It is as follows : -

Gas	Ground colour or Cylinder	Colour bands on cylinder
Acetylene	Maroon No.541	None
Ammonia	Black No.630	Signal red & Golden Yellow
Air	French grey	None
CO	Black No.103	White or aluminium
Nitrogen	Signal red 537	None
Oxygen	Black	None
SO2	Light green brume wick	Golden yellow
PNG	Yellow	Yellow

7.2 Special precautions for handling Cylinders : -

7.2.1 No inflammable or explosive material shall be kept near or in the same room where the filled cylinders are stored.

7.2.2 Any open flame in the neighbourhood shall be extinguished before opening the valves of cylinders containing inflammable gases.

7.2.3 No oil, grease or similar lubricants shall be used on any valve or other fittings of the cylinders.

Note : - Oxygen cylinder valves or any fittings thereof should not be handled with greasy hands or gloves.

7.2.4 The vent or metal cap protecting the valve shall always be kept clear so as to prevent excessive pressure.

7.2.5 The cylinders valve shall not be opened suddenly. While opening the valve orifice must be kept facing away from the operator.

7.2.6 Open cylinders are not in use, discharge valve shall be tightly closed even though the

cylinders are considered empty.

7.2.7 Precautions should be taken to see that the safety devices with which the cylinders are equipped are not tampered with.

7.2.8 Extreme care should be exercised in handling so that cylinders are neither dropped nor permitted to strike against each other.

7.2.9 No lifting magnets shall be used in loading and unloading of cylinders. When any such operation is carried out by means of a crane, a properly designed cradle with chain suspension shall be used. Rope shall always be used for slings, never chains.

7.2.10 Cylinders containing liquified or compressed gas and their fittings shall always be maintained in good condition and stored away from the sun or any source of heat.

7.2.11 It is highly dangerous to alter valves or to use adapters and therefore should not be done.

7.2.12 Cylinders shall not project beyond sides or ends of vehicles while being transported and adequate precautions will be taken to prevent cylinders from falling off or moving by winding them with a rope round, the free ends of which will be tied to the hooks provided in the Trolley. The regulator be tied to the hooks provided in the Trolley. The regulator and gauges should be removed prior to dispatch of cylinders.

7.2.13 After work is finished and when the cylinder is empty, always close the cylinder valves.
Note : - Never loosen or remove the cylinder valve.

7.2.14 Cylinders should be properly supported by chaining and other means.

7.2.15 In case of filled Hydrogen cylinders from which is being tapped, electrostatic hazard should be reduced as far as possible by earthing the cylinder and appropriate parts of the connecting system and where possible by using conductive rubber."

7.2.16 Never treat compressed gas cylinders as scrap.

7.2.17 Be careful to see that cylinders do not come near in contact with electric cables or electric leads starting to cut weld.

7.2.18 Periodically inspect rubber hose connection attached to the cylinder and see that it is free from cuts, cracks, burnt or worn places.

7.2.19 Arrange the hose so that it cannot be cut by contact with sharp edges or corners by falling metal or by passing traffic.

7.2.20 Use "RED" hose for acetylene and other combustible and "BLACK" for Oxygen and be careful that they are never interchanged.

7.2.21 No person shall in any way interfere with or change the identification colour painted on a gas cylinder.

8.0 PROPHYLECTIC MEASURES

8.1 Man working in building / plants where the risk of poisoning from Lead and explosives may exist are required to be provided with milk. Also the men working in hot furnaces in Boiler House, S.A. Concentrations plant, etc. are provided with free issue of Lemon, Barley and Sugar during summer season. Operations like painting, handling of lime, Acids, Alkalies, Suphur, etc. have got harmful effects on skin. These substances on coming in contact remove natural fat from skin causing dry skin cracks and fissures. These result in bad type of dermatitis. It is therefore necessary to apply oil such as coconut oil to skin, of hands, legs and feet after the work for preventing skin disease.

8.2 **PROHIBITED ARTICLES : -**

No person shall bring into, nor have in his possession while within danger area any of the following prohibited articles, unless specially authorised by the General Manager.

8.2.1 Cigarette, cigar, pipes, bidi, pan tobacco in any form (including chewing tobacco and snuff) or other contrivance for smoking. Meals can be carried inside danger area upto dirty site of the change room only.

8.2.2 Matches, mechanical lighters, lamp or other means of producing fire, or other dangerous articles

8.2.3 Penknife, scissors, keys, spurs or other articles of iron or steel, camera, loose coins etc., inside danger building.

8.2.4 Intoxicating liquor of any sort.

8.3 Any infringement of the above is punishable, under DGOF letter No.567/A/Vig., dated: 28-04-73 as under : -

NATURE OF OFFENCE SCALE OF PENALTIES

NATURE OF OFFENCE		
i) a) Introduction of forbidden articles into Danger Area. Tobacco, snuff, en lighted pipe, Cigarette, biddies.		
1st Offence	-	Increment to be withheld for one year with cumulative effect. In case no increment is due, reduction of pay by one stage.
2nd Offence	-	To be removed from service.
b) Unlighted matches or means of producing a light (flame).		
1st Offence	-	To be reduced to the minimum of the grade. Where however a worker is already on the minimum of the scale, increment to be withheld for two years with cumulative effect.

	2nd Offence	-	To be removed from service.
ii)	**Smoking inside DB Area**		
	1st Offence	-	To be removed dismissed from service.
iii)	**Drunkenness**		
	1st offence	-	To be reduced to the minimum of the grade, where, however, a worker is already on the minimum of the scale increment to be withheld for two years with cumulative effect.
	2nd offence	-	To be removed from service.
iv)	**Extracting illicit liquor from varnish.**		
	1st offence		To be reduced to the minimum of the grade, where however a worker is already on the minimum of scale, increment to be withheld for 2 years with cumulative effect.
	2nd offence		To be removed from service.

9.0 TOXICOLOGICAL HAZARDS

9.1 The risk of toxicological hazards in this factory is mainly from acid fumes, chemicals viz. toluene, nitrobodies, tetryl, dimethylaniline, acetone, ammonia, 'G' Fuel and its constituents and also mercury, lead etc.

9.2 Acid Fumes :- Acid fumes are produced in the course of manufacture of acid and other processing of acids viz. concentration, denitration, detetrylation etc., and also during nitration processes viz., manufacture of explosives. All acid fumes constitute a danger to health due to the corrosive effect of the lungs and respiratory tract.

9.2.1 Especially dangerous are the fumes of oxides of nitrogen which generally, but not always are characterised by their brown colourisation. A concentration of nitric oxides in air, as little as 0.01% by volume, is hazard. Because of their relatively low solubility in water, nitrogen oxides are only slightly irritating to the mucous membranes of the upper respiratory tract. Their warning power therefore, is low and dangerous amounts of fumes may be breathed before being noticed.

9.2.2 The fumes in the presence of oxygen react to produce nitrous and nitric acids – this is what happens deep in the respiratory system – causing congestion of the throat and brochi and odema of the lungs.

9.2.3 The fumes from oleum and sulphuric acids react rapidly with mucous membrane of the eyes, mouth etc., and produce immediately warning of their presence even in low concentrations. For this reason they are readily detectable and allow immediately action to be taken to avoid inhalation of dangerous quantities.

9.2.4 Medical Effects : -

a) They are irritants and effects eyes in the form of severe burning and lachrymation. They also affect the nasal mucosa, upper respiratory tract and the lungs. The affection of the lungs was noted in the form of severe bronchospasm but no case of acute pulmonary edeme took place so far.

b) The systemic effect absorbed in the form of violent disturbance of acid base balance was not noticed.

c) Destruction of tissues on the site of contact in the form of acid burns occurs quite often due to accidental spillage of the acid on the body surface.

9.3 Toluene : - In the process of manufacture of Trinitro toluene there is a risk of toxicological hazard from toluene. Breathing of toluene vapours will cause acute poisoning. Chronic poisoning may result through breathing a small concentration over a longer period of time. Contact with the skin can produce dermatitis due to toluene vapour are headache, acute intoxication, nausea, vomiting, disturbance of equilibrium feeling of illness and sometimes unconsciousness. In chronic cases, the signs are headache, giddiness, insomnia, nervousness, irritability, nose bleeding and bleeding from the gums.

9.4 Nitrobodies : - The nitrobodies produced during the manufacture of TNT include the intermediate materials MNT, DNT and crude TNT as well as the final purified product. The poisonous effects of nitrobodies taken into the body is the hazard associated with nitrobodies. Dermatitis is produced by the effect of nitrobodies on the skin. Ingestion or inhalation of TNT and DNT fumes may cause poisoning symptomised by vomiting, nausea, headaches and dizziness. It is often accompanied by paleness of face and grey colouration of the lips (cyanosis). In more serious cases, the tissue, of the kidneys and liver may be harmed which frequently leads to serious illness (toxic hepatitis) and death.

9.4.1 Medical effects : - This stains the clothing, skin and hair yellow orange. It enters the body through the skin when hot and sweating or through lungs. Incidence of cyanosis due to methomoglobinomia was not there. Toxic jaundice due to hepatic damage were also not seen. A mild degree of anemia as noted by paller of the conjunction was seen in most of the workers but no further incidence of bone marrow depression or a plastic anemia occurred. Dermatitis due to T.N.T. sensitization was noted in a minority of workers which was due to improper handling of TNT and inadequate scrubbing of nails and skin. Temporary effects in the eyes in the form of irritation and pain, heaviness in head, loss of appetite and weakness occurs but constant exposure for several week appears to develop tolerance phenomenon and hence these are not complained by the workers.

9.5 Tetryl (Composition Exploding) : - This is an explosive produced by nitration of Dimethylaniline. Following are the toxicological hazard likely to occur during processing of dimethylaniline and tetryl.

9.5.1 Dimethylaniline : - Headache, tachycardia, dysprea, and other symptoms of

methemoglobinomia, depressing effect on the nervous system with headache, weakness, giddiness, tremors and convulsions prior to death.

9.5.2 **Tetryl :** - Contact dermatitis, nasal irritation, epistaxis, staining of the skin and hair.

9.6 **Acetone :** - Toxicological hazard likely to occur due to handling of acetone which is used in purification of tetryl is as follows : -

Central nervous system depression, headache, bronchial irritation.

Medical Effects : - The effects observed due to C.E. exposure were on the eyes and skin. The C.E. dust causes intense irritation in the form of chemical conjunctivitis with marked discomfort. Since C.E. is a sensitizing agent to the skin the susceptible workers developed acute as well as chronic dermatitis, which of course, regressed or cured after the change of section.

9.7 **Ammonia : -** Anhydrous ammonia is a raw material used in the manufacture of nitric acid. Irritation of respiratory passages, occasional pulmonary edema, bronchitis, irritation of eyes, causing action on skin are the toxic hazards involved in processing of Ammonia.

9.8 **Mercury : -** Mercury is used in the manufacture of Mercury Fulminate, an initiatory explosive. Following are toxic hazards involved in the handling of mercury : -

Acute abdominal pain, kidney damage, stomatitis, diarrhoea, vomiting, loosening of the teeth, chronic psychic and venrological disturbances, characterised by weakness, loss of memory, drowsiness, tremer, neurasthenia, optistaxic, stomatitis, ocular lasion, cachexia.

9.9 **Lead :** - Lead is used in the repairs and fabrication of chemical plant equipments. Risk of Lead poisoning is associated with handling and melting of Lead.

9.9.1 **Medical Effects** : - No chronic Lead poisoning (Plumbisum) case has been detected so far.

The initial subjective symptoms of Lead poisoning, viz. muscular weakness and pain, lassitude, fatigue are so much prevalent amongst the general workers alongwith that of lead workers that no effectual differentiation could be made between the two categories of workers but during the quarterly medical checkup, eventually follow up, classical symptoms such as of increasing constipation abdominal colic or lead colic, muscular paralysis in the form of lead neuritis and cerebral effects were not observed.

9.10 **'G' Fuel** : - 'G' Fuel is a mixture of isometric xylidine and triethylamine. Xylene and Triethylamine are the raw materials used in the manufacture of 'G' Fuel. Spillage of 'G' Fuel on skin causes numbness of the skin. Painful sensations resulting from fuel poisoning usually manifest after sometime (headaches, changes of the blood composition weakening of heart activities, affecting the central nervous system, lungs and eyes). It is safe to presume that the toxicity of 'G' Fuel is the same as that of the individual components constituting 'G' Fuel i.e. xylidine and triethylamine, the toxicity of which are as follows : -

9.10.1 **Toxicity of Xylidine** : - Aniline and its homologues have a very slight neural and very

pronounced muscular action and must be considred Quarrelike muscular poison. These also act as cardiac poison and decrease the excitability of the heart muscle. Xylidine also inhibits the growth of tubercle bacillus. It may cause injury to blood and especially to the liver without necessarily causing warning signs such as cyanosis, headache and dizziness. This makes xylidine a more insidious poison than aniline. Sufficient quantities of xylidine and aniline can be obsorbed through skin to cause severe and possible fatal poisonings. Vapours of xylidine inhaled by a person, who has taken milk and yeast, cause acute disturbance characterised by hypernes, panting, salivation and frequently early death but has no effect amount of methomoglobin and Heinz bodies in the red cell often followed by severe haemolytic anemia and jaundice. Pathological studies show that it also causes lesions of the liver, kidney, heart and thymus in both groups. Skin absorption of 3.3 gm of Xylidine causes methomoglobin anemia, extensive muscular charge and parenchynyl cellular damage in the brain, spleen, liver, kidney and also effects central nervous system. Toxic effects of xylindine can be detected with the appearance of sulphemoglobin even before the appearance of methemoglobin, since the former persists for long time for industrial exposures and hence it is a useful indent for early toxicity in such exposures.

Such exposures resulted in diminished catalase activity in blood. Inhalation of Xylidine induces conjuctival congestion, nasal discharge salivation, lachyrimation and postration.

Persons having contacts with aniline and its derivatives viz. xylidine, develop cancer in urinary bladder. Pathological changes were observed in the cardine, pulmonary, nepatic spleenic and renal tissues. If a daily dose of xylidine exceeds 10 mg/kg/day, it produces enlargement of liver. Joseph Trecon et al suggested the safe limit for prolonged human exposure to be 5 ppm. The maximum allowable concentration of xylidine according to Goldsten should be 1 mg/m3.

9.10.2 **Toxicity of Triethylamine** : - The toxicity properties of triethylamine are the same as those of the other amines. Exposures to high concentration of vapours cause injury and necrosis of kidney in rats and guinea pigs resulting in their death. Marked irritation of the corned and lung tissue was developed in rabbits exposed to concentration of 50 ppm of triethylamine for 7 hours a day or 5 days a week for 6 weeks.

Triethylamine in fatal doses has been reported to be significantly ex-hibiting the monoamine oxides activity in liver and brain. In mice exposed to triethylamine vapours for 2 hours, the threshold dose (mg/1) as established by the defence conditioned reflexes was 0.18, LD 100 was 3,54 LD 50 1.9 : maximum tolerated dose was 1.4 contact of trietrhylamine with intact skin (mice & rabbits) produced chemical burns. The single oral LD 50 is reported to be 570 mg/kg.

2:4 Dinitro Resorcinol : - It has similar hazard as nitrobody.

9.11 **SULPHUR**

9.11.1 **Combustion Hazard**

Easily ignitable and combustible. Forms explosive mixture with oxidizing agents.

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9.11.2 **Toxic Hazard**

Conjunctivitis, skin inflammation, respiratory irritation

9.11.3 **Handling & Storage Precautions**

Store in cool, well ventilated room away from chlorates or other oxidizers. Guard against dust aspiration or accumulation. Wear safety goggles, mask and self contained breathing apparatus.

9.11.4 **Fire Precautions**

Use water spray. Avoid scattering molten sulphur.

9.11.5 **Hygienic Practices**

In case of contact, wash eyes with water, skin with soap and water.

10.0 INDIRECT PROPAGATION

10.1 An explosion in a building or stack containing explosives may lead indirectly to explosions in other buildings or stacks within the enclosed explosives area or cause damage to life or property outside the area by lobbed weapons, debris or the partial collapse or movement of an adjacent building. It is not practicable to provide protection against hazards such as these except to provide protective buildings as with Category UNHD 1.2 and UNHD 1.4 explosives and providing for fire fighting on a scale including co-operation with civil fire services, capable of coping effectively with the multiple outbreaks which may result from high velocity missiles.

10.2 **Effect of hillocks**

10.2.1 Where a hillock or fold in the ground between two untraversed buildings containing explosives, completely screen each other, it may be permissible to regard it as a traverse between the two buildings, provided that it is high enough to prevent the direct propagation of missiles from the building to the other. This principle is not applicable to untraversed stacks unless the crest of the hillock is atleast 1.5 m above every line joining the top surface of the two stacks.

11.0 TRAVERSES

11.1 Explosives, by their inherent properties present a risk of explosion or fire, which may propagate to adjacent stacks/buildings containing explosives by fragments, blast or flame. A reduction in the Inside Safety distances is effected by devising means which eliminate, as far as practicable, the causes of propagation. Traverses/barricades play this role. Traverse is a solid mass of earth, concrete or brick built round a building or stack containing explosives.

11.2 FUNCTIONS OF A TRAVERSE

The functions of traverse are three fold : -

(a) To contain the effect of an explosion within its confines by –

i. Intercepting the flight of low angle, high velocity missiles which would otherwise be capable of causing direct propagation of explosion/fire to explosives in adjacent buildings stacks.

ii. Moderating the effects of blast of flame by -

A) Deflecting blast over adjacent buildings/stacks.

B) Deflecting the flame and radiant heat from mass fires e.g. mass burning of propellants.

iii. Intercepting low angle debris which might damage adjacent buildings and cause fires or explosions.

(b) To protect the traversed building stack from direct missile attack, blast or flame emanating in the event of an explosion of an adjacent building stack containing explosives.

(c) To protect the personnel in nearby buildings/open from the effects of an explosion within its confines. A traverse obviously provides no protection from high angle missiles emanating mainly from UNHC 1.1 explosives, fragments of roof, wall or lobbed ammunition projected upwards. Such missiles debris which escape over the traverses may get scattered over a large area and cause injuries to personnel in the vicinity. This contingency has to be accepted. Propagation of explosion to the adjacent buildings at storage ISB is unlikely due to comparatively lower velocity of the missiles falling under gravity.

11.3 DESIGN REQUIREMENTS OF TRAVERSES

11.3.1 To function effectively, the traverse must have sufficient inertia to withstand the blast and remain reasonably intact to arrest the missiles which follow.

11.3.2 To arrest the flight of the fast moving low angle missiles arising from the explosion and the low angle debris from the walls of the buildings, all forms of traverses should be atleast 0.6 metre higher than the stack height in the building or as high as the heaves walls of the building whichever is more. To be effective, the traverse should be of 2.5 metre width of earth (or equivalent) at the tope level of the explosives. For explosives process buildings where the explosives are handled processed at height not more than 1.5 metres from the ground level, the traverses may be 0.3 metre above the doors window.

11.3.3 If the traverse does not surround the building or stack, it must extend sufficiently beyond it at full height to give complete geometric cover with regard to other buildings or stacks.

11.3.4 Where there are both traversed and untraversed buildings or stacks within an enclosed

explosives are, an untraversed building or stack containing UNHD 1.1 explosives may be assessed for ISD as traversed, provided that every portion of it is completely screened from all other untraversed buildings or untraversed stacks containing explosives, by an intervening traversed building or traversed stack sufficiently high and wide to preclude low angle high velocity missiles from it reaching any other untraversed building or stack, provided also that the traverses of these intervening buildings or stack, provided also that the traverses of these intervening buildings or stacks are capable of protecting the UNHD 1.1 explosives in the untraversed stack or building from the effects of an explosion within their own confines (i.e. provided they can be assessed as buildings or stacks with interceptor or container traverses). Failing this, the untraversed unit could only be used for thick walled UNHD 1.1 explosives. This will also entail restricting the types of ammunition stored in the traversed intervening buildings or stacks to those which would not produce missiles of sufficient size and velocity (i.e. thin walled) to propagate explosion to the type in the untraversed building or stack.

11.4 **<u>Traverse may be of the following types</u> : -**

11.4.1 **Natural angle traverse (NAT)**

Natural angle traverse in an earth mound with both faces sloping at the natural angle of repose (about 35^0 - 45^0 depending upon the material used). The crest of the earth mount must be atleast one metre wide at a level 0.6 metre above the stack height. Process building of CE section are having such traverses. It withstands blast better than VIF and other types of large quantities. It also deflects the blast by its slope; therefore highly suitable for use in cases where blast is to be catered for as in UNHD (H.D.1.1) explosives.

11.4.2 **Vertical inner face traverse (VIFT)**

Vertical inner face traverse is an earth mound with the outer face sloped at the natural angle and a vertical inner face suitably supported by walls of brick, stone or concrete or any other suitable material. The crest should be 1.5 m wide. The risk of debris from the supporting wall exists. If RCC is used to support the vertical face, the reinforcement should be in a very light form to avoid the possibility of heavy concrete debris being projected. Also does not give rise to dangerous debris projectiles when undermined by an explosion as it does not contain stone, brick etc.

11.4.3 **Semi – Vertical Inner Face Traverse (Semi –VIFT)**

This is a compromise between a natural angle traverse and VIF traverse in which half or portion of the inner face (i.e. lower) may be vertical and the other half / portion party sloped. The crest of the traverse should be 1.0 M wide.

NOTE :-Two walls of brick, concrete or stone at the side or end may be provided for 11.4.1, 11.4.2 and 1.4.3 above as necessary, to prevent erosion and to conserve space.

11.4.3.1 **Advantages:**

As the portion of the supporting wall in the upper region which is particularly vulnerable to form debris has been substituted by earth, throw of debris will be small. There will be more light in building protected by semi VIF traverse that in

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those with VIFT.

11.4.4 Chilworth traverse:-

This consists of a mass of earth/sand with both faces sloped and suitably supported by metallic enclosure corrugated sheets, wooden planks or any suitable material. Its section forms a truncated prism, the sides of which make an angle of abouot 75^0 to the horizontal. To equate this with vertical inner face traverse, the quantity of earth in the chilworth traverse should be equal to that in the former. With supports, the earth will not be washed down but stay in position. Risk of missiles in case of accidents is small except from the steel etc., used in construction.

11.4.5 Blast Wall:-

Blast walls may be made of either brick or concrete. These are intended to serve as container traverses for small quantities of explosives. Sometimes these are also used as receptor traverses. A 0.34 metre brick wall of building will contain the explosion of quantities not greater than 2.5 kg. just clear of the wall. The thickness of blast wall to contain the effects of explosion of UNHD 1.1 explosives is calculated from the formula :

$$T = \frac{100\ W2/3}{Md}$$

Where 'T' is the thickness in cm., 'W' is the quantity of explosives in kg. 'd" is the distance in metre and 'M' is a constant with value 10 for brick and 22 for RCC.

11.5 Classification of Traverses

11.5.1 Receptor Traverses : - Receptor traverse is intended to protect the explosives in a building or stack from direct attack by low angle high velocity missiles emanating from another building or stack containing explosives.

11.5.2 Interceptor Traverse : - Interceptor traverse is intended to protect explosives in other buildings or stacks from direct attacks by low angle high velocity missiles from the building or stack within its confines.

11.5.3 Container Traverse : - Container traverse is intended to protect, as far as possible, the personnel in nearby buildings or in the open from the effects of an explosion within its confines.

11.5.4 Quantity Limitations : -

Quantity in Kg.	**Types of Traverse**
a) Storage buildings	
i) upto 125	Blast walls of brick/RCC of varying thickness depending upon the quantity.
ii) above 125 and upto 68,000	Vertical inner face traverse.
iii) above 68,000 and upto 135,000	Natural angle traverse. A vertical inner face traverse should be provided on such sides of the storage building on which road/rail service facilities exist.
b) Process buildings	
i) Upto 125	As in (a) (i) above.

ii) above 125 and upto 4,500	Vertical inner face traverse
iii) above 4,500	Natural angle traverse.

11.6 Quantity Limitations : -

Safety Distance for Traversed and Untraversed Explosives Buildings/Stacks i) ISD (Storage) for UNHD 1.1- Trav. 2,4 = 3_/W—Untrav. 3.6 = 3_/W--.

Note : - W is the net weight of explosives in kg.

A building with 0.22 metre brick walls and a 0.15 metre concrete roof (or a building affording equivalent protection) could be considered as a protective building. There should be no windows in any of the walls exposed to the hazards unless they are specially protected.

ii) ISD (Process) in Metres for Cat. UNHD 1.1 : -
Trav. 1.5 RB, Untrav. Not permitted.

Note : - RB is Radius of B-damage i.e. such severe damage as to necessitate demolition of building.

iii) OSD in Metres for Cat. UNHD 1.1 :- Trav. 3.2 RB, Untrav. 4 RB upto 3,600 kg. 4 RB over 3,600 kg.

$$\text{RB in metres} = \frac{5.55_3/W-}{\left(1+\left(\frac{3175}{W}\right)^2\right)^{1/6}}$$

11.6.1 For personnel to be safe from any form of injury or acute discomfort, the distance at which a peak blast pressure of 2 psi may be expected would be adequate provided protection from fragments is ensured. This distance corresponds to about half OSD (2RB). Acute aural discomfort and in rare cases ear damage may occur at distances at which peak blast pressure of 5 psi may be expected. 15 psi is taken as the 50% level for ear drum rupture and at distances where peak blast pressure of 15 psi is expected ear injury is likely. 15 psi distance is in the region of 1RB upto 1000 kg. and less than 0.6 RB at 10,000 kg., zones of B and A (total damage) damages respectively. At greater pressures of the order of 35 psi for smaller quantities and 20 psi for larger quantities (over 7,000 kgs.) there will be serious physical injury which with higher pressures may prove fatal. Distances equivalent to 50 psi for bare charges of bulk HE are also on the verge of flame zone.

11.6.2 Where structural damage is concerned, with blast impulse being the criterion as long as blast period is below 0.1 second, the actual period is multiplied by the peak blast pressure to obtain the impulse. Once blast period reaches a value of about 0.1 second – its limiting value at quantities of the order of 3,600 kg – further consideration of the period of blast is unnecessary. Structural damage becomes roughly proportional to the peak

blast pressure.

11.7 For quantities exceeding 5,000 Kg. with period of explosion over the 0.1 second value, the following structural damages to ordinary dwelling houses with walls of one brick thickness (22.5 cm) occur at the peak blast pressures:

a) Such serious damage as to Necessitate demolition – B damage.	1 RB - /sq.inch.	*
(b) Severe structural damage requiring extensive repairs - C (b) damage.	1.5 RB - 2.3 /sq. inch	* Basis of Process ISD which takes into this type of damage to structures.
(c) Minor structural damage including 100% glass damage.	4 RB : 0.7 /sq. inch	* Basis of normal.
50% glass damage - D damage.	10 RB : 0.2 /sq. inch.	

* Note : - The peak blast pressure however increases when the quantity is below 500 kg. and rapidly rises to 4 times the value between 100 and 50 kg.

11.8 Explosives limits in HEF buildings are fixed on the following basis :

11.8.1 New buildings constructed under TNT modernisation scheme in MDF area : - limits of these buildings are as per new safety distance regulation in vogue at the time of siting of the building i.e. during the period 1970 to 1975.

11.8.2 Explosives buildings in old HEF area (AZ,CE, Old TNT) setting up of these buildings was planned and executed during World War II. The layout of explosives buildings in these factories was based on the provisions of the Magazine Regulations or UK Home Office Regulation. The earth and sand used in the construction should be free from stones or these should be restricted to the centre third of the base and should not extend to more than $1/3^{rd}$ of the height. The size of the stones should not exceed 7.5 cm. All the earth traverses are so designed that their cross-section at the top level of the explosive stack is about 2.5 m

11.9 Trees that grow within the traverse, on inner slopes of natural angle traverses, on the top of mounds of traverses very close to the traverses building and over the retaining walls of vertical inner-face traverses should be cut immediately as these trees are likely to damage the buildings in case of accidental fall and their roots are likely to weaken the traverse and building structures apart from posing a fire risk and creating unclean conditions in explosives area due to fall of dry leaves and branches. Shrubs on the inside of traverses, on inner sloped of natural angle traverse and very near the traversed buildings should be cut immediately to obviate the potential fire risk.

11.9.1 A plant called “IPOMEA PALMATA” has been located by High Explosives Factory, Kirkee in consultation with HPKV College of Agriculture, Poona and found suitable for explosives area. The matter was discussed in the E.C. Safety Audit Panel meeting held on

7-9-79 at New Delhi. The salient features of this plant are listed below : -

a) Kills tall grass in the vicinity (i.e. acts as a weedicide.)
b) Acts as binder to the soil to prevent erosion.
c) It is practically evergreen throughout the year and requires very little water.
d) It tries to retard the growth of other plants in the vicinity.

11.9.2 In the above meeting it was agreed by Rep Fire Adviser that organised plantation of this railway creeper would be very useful in explosives areas as it will not pose any serious fire risk. STEC agreed for introduction of this plant. IPOMIA PALMATA, thus can be grown on the traverses to facilitate upkeep of earth mound of traverse.

11.10 POSITION OF TRAVERSES

11.10.1 For the traverse to be fully effective, the distance between the foot of the traverse and the building/stack should be as small as practicable. However, to facilitate the venting of pressure build-up between the wall of building and the traverse in the event of explosion, a minimum clearance of 1 to 1.5 metres is essential. This clearance will also be adequate for maintenance purposes and movement of personnel.

11.10.2 For storage buildings, which are rail/road served, the traverse should be provided at such minimum distance from the building as to provide space for the free movement of vehicles/Explosive Vans.

11.10.3 For process buildings with Verandah/gantries, the traverse will be sited beyond the Verandah/gantry.

12.0 CIVIL DEFENCE

12.1 Like Democracy, Civil Defence can be defined as Defence of the people, for the people and by the people. The enemy will try to make use of all possible weapons of attack to upset every state of the life of people. It is therefore necessary for every one of the community to voluntarily go in hands in a collective effort to protect ourselves and our neighbours to keep our community life as best as we can. Such an organisation to save life, to minimise damage to life and property, to maintain continuity of production and to keep up the moral of people in a disaster is 'DEFENCE DEFENCE.'

12.2 General guidelines for protection : -

12.2.1 You owe it to yourself and also to your country to adopt the air raid precautions listed below for preparing your household and each member of your family to confidently face a situation arising out of an enemy air raid on your city/town. The action indicated under "Before An Air Raid" is inexpensive. If you make it your habit now and keep it up the damage from enemy bombs will be insignificant. If you and your family know what to do and what not to do during and after air raid the damage to life and property will be further reduced. Know yourself and propagate the training you received to others and thus create a chain of Civil Defence.

12.2.2 Precautions Before an Air Raid : -

i) Make sure that everybody in your family is familiar with "Air Raid" and "Raiders Passed" signals. Two minutes warning note of intermittent blast on sirens and hooters will denote Air Raid Signal/Danger approaching while two minutes continuous hooter/siren will denote "Raiders Passed"/"Danger Over."

ii) Select an inner room – preferably on ground floor of your house to serve as refuge-room/shelter, if there is no open space around your house.

iii) Protect every window in this room against blast by putting sand or dust bags or boxes in your house around the window.

iv) Glass panes of windows and doors to be protected by either wire mesh or thick paper.

v) Keep good stock of drinking water, some food stuff, F.A. equipment, Electric torch, candles, matchbox, recreation items like playing cards, chess boards, flute, mouth organs, book etc. crow bar, trick, rope, shovel, whistle.

vi) Make arrangement for sanitary facilities in refuge room.

vii) Keep buckets, cisterns, water tanks in house full.

viii) Allot definite duties to all members in family viz., closing windows and doors, turning off electricity and water mains switching off lights visible from outside, checking items in room, ensuring presence of everybody in family etc.

ix) Do not believe and get panicky by rumours. Try to get correct information from authentic source.

x) Know your warden, nearest F.A. post, telephone booth, Fire Station, Police Station, Fire Hydrant.

xi) Keep an identification card with photo, name, address, telephone No. of near most relative/friends address etc. with every member of your family.

xii) Keep all inflammable stores in house as must dispersed as possible.

xiii) If you have open space around your house keep trenches ready/duly covered.

xiv) Form house fire parties, rescue parties, F.A. parties in your area.

xv) Get trained and train everybody you know in protection methods.

12.2.3 During Air Raid

i) If you are caught outside : - Take cover immediately. Go into the nearest house or trench, failing this lie on ground face downwards, ears plugged by fingers, chest away from ground and body resting on knees and elbows. Keeping a pen, pencil or handkerchief in between your teeth, eyes closed.
Do not stay in a bus, car or a vehicle like scooter, cycle.
Do not try to rush and run to reach your house. Do not run about getting panicky.

ii) If indoors other than your house at places like cinema theatre, lecture hall, etc., - remain as you are on your seat or sit beneath the chair or lie down as trained to do.

iii) If indoors – Go to refuge room if kept equipped. Otherwise go to a safer room on ground floor. Open all windows, turn off lights, close doors, do not peep out through windows.

iv) Do not listen to rumours and try to spread.

v) Do not try to telephone.

vi) Do not go into streets to see what is happening.

vii) Try to be near the wall preferably in angle of two walls.

viii) Do not lean directly against a wall.

ix) Do not loose courage and start shouting weeping and thereby demoralising others.

x) Do not come out till All Clear signal is sounded and heard.

12.2.4 After Air Raid

i) Use water in cisterns and tank if your supply is cut off. Economise in use of water as it will be needed for fire fighting

ii) If electrical installation in your house is damaged send for electrician and get is repaired. Try not to do it yourself.

iii) Sewers if the waste disposal system is damaged use disinfectants freely and burn or bury your rubbish

iv) If your house is damaged, get it repaired or ask for help from police/warden

v) Attend to the injured immediately. Give first aid and send to nearby F.A. post or hospital depending on the seriousness. Keep the patient warm reassure him, give water with sugar or hot tea/coffee to reduce the shock. Control bleeding, support fractured limbs by improvised splints, give artificial respiration.

vi) Try to get correct information regarding damages raised from authorities. Do not believe or spread rumours.

vii) Fight fires : - See the nature of fire and decide on the mode of fire fighting. Try to mobilise help from neighbourhood. Inform warden/Fire station if found beyond control.

Do not rush into a building or room on fire. Always work in pairs. Tie a rope round your waist and ask your partner to hold the other end when you enter a closed/narrow room/passage. If you are trapped in fire try to escape with cool head. Exercise great care in removing debris nearby a casualty.

viii) Try to restore normalcy as early as possible.

ix) Do not take any action if you are having any doubt in mind.

x) Treat all electric wires as "LIVE." Do not touch them carelessly

xi) Do not pick up tiny articles however attractive they are.

xii) Do not try to handle and move on "UXB." Inform immediately to your area warden. Encircle the area and keep traffic in that area closed.
Alarm the people in nearby area but do not exaggerate the effects to frighten them and go panicky.

xiii) If you are safe, unaffected try to help others who need it.

xiv) Arrange group discussions to analyse actions taken, difficulties faced, mistakes made so that these could be eliminated/minimised in the events to come.

xv) Arrange for repairs to equipments, replenish the stocks of items like F.A. kit equipment, food stuffs.

xvi) Raise general morale of civilian population and prepare them for a prolonged struggle with due courage.

13.0 CONTROL OF MAJOR INDUSTRIAL HAZARDS

13.1 WHAT IS A MAJOR HAZARD ?

13.1.1 The third report of the Advisory Committee on Major Hazards appointed by the Health and Safety Commission, U.K., says :
"The phrase 'major hazard' was coined in the context of possible accidents in chemical or other industrial installations handling hazardous substances which might cause extensive damage and kill or injure a person in or outside the site boundary."

13.1.2 The Council of the European Communities have defined major accidents thus :

"An occurrence such as a major emission, fire or explosion resulting from uncontrolled developments in the course of an industrial activity, leading to serious danger for man, which may be immediate or delayed, inside or outside the establishment and to the environment and involving one or more dangerous substances."

13.1.3 The other definitions are more complicated. In simple words, a major hazard can be defined as an industrial accident which causes injury or death to a large number of people. It could be an industrial fire, explosion, a toxic release or even a structural collapse. Since an accident also involves some people, it is called major accident, hazard, particularly in U.K. and Europe.

13.1.4 A 'major hazard' is totally different from a serious accident.'

13.2 Explosion

Flammable material released can mix with air and form "explosive mixture" at certain

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(specified) concentrations. When this mixture is ignited, the result is an explosion. Explosions are characterised by shock waves and can result in :

- structural damage to buildings.
- flying objects
- persons getting knocked down or buried under collapsed structures.

Examples :

- Gases (e.g. LPG)
- Dust (e.g. Flour, milk powder)
- Confined vapour clouds.
- Unconfined vapour clouds (vapours released which form a vapour cloud in the air)
- Boiling liquid expanding vapour explosion (a situation where a flammable liquid is on fire and vapours released expand get ignited, then explode).

13.2.2 Examples of Industrial Explosions

Material Involved	Consequences		Place & Date
	Deaths	Injuries	
Dimethylether	245	3800	Ludwigshafen, Federal Republic of Germany, 1948.
Kerosene	32	16	Bitburg, Federal Republic of Germany, 1954.
Isobutane	7	13	Lake Charless, Louisiana, United States, 1967.
Oil Slops	2	85	Pernis, Netherlands, 1968.
Prophylene	--	230	East St. Louis, Illionis United States, 1972.
Propane	7	152	Decatur, Illinois, United States, 1974.
Cyclohexane	28	89	Flixborough, United Kingdom, 1974.
Prophylene	14	107	Beek, Netherlands, 1975

13.3 Toxic Releases

13.3.1 Large quantities of toxic chemicals released into the atmosphere due to accidents can

cause serious injury of death in large numbers. The tragedy at Bhopal is vivid example of this.

13.3.2 In case of toxic releases too the extent of damage depend upon several factors. The higher the quantity released, naturally higher will be the damage. The toxicity of the material is important. Higher the toxicity and lower the 'threshold limit value' more will be the extent of damage. Physical properties of the material released (lighter or heavier than air, soluble in water or not) also plays its role. Wind can spread toxic clouds over a large area. Hence factors like wind direction, wind velocity, fog and humidity needs consideration in estimating the extent of the damage.

13.3.3 Examples of Major toxic releases

Chemical involved	**Consequences**		**Place & Date**
	Deaths	**Injuries**	
Phosgene	10	-	Roza Rica, Mexico 1950
Ammonia	30	25	Cartagena, Columbia 1977.
Sulphur Dioxide	-	100	Baltimore, Maryland United States, 1978
Hydrogen sulphide	8	29	Chicago, Illinois, United States, 1978.
Methyl isocyanate	2000	20000	Bhopal, India, 1984.

13.4 CRITERIA FOR IDENTIFICATION OF MAJOR HAZARDS

13.4.1 Efforts to control major hazards necessarily have to begin with a standard for identification. It is not easy to equate or differentiate between two hazards – say an LPG fire and a chlorine leak. The number of persons at risk is to be considered and factors like local site conditions, impact on environment and meteorological information come into the picture. Nevertheless a standard is necessary to begin with.

13.4.2 Such a standard, obviously, has to be based on the two important and quantifiable data.

1. Toxic, flammable or reactive properties of the material involved.
2. The quantities of hazardous material (stored, produced or handled).

13.4.3 Considering the above, the criteria for identification of major hazards has been developed by different agencies. Such standards specify that a particular chemical having certain hazardous properties assumes the status of major hazard when its quantity (stored, handled or produced) exceeds a certain limit. This limit is known as the threshold quantity. As an example LPG is considered a major hazard above 25 tons (International Labour Office) whereas Benzidine is considered a major hazard (As per CIMAH regulations, U.K.) even at 1 Kg. The rationale here is that even 1 kg of Benzidine can cause substantial injury to a large number of people. Not surprisingly the standards prescribed by different agencies also show variance to some extent.

13.4.4 According to their harmful properties, these chemicals are grouped as under :

Group 1 :

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Highly toxic substances. The threshold quantities are very low since even small quantities are harmful or lethal for considerable distances. For example, in case of Benzidine, threshold quantity is only 1 Kg. and storing above 1 Kg. as considered dangerous.

Group 2 :
These are a moderately toxic substances, and considered harmful at considerable distance from point of release in large quantities. The threshold quantities vary from 2 tonnes to 250 tonnes.

Group 3 :
Consists of highly reactive of unstable substances. These can react easily with certain chemicals or under specific circumstances which can lead to major accidents. The threshold quantities vary from 2 tonnes to 500 tonnes.

Group 4 :
Substances with explosives properties.

Group 5 :
Flammable substances not included in above groups, but which can form large flammable clouds which can explode or burn. These include :

(a) Gas or mixture of gases which are flammable in air.
(b) Substances which are flammable in air, but are held in the form of liquid (or liquid and gas mixture) under pressure.
(c) Liquified gas which is flammable in air, held under cooling or refrigeration.
(d) Other liquids whose flash point is less than 21^0 C.

13.5 MAJOR ACCIDENT CAUSES

13.5.1 Standards of maintenance.

13.5.1.1 The standard of maintenance is variable which decides the safety of a major hazard unit. In the absence of correct maintenance practice components of the system do not get the routine care, which leads to failure of the components and disasters. A bearing overheated because it did not get lubrication, or a valve which got stuck due to corrosion or a pressure vessel which was not tested in time could cause a major hazard.

13.5.1.2 In industry the tradition (barring a few good units) is to consider maintenance as a supporting function to production. As a result the maintenance schedules get upset, and some part of the plant or equipment is left out from maintenance to meet exigencies of production. Apart from this, human error also comes in when a maintenance mechanic commits a mistake. In a major hazard unit all these contingencies have to be scrupulously avoided and the plant and equipment need to be maintained in good working condition.

13.6 MAJOR HAZARD CONTROL - STANDARDS

13.6.1 As regards the guidelines to be followed, comprehensive information which can be directly applied to a particular installation is difficult to obtain, though there is sufficient

information available in the literature and guidelines issued by governments. This will naturally put the onus on managers in industry to understand their processes and problems and particularly look for information which they want, and which is applicable to them.

13.6.2 Managers would be well advised to identify the problem areas they have and to put in positive efforts to locate and apply the right standards applicable to them. It would also be in their interest to establish and maintain contact with the sources of information, both within the country and abroad. Fortunately, there is a good amount of published material available (in the form of books) which could prove useful.

13.7 CONTROL OF MAJOR HAZARDS AND THE MANAGER

13.7.1 Control of major hazards is important to the manager on two counts. First, it is a moral and legal obligation on his part to the employees and the community. Second, control of hazards is a profit centre for the manager since a major hazard can threaten the equity base of the organisation itself.

13.7.2 Action on the part of management on safety and major hazards control has the following objectives :

- Prevent the occurrence of emergency conditions.
- Minimise effects on the community and company personnel.
- Keep property and equipment losses to a minimum.
- Assure interdepartmental and interplant co-operation and mutual help.
- Assure co-operation from outside agencies.

13.8 INVENTORIES

13.8.1 'Take stock of things' is a prudent advice to all the major hazard units. Not once, but on a continuous basis. The hazards are proportional – may not be linear – to the quantities stored and handled and conscious efforts are needed to see that the quantities are kept within limits. Storage of material in tanks and vessels as raw material, finished products or intermediate products have to be checked for correctness of the type of storage, compliance with statues and also for quantities.

13.8.2 There will always be tendencies and temptations to store more to meet production needs or difficulties in supplies of even fluctuations in prices. Spare vessels for transfer are not to be forgotten. Attention also needs to be given to mobile storage – the tankers and rail Explosive Vans carrying hazardous chemicals or material which enter the plant. Apart from the hazards posed by the tankers/rail Explosive Vans themselves, it should be borne in mind that their presence increase the potential for hazards in the plant. The number of tankers/Explosive Vans which would be allowed at a time and the additional precautions/safety measures to be taken are to be studied.

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13.8.3 In case material is drawn from storage for production, or material is produced and stored, check has to be made regarding changes in the production programmes and the consequent effects on safety at the plant. In case of intermediate storages, holding more than normal quantities is possible in case of stoppage of some process. Such a situation is to be checked with the intention of the designer and the safety features incorporated. The quantities of chemicals left in pipelines during stoppages along with their behaviour has to be analysed.

13.8.4 In short a thorough exercise to analyse the chemicals/materials in the plant with reference to their origin, storage (intentional and inadvertent) and movement is necessary. This exercise will bring to light any causes which have been left out in the study of P & I diagram and control circuits.

13.8.5 Information regarding all the hazardous materials must be obtained on a regular basis and monitored at the manager level. A suitable information system would contain the quantities stored in different locations, the quantities produced, the liquid levels measured at strategic points, the corresponding pressure levels, the entry and exit of tankers and explosive vans. This information should be processed to arrive at the inventory held at a particular time (output of information system). The inventory should be monitored at regular intervals depending upon the hazardous properties of the material. On a minimum basis checking of inventory at the beginning of the shift is recommended.

13.9 PLANT SAFETY INSPECTION

13.9.1 Safety inspection in major hazard units has two areas. One is the inspection covering general safety aspects like machine guarding, material handling, use of personal protective equipments, housekeeping, hand tools, safe methods of work and so one. This is mainly an exercise of observing the actual working conditions preferably for a check list, and identifying the unsafe work practices and working conditions.

13.9.2 Second is the inspection from the point of view of major hazards control. This is more technical in nature and involves not only physical observations but also study of drawings and details, analysis of systems and subsystems. The objective of inspections in major hazard units is to identify possibilities of major accidents in future and check the effectiveness of measures taken to control major hazards.

13.9.3 Inspections in major hazard units are best done by a team of engineers from the disciplines of safety, maintenance, production and design. Familiarity with the drawings P & I diagrams, and control circuits (electrical) is a must for the team. Safety inspection in a major hazard unit should give detailed attention to following :

13.9.4 A chemical plant offers scope for three types of inspections. Inspection prescribed under statues or as per guidelines issued by the government come first. Inspection of pressure vessels come under this head. Second is the detailed inspections undertaken while the plant is shut down for maintenance and renovation. Third is routine inspection as part of normal work to look for and identify possible causes of a future mishap. The action areas for managers are :

- The inspection procedures have to be drafted in detail with due care in consultation with standards and guidelines available.

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- Inspections team should be thoroughly familiar with the plant, the possible hazards and the inspection needs.

- Inspection reports should be made in formats, appropriately designed.

- All inspection reports should be seen and discussed by a group of managers from different disciplines forming a surveillance group.

- Action on inspection reports should be taken without delay.

13.10 SAFETY AUDITS

13.10.1 "Safety audit" is an improvement over conventional safety inspections.

13.10.2 The work "Audit" is used in finance to denote checking of transactions with reference to norms specified. Safety audit, similarly, is the word used to describe the activities relating to checking operations/procedures to make sure that they comply with the safety norms specified.

13.10.3 Take the case of the welding job in a petrochemical factory. Due to potential fire hazards strict norms are established for welding within factory premises. The following step by step procedure is laid down :

- The section supervisor asks for permission from his manager.

- The manager okays.

- A request is made to maintenance department - who are only authorised to do the welding.

- A clearance of safety department is necessary. This is issued only after physically checking the concentration of flammable vapours in the site with an Explosimeter.

- After clearance a "permit to work" is issued by the department which confirms that all the above precautions are taken.

- A qualified and trained welder is deputed for the job.

- Fire section is alerted to stand by ready during welding.

- After work is carried out, reports are sent to concerned people.

13.10.4 Though the system is fool proof, exigencies of work and human element can short circuit the procedures. Fire section may not have been alerted. Due to urgency the checking by meter might have been left out. Instead of a qualified welder, a helper might have been deputed.

13.10.5 A safety audit of the job checks on these aspects. By intervening in the middle of the process and asking questions and checking, the auditor finds out whether the procedure

have been strictly followed and identifies mistakes committed in the process, if any. Some times shortcomings in the procedures specified themselves surface in the course of audits.

13.11 HAZARD ANALYSIS TECHNIQUES

13.11.1 Over a period of time, many new methods and techniques have been developed to assess and evaluate potential hazards, employing chemical technology and reliability engineering. These techniques have the advantage that they can be employed right from the stage of plant design on the drawing board itself. Some of the techniques are described below in short :

13.11.2 This is a deductive method, and the analysis begins with the listing of the logical ways in which failure of the system (accidents in our case) can take place. The logical reasons and contributory causes that can lead to each failure are worked out. The analysis is continued till all the causes and circumstances are covered.

A typical example to this method of analysis can be seen in the fault locating charts supplied with household appliances or automobiles, where the possible failures (e.g. engine not starting) and the probable reasons for the same (e.g. : engine cold, defective plug, loose contact in ignition system, poor mixture) are told to the customer in a logical order.

On the basis of the analysis, a block diagram is constructed which depicts :

- The possible ways of failure.
- The events/circumstances which can logically be responsible for such failures.
- The sequence of events leading to each failure.
- Relation between failure of different components.

13.11.3 Failure mode analysis.

This is an inductive method. Here the entire system is divided into sub systems, sub-sub systems and then to individual components. Each component is then studied in detail as to : -

- The function it is performing.
- The ways in which it can fail.
- The effect of failure of the component on the sub-systems and the system (Example: A worn out bearing can overheat. Overheating of the bearing leads to temperature rise of the motor and the pump; temperature rise can damage the motor which in turn can stop the pump. The pump failure affects the flow rate and so on).
- The seriousness of the effect of the failure is assessed critically.

14.0 EVALUATION OF HAZARD – NEW APPROACH

14.1 Need :

1. Increased public awareness.
2. Govt. controls/rules/regulations.

3. Increased cost of risk involved.
4. Answerability to public.
5. Compensation and loss of life/property.
6. Downtime loss and quality-loss.
7. Crippling in competitiveness due to need for making good the losses.

14.2 ADDITIONAL TECHNIQUES :

1. Hazard Indices (HI)
2. Hazard Analysis (HAZAN).
3. Hazard and Operability - Studies (HAZOPS).
4. Fatal Accident Frequency Rate Analysis (FAFRA).
5. Event Tree Analysis (ETA).

14.3 HAZARD INDICES

14.3.1 Dow Fire and Explosion Index (DFEI) is arrived at based on Material Factory (MF), General Process Hazards (GPH) and Special Process Hazard (SPH). The MF' is a number from 1-40 based on its energy level/potential of the most hazardous element/constituent. This depends on flammability, reactivity, explosive nature, etc. The GPA and SPH are shown as 'Penalties' to be added as percentages for the hazardous operation or process condition. From the values of MR, GPH & SPH the index is arrived at from the equation.

14.3.2 **The degree of Hazard is then categorized into the following types.**

Light	-	(1-50)
Moderate	-	(51-81)
Intermediate	-	(82-107)
Heavy	-	(108-133)
Severe	-	134 and above.

14.3.3 Based on the above index design features can be incorporated in the plant/process to minimise hazard.

14.4 HAZARD AND OPERABILITY STUDIES (HAZOPS)

14.4.1 This is a structured technique of evaluating hazard. Each individual part or the process is submitted to questions and come to question as 'WHAT IF' there is a deviation or malfunction. There answers to queries would give insight into the possible consequences of each deviation vis-à-vis courses. This type of study involves features such as intention, deviation, causes and consequences, usually a set of guide words are used for the purpose of questioning the features. They are None, More, less, As well as, Part of, Reverse, Other than etc. The key words stimulate thoughts about design intention, deviation and have specific meanings in the context of HAZOPS study. The basic assumption in this approach is that any problem in safety in operation or process in a plant arises out of a deviation with regard to the design or operation intentions, a study or analysis can be performed as above. Each individual unit or part or segment of system will be separately subjected to such analysis so that the deviations (causes) and hazards (consequences) are clearly brought out

in respect of each unit or part.

14.5 Afterwards these are once again critically screened with respect to overall systems. After eliminating insignificant ones the major ones are subjected to a HAZAN (Hazard Analysis) in order to arrive at the frequency of occurrence, frequency of fatality and cost of failures. The values so arrived at are compared with the Acceptable Criteria (Values acceptable in respect of each country), then the process design is accepted/finalised and if more, then suitable modifications are effected to bring it within the acceptable level.

14.6 HAZARD ANALYSIS

14.6.1 Whereas HAZOP study is a method of identifying hazards and problems which prevent efficient operation, HAZAN is a quantitative approach to the hazard level which helps to take cost-effective decision to reduce or eliminate the hazard.

14.6.2 The following are the objectives of HAZAN :

1. To quantify or assess the hazard and the risks of its occurrence.
2. To aid decision making to reduce risks.
3. To facilitate rational investment towards hazard elimination.

14.6.3 The first step is to estimate the consequences or the adverse effects of a possible hazard to :

(a) employee inside
(b) public outside
(c) the plant and
(d) profits.

14.6.4 From the frequency of occurrence and consequences the Annual Risk can be calculated and a rational decision can be taken whether to change the system design or leave it as it is which is a major decision.

15.0 AREAS WHERE HAZOPS ANALYSIS HAS BEEN CARRIED OUT AND NEED FOR CARRYING OUT THE SAME.

15.1 TNT (2.4.6 TRI NITRO TOLUENE)

TNT is produced by treating toluene with mixture of sulphuric acid and nitric acid, so that, the toluene is first nitrated to mono-nitro-toluene, then to di-nitro-toluene and finally to tri-nitro-toluene. Toluene nitration unit consists of seven numbers of Nitrators, Separators and Decantors each, connecting to each other.

15.1.1 Toluene is fed into nitrator 1 & 2. Oleum is fed to nitrator 7. Strong Nitric Acid (98%) is fed to nitrators 4, 5, 6 & 7. Weak Nitric Acid (60%) is fed to nitrators 1, 2 & 3.

15.1.2 As the nitration is conducted by a continuous process, it is necessary to have proportioners that supply the different raw materials to the nitration system in constant quantities per unit time and in reciprocally correct ratio of flow. This is accomplished by means of LEWA Metering Pump.

15.1.3 The Nitration process is controlled from the rates of feeds of ingredients and the nitrating temperature. The temperature of the nitrators are controlled automatically by regulating

the flow of cooling water through the coils. If the nitration process is not controlled properly there could be formation of undesired isomers of TNT.

15.1.4 To start with HAZAN/HAZOP procedure let us consider the feeding rate of various constituents into nitrators control of reaction temperature and identify the possible causes of hazards involved in the reaction with the help of guide words.

15.1.5

GUIDEWORD	DEVIATIONS	CAUSES	CONSEQUENCES	ACTION REQUIRED
a) NONE OF TOLUENE	No addition of Toluene.	Non availability or fault in Metering Pump	No reaction	Availability to Toluene and repair of Metering pump
WEAK NITRIC ACID	-do-	-do-	-do-	Availability of WNA and repairs of Metering Pump
Strong Nitric Acid	-do-	-do-	Rate of Denitration and Tri-nitration will affect	Availability of SNA and repairs of Metering Pump
Oleum	-do-	-do-	Rate of Tri-nitration will affect	Availability of Oleum and repairs of Metering Pump
b) MORE OF TOLUENE	Deviation from specified rate	Fault in adjusting the feed of pump or calibration –fault in Rotameter	Incomplete Nitration . Wastage of Toluene	Proper adjusting feed of Metering Pump and Calibration of Rotameter
WNA	-do-	-do-	Wastage of WNA	-do-
SNA	Deviation from specified rate	Fault in adjusting the feed of pump or calibration –fault in Rotameter	Rate of nitration will increase. Rise in Temperature	Proper adjusting feed of Metering Pump and Calibration of Rotameter. Circulation of cooling water
Oleum	-do-	-do-	-do-	-do-
c) Less of TOLUENE	Deviation from specified quantity	Fault in metering feed of pump or calibration –fault in Rotameter	Losses of Acids i.e WNA, SNA, Oleum	Repair of Metering Pump and Calibration of Rotameter
WNA	-do-	-do-	Incomplete Nitration at first nitration stage, which may leas to faster rate of reaction at 2^{nd} & 3^{rd} stage. Rise in Temperature	-do – Circulation of cooling water

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SNA	-do-	-do-	Incomplete Nitration at 2nd & 3rd stage. Of Nitration	-do-
Oleum	-do-	-do-	Slow rate of Nitration at 2nd & 3rd stage	-do-
d) Part of TOLUENE	Only part addition	Non-availability of sufficient quantity or fault in metering pump.	Wastages of Acids such as WNA, SNA, Oleum	Availability of sufficient quantity to the ensured. Metering Pump to be repaired.
WNA	-do-	-do-	Incomplete 1st stage nitration. Faster reaction at 2nd stage. Rise in Temperature	-do-
SNA	-do-	-do-	Incomplete nitration. reaction at 2nd & 3rd stage & Wastage of Toluene	-do-
Oleum	-do-	-do-	Rate of nitration very slow. Incomplete nitration at 2nd & 3rd stage	-do-
e) More than (Concentration) TOLUENE	Deviation from specified concentration	Improper testing of chemicals or non-availability of material of proper concentration	Faster rate of reaction. Rise in temperature	Proper testing of chemicals . Availability of material of required concentration
WNA	-do-	-do-	Faster rate of nitration. Rise in temperature	-do- Circulation of cooling water
SNA	-do-	-do-	-do-	-do-
Oleum	-do-	-do-	-do-	-do-
f) Other Temperature	More or less.	More or less Feeds of Nitrating constituents . More or less feeds of steam of cooling water.	It will affect the rate of reaction. At higher temp. the oxidation stage nitration and may lead to formation of Isomers such as 2.6 Di-Nitroparacresol. At higher temp. in the trinitration stage possibility of formation of TETRANITRO METHANE C(NO2) 4 which may lead. to	Proper feeds of nitrating Constituents to be adjusted Proper regularization of feeds of Chilled Water and steam. Use of nitrating acid having lower content of Nitrose (HNO2) to avoid formation of 2.6 dinitro-paracresol.

			serious accidents	Temperature of Trinitro- toluene stage to be maintained as specified. Exhaust fans to be provided in the building to keep the concentration of Tetranitro Methane fumes below hazardous level
ABNORMAL RISE IN BUILDING	Non-controlled of reaction or Improper electrification.	Fire etc.	Fire may lead to serious explosions	Immediate control of Reaction by adjusting of and chilled water. Rectification of electrical fault.
ELECTRICITY	result do not conform to specified limit	of EC, LP conductors or Improper installation of plants and equipments.	May lead to fire or explosions	Extinguish fire etc., Provision of EC, LP conductors. Proper grounding of plants and equipments and periodical EC, LP test.

15.1.6 CONCLUSION

Having examined the hazardous situation during nitration process with the help of Guide-words, it becomes essential to take proper action to minimise the hazardeviatiomd in the operation. Most of the actions required are as follows : -

1. Adjusting metering pumps and calibration of rotameters.
2. Automatic regulation of flow of cooling water.
3. Availability of specified raw materials with respect to quality and quantity.
4. Proper control of nitration processes with respect to feed of ingredients and reaction temperature.
5. Periodical testing of EC, LP.
6. Provision of sprinkler system with actuating switch nearby.

All these actions required are incorporated in Standing Instructions and also find place in Plant Operation Manual. Hence after Hazan/Hazop analysis it is not felt essential to incorporate any change or add any safety device.

15.2 CE (COMPOSITION EXPLODING)

SULPHATION OF DMA (DIMETHYL ANILINE)

In the sulphation reaction two materials, such as S.A. (94%) and DMA are reacted to form a product DMAS.

The chemistry of the process is such that the flow of DMA to the reactor containing SA

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must be at a specified rate to avoid rise in temperature and ratio of DMA to SA (25^0 to 29^0C).
To start with the hazop procedure let us consider the above operation. The abnormal situation could arise resulting in rise in temperature of reactants. The cause due to more addition of DMA that specified rate and failure of chilled water supply to the cooling coils.

The above hazard and its process have been identified by use of guide-words as follows:

Guide words for Hazops and Hazan

Guide Word	Deviation	Causes	Consequences	Action Required
NONE				
DMA	No addition of DMA.	Fault in DMA injection valve	No reaction.	Repairs of injection system (valve)
Chilled Water	No proper maintained Reaction.	No cooling effect.	Abnormal rise in temperature.	Provision of chilled water.
MORE OF				
DMA	DMA quantity variation than required. valve.	Faulty DMA injection	Rise in reaction temperature.	Repair of valve.
Chilled water	No proper maintained of reaction temperature.	No conformation of chilled water circulation through coil.	No proper water control valve.	Repair of chilled Water line valve & ensure flow.
LESS OF				
DMA	Quantity variation	Faulty injection	Long reaction time.	Repair of DMA injection valve.
Chilled water	No proper maintained of reaction temperature.	Faulty chilled water line valve.	Rise in reaction temperature or boil over of reaction contents.	Repair of chilled water line valve & ensure flow.
PART OF				
DMA	Deviation From specified ratio of	1. Total failure of DMA injection systems.	Wastage of S.A.	1. Rectification of DMA injection system.

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	SA to DMA.	2. Non-availability of DMA.		2. Provision of DMA.
Chilled Water	Non availability of chilled water.	Failure of chilled water System.	No control on reaction temperature.	Repair of chilled water unit.
MORE THAN				
DMA	Deviation From specified ratio of SA to DMA.	Faulty measuring vessel.	Wastage of DMA, incomplete sulphation.	Provision of specified quantity for reaction and proper measuring vessel.
OTHERS				
SUDDEN POWER	No proper maintenance of temperature	Failure of chilled water unit and air compressor.	Reaction may go out of control.	Circulation of ordinary water. Cut off of DMA feeds.

15.2.2 NITRATION OF DMAs (DIMETHYL ANILINE SULPHATE)

In the nitration of DMAs, two materials, DMAs and Nitric acid of strength 91.2 + 1 are reacted to form a product tetryl i.e. 2-4-6- trinitro phenyl methyl nitramine (Composition Exploding). In the process, the rate of addition of DMAs in N.A. taken into nitrator is to be adjusted such that there is no abnormal rise in temperature (70 $\pm 2^0$C). The deviation from maintaining the reaction temperature could be due to various reasons.

1. Failure of chilled water system.
2. More addition of DMAs.

The above hazard of rise in reaction temperature and its possible causes have been studied by use of guide words as follows : -

Guide Word NONE	Deviation	Causes	Consequences	Action Required
DMAs	No addition of DMAs.	Fault in DMAs injection valve.	No reaction.	Repair of DMAs injection valve.
Chilled water	No proper maintained of reaction	Fault in chilled water line	Rise in reaction temperature.	Repair of valve on chilled water line.

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MORE OF				
DMA's	Variation in DMA's quantity than required.	Faulty injection valve or untrained operator.	Rise in temperature.	Repair of injection valve and proper training to the operator.
Chilled water	No proper maintained of tempera-ture.	Fault in chilled water line valve.	No proper reaction.	Repair of valve on chilled water line.
LESS OF				
DMAs	Quantity variation than required.	Faulty injection valve or	Long reaction time.	Repair to injection valve and training to the operator.
Chilled water	No proper maintained of reaction temperature	Fault in valve on chilled water line.	Rise in temperature.	Repair of valve on chilled water line.
PART OF				
DMAs	Deviation from specified reaction of DMAs to N.A.	Total failure in DMAs injection system or non availa-bility DMAs.	Wastage of Nitric acid.	Repair of DMAs injection valve and availability of DMAs.
Chilled water	No proper maintained of reaction temperature.	Failure of chilled water system.	No control on reaction temperature.	Repair of chilled water unit.
MORE THAN				
DMAs	Deviation from specified ratio of NA to DMAs.	Faulty measuring vessel/ egg.	Incomplete reaction.	Provision of specified quantity of DMAs and proper measuring vessel/ egg.
N.A.	- do -	- do -	Wastage of N.A.	- do -
OTHERS				
Sudden Power	No proper maintained	Failure of chilled	Reaction may go out of	Circulation of ordinary water and failure

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	of temperature.	water unit	control.	cut off of DMAs feed.

15.2.3 CONCLUSION

The possible risks involved and the action required have been studied by using HAZAN and HAZOP analysis method.

15.3 MANUFACTURE OF MERCURY FULMINATE

In the manufacture of mercury fulminate two materials such as mercuric Nitrate and Ethyl Alcohol are reacted to form Mercury Fulminate. The ratio of the two materials is specified to get the Mercury Fulminate of the purity.

15.3.1 To start with hazan/Hazp, let us consider the addition of Mercuric Nitrate in the retort containing Ethyl Alcohol. The abnormal situation (rise in temperature) could arise only when reaction is not controlled properly.

The above hazard have been studied by use of Guide words.

GUIDE WORD	DEVIATION	CAUSES	CONSEQUENCES	ACTION REQUIRED
NONE				
Mercuric Nitrate	No addition	Non availa-bility	No formation of Mercury Fulmi-nate	Mercuric Nitrate to be kept ready in advance.
Ethyl Alcohol	- do -	Non-availa-bility	- do -	It is also be ensured that Ethyl Alcohol is taken into retort before addition of Mercuric Nitrate.
MORE OF				
Mercuric Nitrate	Variation in specified quantity.	Operation error. Calibration error.	Incomplete reaction, Impure product.	Mercuric Nitrate quantity to take as specified. Equipment to be calibrated.
Ethyl Alcohol	- do -	- do -	Evaporation of excess Ethyl Alcohol More reaction time.	Specified quan-tity to be taken Equipment to be calibrated.
LESS OF				

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Mercuric Nitrate	Quantity Variation	Operational error. Calibration error.	Less Product.	Specified quantity to be taken. Equipment to be calibrated.
Ethyl Alcohol	- do -	- do -	Less products Product may carry impurities.	- do -
PART OF				
Mercuric Nitrate	Quantity Variation	Non-availability	Less product Formation of contaminated product.	Specified quantity to be
Ethyl	- do -	- do -	- do -	- do -
MORE THAN				
Mercuric Nitrate	- do -	Operational error.	Contamination of mercury fulminate. May rise into abnormal during washing stage.	Specified quantity to be taken operators to be trained.
Ethyl Alcohol	- do -	- do -	Larger reaction time. Formation of free mercury contaminating final product.	- do -
Temperature of the reaction.	Rise in temp.	Exothermic reaction	Less product May pressure the retort	Reaction to be carried out at room temp. (about 30^0 C) rate of reaction to be controlled by applying suction to the retort.
Presence of Metallic	Improve reactants. Use of metallic equipment	Deviation Acceptance of raw materials.	Formation of impure Fulminate Unsuitable Product	pure raw material to be used no use of metallic equipment in the process.

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15.3.2 CONCLUSION

Having examined the consequences of reaction with the help of Hazan/Hazop study, next step is to take the action as required to minimize the reaction hazard. All the action required are confirmed in advance before starting the operations : Action required and covered in the form of standing instruction and Raw materials specifications. Hence study team do not suggest any modification of addition to the existing or manufacturing procedures.

15.4 MANUFACTURING PROCESS OF PRODUCTS COMING UNDER AMMUNITION STORES

15.4.1 GRENADE HAND / RIFFLE 36 M MK1 :

Empty Preparation:- Empty bodies of cast iron is cleaned with the help of Kerosene to remove foreign material, dust, grease etc. Threads are to be cleaned before fixing the Center Piece. One Red band of paint is applied on the body as identification mark of TNT filled grenade. **Filling:** TNT flakes are filled (approx..- 65 gms) through the filling hole of grenade body and plugged with filling hole plug(Marked with mfg. year and lot number). Striker is assembled and retained with the help of safety pin. Base plug is fixed at the bottom. Water proofing composition is applied at the striker hole to prevent the moisture entry. 10 Nos. of such grenades are packed in one H_2A Box, 4 H_2A Boxes are packed in one 6A carrier and then sealed before dispatch.

15.4.2 RIFFLE GRENADE 36 M MK1 : During packing of RIFFLE GRENADE 36 M MK1 components tube launching, ring arming and cartridge 7.62mm HD are also packed along with Grenade in H2A box with different set of profeel.

Destruction : Empty Grenade body not contaminated with explosive (i.e. TNT) can be destroyed (breaking) with the help of mechanical means, if contaminated then the body is to be boiled with hot water to achieve free from explosives condition and then broken into pieces by mechanical means. The explosive to be destroyed by burning.

15.4.3 Augmenting Cartridges for Mortor Bomb 81mm

FILLING : Preparation of Augmenting Charges:

Receipt of empty Celluloid Nitrate Container ITV 6A with disc, labels-916, Acetone and Propellant NGB-221. On receipt of empty Celluloid Nitrate Container for days outturn, Leak test is carried out by QC section with the help of leak test apparatus to sketch no. CIA/PR/SK/151. Further samples have been taken from above accepted containers as per "Double sampling plan, normal Inspection level-II with AQL 1.5% of specification No.

DEF 131-A" and leak test is carried out as per specification No. CQA(A)2339 by QAE(ME).

In case of non-conformance of above sampling plan, 100% inspection have to be carried out to weed out the defective containers.

Above accepted containers are taken to filling wing for continue further process. The propellant NGB-221 is taken with the help of Copper / Brass / Aluminium scoop for weighing in accordance with ACM and filled in empty container through the filling hole with the help of Copper / Brass funnel. The mouth of filling hole is closed with disc by applying acetone and allowed to dry. Label, showing Lot No., Name of manufacture, month & year of mfg. is affixed over the disc applying acetone / celluloid cement and allowed to dry. This outturn lot is offered to QAE(ME) HEF for inspection 30 Nos. of Cartgs. From day's outturn will be selected at random for checking of charge mass.

Further filled containers are packed in Half cups. The two halves of Half cups are closed. Conveyed to packing room for packing in H2A box. Stencilled box H2A arranged serially and by opening the lid packing fitments are placed at appropriate location. Packed 96 of filled containers in 12 Nos. pairs of Half cups i.e. 08 containers in each pair of Half cup (06 Nos. pair of Half cups with red & blue colour each). Filled pair of Half cups are arranged alternately in two layers. Put middle & top packing fitments. Packing label is affixed below the lid of Box H2A and allow to dry. Thin coat of APC 207 is applied & allowed to dry. Close the lid of H2A Box. 'Explosive' label is affixed at the appropriate place on box H2A/ the filled box is sealed with wire steel mild and lead seal and impressed the lead seal with QA acceptance punch.

15.4.4 Augmenting Cartridges for Mortar Bomb 120 mm

FILLING : Preparation of Augmenting Charges:

Receipt of empty Celluloid Nitrate Container ITV 21A with disc, labels-905, Acetone and Propellant NGB-241.

On receipt of empty Celluloid Nitrate Container for days outturn, Leak test is carried out by QC section with the help of leak test apparatus to sketch no. CIA/PR/SK/151. Further samples have been taken from above accepted containers as per "Double sampling plan, Normal Inspection, Inspection level Gen-II with AQL 1.5% of specification No. DEF 131-A" and leak test is carried out as per specification No. CQA(A)2339 by QAE(ME).

In case of non-conformance of above sampling plan, 100% inspection have to be carried out to weed out the defective containers.

Above accepted containers are taken to filling wing for continue further process.

The propellant NGB-241 is taken with the help of Copper / Brass / Aluminium scoop for weighing in accordance with ACM and filled in empty container through the filling hole with the help of Copper / Brass funnel. The mouth of filling hole is closed with disc by applying acetone and allowed to dry. Label, showing Lot No., Name of manufacture, month & year of mfg. is affixed over the disc applying acetone / celluloid cement and allowed to dry. This outturn lot is offered to QAE (ME) HEF for inspection 30 Nos. of Cartgs. From day's outturn will be selected at random for checking of charge mass.

Further filled containers are packed in Half cups. The two halves of Half cups are closed. Conveyed to packing room for packing in H2A box. Stencilled box H2A arranged serially and by opening the lid packing fitments are placed at appropriate location. Packed 14 of filled containers in 02 Nos. pairs of Half cups i.e. 07 containers in each pair of Half cup (04 Nos. pair of red filled containers & 3 nos. of blue packed alternatively ensuring, red containers should be at both the outer sides of pair of half cup). Filled pair of Half cups are arranged vertically in single layer. Put middle & top packing fitments. Packing label is affixed below the lid of Box H2A and allow to dry. Thin coat of APC 207 is applied & allowed to dry. Close the lid of H2A Box. 'Explosive' label is affixed at the appropriate place on box H2A/ the filled box is sealed with wire steel mild and lead seal and impressed the lead seal with QA acceptance punch.

15.4.5 Augmenting Cartridges for Mortar Bomb 51mm

FILLING : Preparation of Augmenting Charges:

Receipt of empty Celluloid Nitrate Container ITV 28A with disc, labels-2412, Acetone and Propellant NGB-061.

On receipt of empty Celluloid Nitrate Container for days outturn, Leak test is carried out by QC section with the help of leak test apparatus to sketch no. CIA/PR/SK/151. Further samples have been taken from above accepted containers as per "Double sampling plan, normal Inspection level-II with AQL 1.5% of specification No. DEF 131-A" and leak test is carried out as per specification No. CQA(A)2339 by QAE(ME).

In case of non-conformance of above sampling plan, 100% inspection have to be carried out to weed out the defective containers.

Above accepted containers are taken to filling wing for continue further process. The propellant NGB-061 is taken with the help of Copper / Brass / Aluminium scoop for weighing in accordance with ACM and filled in empty container through the filling hole with the help of Copper / Brass funnel. The mouth of filling hole is closed with disc by applying acetone and allowed to dry. Label-2412, showing Lot No., Name of manufacture, month & year of mfg. is affixed over the disc applying acetone / celluloid cement and

allowed to dry. This outturn lot is offered to QAE (ME) HEF for inspection 30 Nos. of Cartgs. From day's outturn will be selected at random for checking of charge mass.

Further filled containers are packed in Half cups. The two halves of Half cups are closed. Conveyed to packing room for packing in H2A box. Stencilled box H2A arranged serially and by opening the lid packing fitments are placed at appropriate location. Packed 240 of filled containers in 15 cylinders i.e. 16 containers in each cylinder. Filled cylinders are arranged in three rows of 5 filled cylinders in each row vertically & mouth of cylinders towards upper side. Put top packing fitments. Packing label is affixed below the lid of Box H2A and allow to dry. Thin coat of APC 207 is applied & allowed to dry. Close the lid of H2A Box. 'Explosive' label is affixed at the appropriate place on box H2A/ the filled box is sealed with wire steel mild and lead seal and impressed the lead seal with QA acceptance punch.

15.4.6 Safety / Security aspects involved in manufacturing of Augmenting Cartridges :

The Aug. Cartgs. are classified under Hazard Division 1.3C. Hence great are must be taken while handling it and should not be allowed to be subjected to impact, friction and nipping between hard surfaces. Suitable gas mask should be worn during operations. In addition to the above, all safety regulations prescribed in STEC Pamphlet No. 2 issued by CFEES should be complied with.

The following precautions shall be taken during the filling of Aug. Cartgs.

a. Propellant NGB-061 is sensitive to shock, impact and friction. It shall be handled with meticulous care and stored part from other classed of explosives.

b. Operators shall be well familiar with the regulations regarding handling / storage of propellant in the shop floor wherever they are working.

c. Propellant spilled on the working area after various operations shall be collected in to waste drum & destroyed forthwith.

d. It should not be exposed to direct sunlight & heat and be stored away from flammable substances.

e. Explosive quantity should not exceed the specified limit.

f. PPE shall be worn during work with Propellant NGB-221, NGB-241 and NGB-061.

15.4.7 CE Primer :

CE Dry Gran (14/100) is blended with 0.6 % Zinc stearate which is CE gran mix. Weigh 37Gm$\pm$ 1 gm mix. And fill in mould along with punch base ,place distance piece .Place this mould in pressing machine in U slot operate at 8 to 10 Tonne pressure by hydraulic press. Dwell time is 7 sec. Collect pressed mould assembly from working table and remove the mould and pellet in aluminium tray. Clean the mould after collection of primer. Convey the pellets for inspection to Lab and QAE(ME).LOT size 1010Nos.

15.4.8 TNT - SLAB

Slab demolition TNT 500g MK 2 A/L (with integral CE primer) in carton board container is used as demolition explosive to pierce M.S. sheet upto 12mm thick and also used in mining and site-clearance.
TNT Gr.I or TNT Gr.II with set point 80°C is used. The mass of TNT filling is 500g (nominal) and density 1.5 to 1.6g/cm³. The slab consists of a rectangular block of cast TNT in carton board container with integral CE primer centrally accommodated in the primer socket. The mass of CE primer is 35g (minimum) and density of the primer shall be 1.55 g/cm³ ± 0.05 g/cm³.

THE PROCESS

Cartons for slab demolition are first assembled and waxed from carton lay flat received from trade or from sister factory. Wooden stopper is put into primer socket and the carton is put into wooden paddler/mould.

TNT is melted in aluminium pot at 90-95°C and poured uniformly in aluminium trays and allowed to cool. The solid TNT is broken into pieces. The product is TNT-Biscuits. Requisite quantity of molten TNT and TNT biscuits are then added in empty cartons, and puddled with wooden puddle. This is done in 3 stages.
Stage 1: 175 gms (⅓rd level of carton) molten & biscuit TNT.
Stage 2: Further 175 gms molten plus biscuit TNT (⅔rd level of carton).
Stage 3 : Final filling till carton empty level is ¼ inch.

Final weight is checked. (Limit 490 to 520 gms; 500 +20). The cart cooled and taken out from the mould, flap of the carton is closed. Edges are waxed with molten paraffin wax to a more perfect sealing. CE primer is then assembled and disc papers pasted by applying animal glue paste. The slab demolition TNT are packed in wooden boxes (conforming to drawing No. IND/ME/58) with inner lining of kraft ammunition. 20 numbers of slab in one box (10 x 2 rows). 50 boxes i.e. 20x50 = 1000 slabs constitute one lot.

ANNEXURE - I

IMPORTANT STANDING INSTRUCTIONS ON SAFETY AT HEF

S.I. NO.	SUBJECT	CUSTODIAN SECTION	DATE	SUPERSEDES
1.	Matches and Fire-Authorisation of.	Safety	15-04-2016	30-04-2003
2.	Use of the internal combustion Engines in Explosive area In HEF.	Safety	15-04-2016	30-04-2003
3.	H.E.Factory - Fire Orders	FB	18-10-2016	23-10-2008
4.	Procedures regarding accidents Including Employees &Plants.	Safety	15-04-2016	30-04-2003
5.	Procedure for cleaning and Passing out of equipment in Explosive process Building (CE section).	Safety	19-01-2016	30-04-2003
6.	Destruction of Waste Ammonium Perchlorate By Burning.	AP	10.01.2019	10.01.2019
7.	Cleaning of Nitrators and Separators in Bldg. No. 223 TNT section	TNT	02-02-2016	25-10-2015
8.	Handling Upkeep & Inspection of Magazine procedure for	IO	16-08-2016	15-03-2011
9.	Handling & Disposal of Explosives Samples.	Lab-Div.	08-11-2015	28-06-1993
10.	Disposal of Hazardous / Non Hazardous Waste Materials.	GEN.	15-03-2019	12-10-2015
11.	Care, Custody, Disposal And According	ME	02-11-2015	10-12-1992

	Of Lead Scrap.			
12.	Safety Precautions – Electrical Special Rules.	EM	15-09-2015	28-04-1992
13.	Boiler & steam service Operation care & Maintenance.	EO	01-09-2018	02-11-2015
14.	Destruction of TNT Waste Explosives by Burning at (Mhasoba) AFK Burning ground.	TNT	15-06-2019	15-06-2019
15.	Disposal of Rejected Celluloid Containers and Waste Propellant NGB-221/241/061 of Aug. Charges 81 used 51mm/ 81mm/120mm at AFK Burning Ground.	F	15-06-2019	15-06-2019
16.	Bio- Medical Waste Management	FHC	12-02-2016	26-03-2004
17.	Receipt, Storage, Issue of Waste acid & Cleaning of Waste acid Towels.	TNT	20-02-2016	20-02-2016
18.	Breaking of Empty Rejected Body for Disposal.	HG	04-11-2016	04-11-2016
19.	Disposal of Waste LTPE Cartridges by Burning.	TNT	28-12-2016	28-12-2016
20.	Destruction of Rejected Tetrazene	AZ	12-01-2016	08-10-2005

ANNEXURE - II

FIRE FIGHTING ACTION - SUMMARY

Characteristic / Hazard	Actions
FIRE DIVISION - 1	
Explosives susceptible to Explosion en mass. Blast Flame, high speed fragments And debris constitute the major Hazard.	a. Fight fire immediately with 'First Aid' equipment in its incipient stage. b. Open the drenchers immediately. c. If fire reaches the explosives, abandon the building without delay to a safe distance. d. Prevent the fire spreading to adjacent building / stacks by spraying water on them.
FIRE DIVISION - 2	
Explosives which do not Explode en masse, having a Projection hazard but minor Explosion effects. Blast effects are Limited.	a. Fight fire with 'First Aid' equipment in its incipient stage. b. Open the drenchers immediately. c. If explosives become involved, fight fires from behind cover. d. Spray water on the affected items and adjacent buildings to prevent spread of fire.
FIRE DIVISION - 3	
Explosives which do not explode en masse, having a mass fire hazard With minor or no explosion effects. Intense heat with emission of considerable Thermal radiation over a wide area Constitute the major risk.	a. Fight fire with 'First Aid' equipment in its incipient stage. b. Open the drenchers immediately. c. If explosives are involved, fight fire From a protected position. d. Spray water on the affected items and adjacent buildings to prevent spread of fire.

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FIRE DIVISION - 4

Explosives which present no Significant hazard Except a moderate fire risk.

a. Fight fire with 'First Aid' equipment in its incipient stage.

b. Open the drenchers immediately.

c. If the explosives are involved, continue to attack the fire from a protected position.

d. Spray water on the affected items and adjacent buildings to prevent spread of fire.

METALLIC POWDERS.

These constitute a special risk because they are capable of burning Fiercely and reacting violently with water

a. Do not use water, foam or chemical extinguisher.

b. Use sand powdered graphite, talc, soda ash and lime stone, all of which must be in a dry state.

d. Use chemical dry powder suitable for extinguishing metallic powder fires.

e. Do not agitate the burning powder until it has cooled below its ignition temperature.

IMPORTANT STEC AND OTHER PUBLICATION

1.	Safety Distance Regulations	-	STEC pamphlet No. 1.
2.	Conveyance of Govt. Explosive By road.	-	STEC pamphlet No. 2.
3.	Classification list of Govt. Explosives		STEC pamphlet No. 3.
4.	Transport of Govt. Explosives by Air.		STEC pamphlet No. 4.
5.	Regulations for Storage, Handing, Care Preservation & Transport of Celluloid.		STEC pamphlet No.5.
6.	Regulation Fighting Fires in Govt. Explosives Establishment.		STEC pamphlet No. 6.
7.	Technical Requirements Traverses.		STEC Technical Memorandum No. 1.
8.	Technical Requirements For the construction Of Explosives Storages.		STEC Technical Memorandum No. 2.
9.	Regulation of Electric Lights etc. in building containing Explosives.		E – in C Pamphlet No.15.
10.	The Petroleum and Carbide of Calcium Manual.		
11.	The Gas Cylinder Rules 1940.		
12	Conveyance of Military Explosives by Train.		Military Tariff No. 5
13.	Conveyance of Explosives And other dangerous Goods by Rail.		Red Tariff No. 18.
14.	Magazine Regulations, 1941 Edition.		

15. Safety certificates issued By CI (ME) for different Explosives / propellants. etc.

16. Factories Act , 1948.

17. Maharashtra Factories Rules, 1963.

18. IMCO (Inter- Government Maritime Consultative Organization) Hand book. — International Maritime Dangerous Goods Code.

19. IATA (International Air Transport Association) Restricted Articles Regulations.

20. The Indian Explosive Act, 1884.

21. The Explosives Rules, 1940.

22. The Explosives Manual by CIE in India (Now CCE).

23. CITIZEN MATTERS Bengaluru Magazine — Fire Safety Tips for Piped Natural Gas Customers in Bengaluru February 27. 2018 by Savitha Sampath

WORTH REMEMBERING

All explosives are potentially hazardous and every type of explosives irrespective of its relative safety; should be handled, stored and used with utmost care at all time and under all conditions.

A chance taker is an accident maker.

While the best safety procedure is accident prevention; it is imperative to have well designed first aid and fire-fighting programs. The first few minutes after an accident occurs are the most important in terms of lives saved and reduced material loss.

The key factors to be considered in protecting health and safety of persons working in an explosive manufacturing unit are –

i) Instruction to personnel in safe practices,

ii) Prevention of fire and explosion.

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ACKNOWLEDGEMENT

A. LITERATURE :

(i) STEC Pamphlets.

(ii) Factory Act 1948.

(iii) Maharashtra Factory Rules, 1963

(iv) Explosive Act 1884.

(v) Petroleum Act 1934 & Rules 2002.

(vi) Manufacture, Storage and Handling of Hazardous Chemicals – 2000.

(vii) Ammunition Maintenance Instruction.

(viii) Fire Order.

(ix) Safety Management in Industry.

(x) Safety Manual 1994 & 2002.

B. PERSONNEL

The Safety Manual 2019 has come to your hand due to the concerted efforts put in by :

1) **Shri. V. B. KURIL, AGM / VBK (CSO).**

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General Manager, High Explosives Factory, puts on record his deep appreciation for their efforts.

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CHAPTER:-III **STANDING INSTRUCTION** **SECTION:-SF**

SI NO.:- 06 DATE:- 01/06/2023 SUPERSEDES SI NO:-06 DATED:- 14/11/2019

REAFFIRMED ON: NEXT DUE ON:- 01/06/2026

USE OF INTERNAL COMBUSTION ENGINES IN EXPLOSIVE AREA .

1. GENERAL.

1.1 "Explosives Area" comprise the area enclosed by fencing, to include TN, CE, AZ, ACETONE, TOLUENE, IPN, G-FUEL, HNS and ESH areas.

1.2. Petrol / Diesel driven vehicle will have the exhaust fitted with flame proof close meshed gauze (100 mesh) and if possible the carburetor with a flame arrestor.

2. ROUTES INSIDE EXPLOSIVE AREA:-

2.1. Heavy vehicles and explosives lorries/Vans operated by internal combustion engines (Diesel or petrol type) will ply along the parameter road only inside the explosive area. Other vehicles viz. lister trucks and Fire fighting appliances will be permitted to ply on other routes also inside the explosive area.

2.2. **Deviations from this can be allowed in exceptional circumstances under written order by DVO/SF.**

3. FUELING OF VEHICLES.

3.1. Fuel tanks of vehicles etc. will not be fitted inside the "Explosive Area". Filling should be done in the motor shop /garages only.

3.2. No spare fuel will be carried on vehicles etc. , inside the explosive area.

3.3. Vehicles etc. will not be left loaded within the inside Safety Distances of Bldgs. containing explosives.

Note:- i) Fuelling within the inside safety distance of Bldg. containing explosive may however be permitted for firefighting pumps.

ii) When constructional work is in progress, diesel or petrol appliances such as Concrete Mixers may be permitted to be stationed and refueled inside explosives area under written orders of DVO /SF.

4. SPEED LIMITS:-

4.1. Speed limits and caution boards will be exhibited at starting points on roads inside the explosive area by JWM/MT action in accordance with the advice of DVO/SF.

4.2. The following speed limits for vehicles etc. will be observed in explosive area.

4.2.1. M.T. Trucks - and Lorries – maximum 25 Kmh (Ref. STEC 12 Sl. No. 9) .

4.2.2. Lister Trucks - Maximum 16 kmp (10 mph)

4.2.3. Private / Contractor's vehicles will also observe the above rules, whenever they come inside the factory.

(DR.A.S.KHAN)
GENERAL MANAGER
HIGH EXPLOSIVE FACTORY
KHADKI, PUNE - 411003.

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