



**DEDICATED FREIGHT CORRIDOR CORPORATION OF INDIA LIMITED
(A GOVERNMENT OF INDIA ENTERPRISE)**

**Under
MINISTRY OF RAILWAYS**

Tender No.: DFCCIL/NOIDA UNIT / Electrical/ Substation /2022/02
Name of Work: Supply, Erection, Testing and Commissioning of 33 kV Sub-stations, DG Set and related works for DFCCIL Integrated Office Cum Residential Complex at Sec-145, Noida.

**E-TENDER DOCUMENT
TECHNICAL BID
(PACKET – A)
FEBRUARY– 2022**

**Chief General Manager/DFCCIL
Sector 145, Noida**

Information to Bidders

The tender for above work was floated earlier and awarded also, however it was cancelled/terminated as the successful contractor failed to take up the work. All bidders are hereby advised to go thorough the make list and technical specification of the tender document including BOQ very thoroughly and minutly. They should closely peruse specifications, scope of work, terms and conditions, all clauses etc. Tenderer may also visit the site to ascertain the site conditions and other related information. In case of any doubt, the bidders can contact at the address given in the tender document.

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PART-I

CHAPTER-I

**CHECK LIST OF DOCUMENTS
TO BE UPLOADED
IN E-TENDER**

PART-I
CHAPTER-I
CHECK LIST

Check List of items/documents pertaining to Bid to be uploaded by the bidder in E-Tender portal on or before the last Date & Time of Bid Submission	
Item No.	Items
Technical Bid (Packet-A)	
1	EMD of Rs.30,00,000/- (<i>Rupees Thirty Lakh Only</i>) to be paid online through payment gateway provided at www.ireps.gov.in in the account of Dedicated Freight Corridor Corporation of India Ltd., New Delhi on or before schedule date & time of submission of bid.
2	Cost of Bid Document of Rs.11,800/- (<i>Rupees Eleven Thousand & Eight Hundred Only</i>) (Non-Refundable) to be paid online through payment gateway provided at www.ireps.gov.in in the account of Dedicated Freight Corridor Corporation of India Ltd., New Delhi on or before schedule date & time of submission of bid.
3	Offer Letter on the Letter Head of the Applicant/Bidder that they agree and abide by the bid documents and amendments thereof (<i>if any</i>) and would execute the work accordingly. (Form No. 1A)
4	Format for Certificate to be Submitted / Uploaded by Tenderer Alongwith the Tender Documents (Form No. 1B)
5	Power of Attorney of the person authorized for signing/submitting the Tender (Form No. 22).
6	Submission of Tenderer's Credentials in accordance with Technical Eligibility Criteria defined in Para-1.3.11.1 (Preamble & General Instructions to Tenderer) of Part-I, Chapter-III of Tender Document in prescribed forms. (Form No.2A/2AA)
7	Submission of Tenderer's Credentials in accordance with Financial Eligibility Criteria defined in Para-1.3.11.2 (Preamble & General Instructions to Tenderer) of Part-I, Chapter-III of Tender Document in prescribed forms. (Form No.2B)
8	Submission of Valid Electrical Contractor License issued in the name of the firm as per clause 1.2.3 of Special Conditions of Contract (Electrical), Part-I, Chapter- V, Section-I of Tender Document.
9	Applicant's Party Information Form (Form No.2C). Documentary Evidence in support of their formation as Proprietary Firm/ Partnership Firm/ Company/ Joint Venture/ LLP /Registered Society/ Registered Trust/ HUF as per the requirement defined in Para 1.3.14 of Part-I, Chapter-III (Preamble and General Instructions to Tenderers) of Tender Document.
10	Valid GST Registration, EPF Registration, ESI and PAN No.

11	In case of JV, Memorandum of Understanding as per bid document. (Form No.9)
12	In case of JV, Joint Venture agreement (Form No.10)
13	In case of JV, Letter of participation from each partner of Joint Venture (JV)– (Form No. 11)
14	In case of JV, The Power of Attorney for authorized signatory of JV partners and for Lead Member of JV (Form No. 12 & 13 resp.)
15	Integrity Pact duly signed by the bidder (Form No.19).
16	No Deviation Certificate (Form No. 23).
17	The entire Tender document should first be downloaded & then, upload the same through digital signature by the Authorized signatory of the bidder. As per clause 1.3.1 (v) (E) (iii) of Part-I, Chapter-III of tender document, “In case the authorized signatory, holding Power of Attorney and Digital Signatory are not the same, the bid shall be considered non-responsive”.
18	All pages of all the Corrigendum/Addendum/Clarification (if any) should first be downloaded then, upload the same through digital signature by the Authorized signatory of the bidder.
Financial Bid (Packet-B)	
19	Financial Bid to be filled and submitted on <u>www.ireps.gov.in</u> by following the steps available on the website.

Note: All the uploaded documents should be in readable, printable & legible form.

IMPORTANT NOTES:

- i. **Document mentioned at S.No. 1 to 16** above of the Check list [Technical Bid (Packet-A)] should be scanned and uploaded as attachment at website (www.ireps.gov.in). The detailed instructions of E-tendering can be read through website www.ireps.gov.in.
- ii. Similarly, the **document mentioned at S.No. 17 & 18** of the Check list [Technical Bid (Packet-A)] should first be downloaded from E-Tender Portal (in PDF Format) and thereafter upload them to E-Tender Portal, through digital signature.
- iii. **For Document No. 19** of the Check list [Financial Bid (Packet-B)], Financial Bid to be filled and submitted on www.ireps.gov.in by following the steps available on the website.

PART-I
CHAPTER-II
NOTICE INVITING E-TENDER

PART – I

Chapter II

DEDICATED FREIGHT CORRIDOR CORPORATION OF INDIA LIMITED (A GOVERNMENT OF INDIA ENTERPRISE)

Tender No: DFCCIL/NOIDA UNIT/Electrical/Substation/2022/02

NOTICE INVITING E-TENDER National Competitive Bidding

Name of Work: Supply, Erection, Testing and Commissioning of 33 kV Sub-stations, DG Set and related works for DFCCIL Integrated Office Cum Residential Complex at Sec-145, Noida.

1.2.1 Chief General Manager/Noida, Dedicated Freight Corridor Corporation of India Limited, D-89,1st Floor, Sector-2, Noida-201310, India, invites **E-Tenders in single stage two packet system** on prescribed forms from Firms/Companies/Joint Ventures meeting requisite experience and financial capacity for execution of the following work:

Tender No.	DFCCIL/NOIDA UNIT/ ELECTRICAL/SUBSTATION/ 2022/02
Name of Work	Supply, Erection, Testing and Commissioning of 33 kV Sub-stations, DG Set and related works for DFCCIL Integrated Office Cum Residential Complex at Sec-145, Noida.
Employer/Client/Owner	Dedicated Freight Corridor Corporation of India Ltd. (DFCCIL), a Govt. of India (<i>Ministry of Railways</i>) Enterprises through Chief General Manager/Noida, Sector 145, Noida-201310.
Type of Tender	Open E-Tender (<i>Single stage two packet system</i>)
Type of Contract	Works Contract
Total Estimated Cost	Rs. 18,27,43,008/- (Including GST@18%)
Completion Period of Contract	09 Months
Defect liability period	12 Months from the date of issue of completion certificate of the work by DFCCIL
Earnest Money Deposit	EMD of Rs. 30,00,000/- (Rupees Thirty Lakh Only) to be paid online through payment gateway provided at www.ireps.gov.in in the account of Dedicated Freight Corridor Corporation of India Ltd., New Delhi. <u>Note:</u> (i) Any firm recognized by Department of Industrial Policy

	<p>and Promotion (DIPP) as ‘Startups’ shall be exempted from payment of Earnest Money on submission of Registration Certificate issued by appropriate authority.</p> <p>(ii) 100% Govt. owned PSUs shall be exempt from payment of earnest money deposit.</p> <p>(iii) Labour Corporate Societies shall deposit only 50% of above earnest money deposit.</p>
Cost of Tender Document (Non-Refundable)	<p>Rs. 11,800/- (Rs. 10,000/-+GST @ 18%) (Rs. Eleven Thousand Eight Hundred only) to be paid online through payment gateway provided at www.ireps.gov.in in the account of Dedicated Freight Corridor Corporation of India Ltd., New Delhi.</p> <p>Note: “No exemption is admissible for cost of bid document and shall not be claimed by bidder on the E-Tender portal”.</p>
Validity of Offer	120 days
Security Deposit	5% of Contract value (as per clause 16. (1) of GCC).
Performance Bank Guarantee	Performance Guarantee (PG) has to be submitted within 21(Twenty-One) days from the date of issue of Letter of Acceptance (LOA), amounting to 3% of the contract value.
E-tendering website	<p>www.ireps.gov.in</p> <p>For any help, please refer User Manuals containing the detailed guidelines for E-Tendering available on www.ireps.gov.in > Learning Centre and on Helpdesk of IREPS: 011-23761525.</p>
Date & Time Schedule	
Date of uploading of NIT/ Tender document (Online)	On Date 23.02.2022
Pre-bid Meeting	01.03.2022 (Tuesday)
Last Date & Time of Submission of Tender	On or before 21.03.2022 and time upto 15:00 hrs
Last date & time of deposition of EMD & tender document cost	On or before 21.03.2022 and time upto 15:00 hrs to be paid online through payment gateway provided at www.ireps.gov.in .
Date & Time of Opening of Technical Bid (Online)	On date 21.03.2022
Date & Time of opening of Financial Bid (online)	To be communicated later to only those bidders who are found technically qualified after closure of Technical Evaluation.
Representative/Contact Person of DFCCIL/Noida Unit	<p>Shri J V Rao</p> <p>Assistant Project Manager-II/Electrical</p> <p>Dedicated Freight Corridor Corporation of India Ltd. (Noida Unit)</p> <p>Sector 145, Noida</p> <p>Mobile No: 9911144941</p> <p>E-MAIL ID: jvr Rao@dfcc.co.in</p>
Address for Pre-Bid meeting & opening of Tender	<p>Office of Chief General Manager/Noida Unit Dedicated Freight Corridor Corporation of India Ltd.</p> <p>Integrated Office Complex, Sector 145, NOIDA</p>

- 1.2.2 Eligibility shall be assessed of applicants, fulfilling the technical capability and competence as well as for financial and organizational resources as specified in **Clause no. 1.3.11** of Preamble and General Instruction to tenderers (*Part -I, Chapter-III of Tender Document*). The tenderers are also required to fulfil the special technical compliance as per **Clause 2.1** of Special Conditions of Contract (Electrical), Part-I, Chapter- V, Section-I of Tender Document.
- 1.2.3 Tender document can be viewed & obtained/downloaded from www.ireps.gov.in. The cost of the tender document is Rs. 11,800/- which is non-refundable payable towards the cost of one set of tender documents. The tender document shall have to be purchased in the name of Firms/Company/Joint Venture and can be downloaded from website www.ireps.gov.in. Tenderer are advised not to make any correction/addition/alteration in the downloaded tender documents.
- 1.2.4 DFCCIL may issue addendum(s) / corrigendum(s) to the tender documents. In such cases the addendum(s) / corrigendum(s) shall be issued and placed on www.ireps.gov.in only before bidding start date of tender. The tenderers who have purchased or downloaded the tender documents from the website before issue of addendum(s)/corrigendum(s) must visit the website and ensure that such addendum(s) / corrigendum (s) (if any) is also downloaded by them. Such addendum(s)/corrigendum (s) (if any) shall also be submitted/uploaded duly stamped and signed along with the submission of tender. Any tender submitted without addendum(s) / corrigendum(s) (*if any*) is **liable to be rejected**.
- 1.2.5 The tender documents shall be submitted in online mode only through website www.ireps.gov.in in two packets only viz Packet-A containing TECHNICAL BID and Packet B containing FINANACIAL BID.

Bidder shall submit the **Tender document cost & EMD** (*as mentioned in clause 1.3.4.1 & 1.3.4.2 of preamble & general instructions to tenderer, Part I, Chapter III of Tender Document*) on or before schedule date & time of submission of bid.

Financial Bid (*as specified in “Financial Bid” in Tender Document*) to be filled and submitted on E-Tender portal www.ireps.gov.in by following the steps available at E-Tender IREPS Portal.

Tender shall be submitted as per “General Instructions to Tenderers” forming as part of the complete tender documents.

- 1.2.6 To participate in the E-Tender, it is mandatory for the bidders to get themselves registered with the IREPS (www.ireps.gov.in) and to have user ID & password.

www.ireps.gov.in is the only website for submission of tender. 'User Manuals' containing the detailed guidelines for E-Tendering are available on www.ireps.gov.in > Learning Centre.

It is mandatory for all Tenderers to have Class-III Digital Signature Certified from any of the Licensed Certifying Agencies ('CA') to participate in E-Tendering of DFCCIL, (Tenderer can see the list of Licensed CAs from the link www.cca.gov.in in the name of the person who will submit the Online tender and is authorized to do so.

Tender shall be submitted through Online mode only at www.ireps.gov.in. Tender submitted by any other mode will not be accepted. All the required documents (legible) as mentioned in Check List have to be uploaded along with the offer on www.ireps.gov.in failing which, the bid may not be considered.

- 1.2.7 Tenders shall be opened at the address given below on scheduled date & time in the presence of the tenderers or their authorized representatives intending to attend the opening.

Office of Chief General Manager/DFCCIL/Noida Unit
Sector 145, Noida-201310, U.P.

All the Bids received shall be opened on the date and time mentioned above in the tender notice. Bid of the bidders shall be opened through process of e-tendering. The sequence of opening shall be:

- i) Earnest Money Deposit (*EMD*) and Tender Document Cost
- ii) Technical Bid.
- iii) Financial Bid (*at a later stage after scrutiny & finalization of acceptable Technical Bids*)

- 1.2.8 **Any tender received without Earnest money and cost of tender documents in the form as specified in the tender documents shall not be considered and shall be summarily rejected.**

- 1.2.9 DFCCIL reserves the right to cancel the tender before submission/opening of tender, postpone the tender submission / opening date and to accept / reject any or all tenders without assigning any reason thereof. DFCCIL's assessment of suitability as per eligibility criteria shall be final and binding.

- 1.2.10 Tenderers may note that they are liable to be disqualified at any time during tendering process in case, any of the information furnished by them is not found to be true.

EMD of such tenderers shall be forfeited & the decision of DFCCIL in this regard shall be final and binding.

- 1.2.11 DFCCIL reserves the right to pre-qualify the bidder(s) provisionally based on the documents submitted by them in technical bid. Financial bids of only those bidders would be opened, whose technical bids are found acceptable. In the event of any document being found false (*at a later stage*), the provisional qualification shall stand withdrawn, and the next lower bidder shall automatically come to the position of such disqualified bidder. Also, action against such disqualified tenderer shall be taken as per the provisions of the Tender.
- 1.2.12 Information as required as per various Forms of tender document should be submitted by the tenderers without fail strictly as per formats.
- 1.2.13 The validity of offer shall be **120 days** from the date of opening of the tender.
- 1.2.14 Transfer of the tender document purchased by intending tenderer to another tenderer is not admissible. Tenderer can submit tenders only on the documents purchased /downloaded from website: www.ireps.gov.in by them.
- 1.2.15 Tenderers must read all instructions regarding E-Tendering process on www.ireps.gov.in > Learning Centre > E-Tender(Works) > User Manual for Contractor and INSTRUCTION TO TENDERERS Part I, Chapter III of the Tender Document.
- 1.2.16 Tenderers are advised to regularly visit the E-Tender Portal (www.ireps.gov.in) for information regarding tender, corrigendum, addendum (if any) etc.
- 1.2.17 **Joint Venture are allowed in terms of Para 1.3.17 of Part-I, Chapter-III of the Tender Document.**
- 1.2.18 The rates quoted by the contract or are deemed to be inclusive of site clearance, setting out work, profile, setting lay out on ground, establishment of reference benchmark(s), installing various signage, taking spot levels, survey with total station, construction of all safety and protection devices, compulsory use of helmet and safety shoes, and other appropriate safety gadgets by workers, imparting continuous training for all the workers, barriers, preparatory works, construction of clean, hygienic and well ventilated workers housings in sufficient numbers working during monsoon or odd season, working beyond normal hours, working at all depths, height, lead, lift, levels and location etc. and any other unforeseen but essential incidental works required to complete this work. ***Nothing extra shall be payable*** on this account and ***no extension of time*** for completion of work shall be granted on these accounts.

In the Estimated Value of tender, GST @ 18% has been taken on the Basic Value. The Basic Value is inclusive of all taxes, duties and levies except GST. The %

(above/below/at par) rates quoted by the tenderer shall apply on the Basic Value. The GST as legally leviable and payable by the Bidder under the provisions of applicable law/act shall be paid extra by DFCCIL.

The Bidders should quote their rates after considering the Input Tax Credits on their input materials and services. Hence, Bidders should ensure that, full benefit of Input Tax Credit (ITC) likely to be availed by them is duly considered while quoting their rates.

- 1.2.19 Price Variation Clause (PVC) will be applicable for this work as per Clause 1.7 of Special Conditions of Contract (Electrical) (Part-I, Chapter-V, Section-1 of Tender Document).**
- 1.2.20 Mobilization and Secured Advance will not be applicable for this work.**

**Chief General Manager/Noida
For & on behalf of DFCCIL**

PART-I

CHAPTER-III

PREAMBLE & GENERAL INSTRUCTIONS TO TENDERERS

PART-I

Chapter- III

PREAMBLE & GENERAL INSTRUCTIONS TO TENDERERS

1.3.1 Introduction

(i) General

Ministry of Railways (MoR) established the Dedicated Freight Corridor Corporation of India Limited (DFCCIL), a Schedule “A” Public Sector Undertaking wholly owned by Ministry of Railways, Govt. of India to undertake planning & development, mobilization of financial resources, construction, maintenance and operation of the Dedicated Freight Corridor project. DFCCIL was incorporated as a company under the Companies Act 1956 on 30th October 2006.

This company is now actively engaged in the implementation of Computerized Multi Modal High Axle Load Dedicated Freight Corridor Project between Delhi-Mumbai under the Western DFC Corridor and Ludhiana-Delhi-Kolkata under the Eastern DFC Corridor.

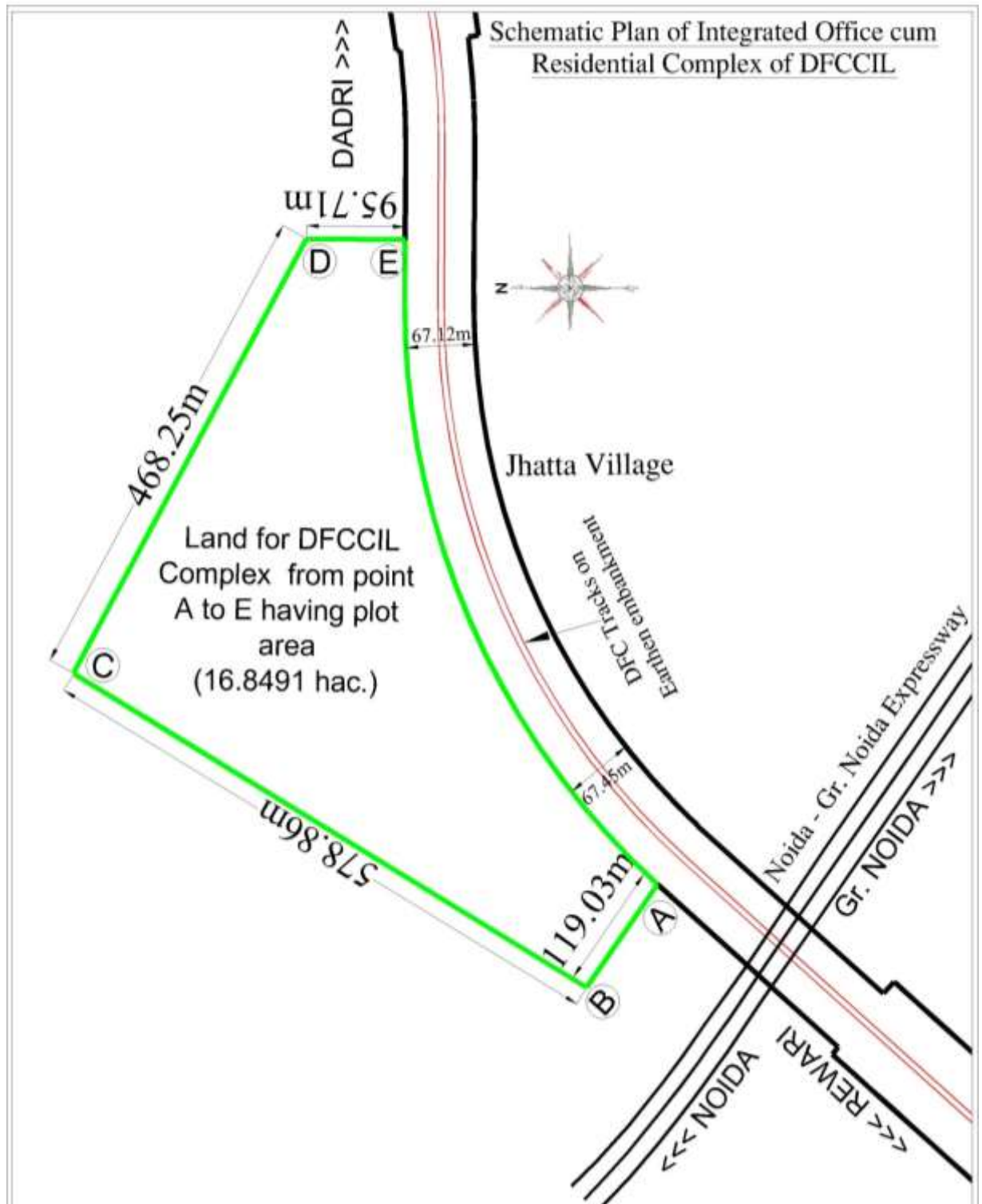
The DFC project will also restore the Indian Railway’s competitive strength in the freight transportation market and emerge as the *major low carbon and energy efficient transport system in the country*. It will drive the establishment of industrial corridors and logistic parks along its alignment and play a crucial role in supporting India’s growing economy.

(ii) Project Concept

The work of “Supply, Erection, Testing and Commissioning of 33 kV Sub-stations, DG Set and related works for DFCCIL Integrated Office Cum Residential Complex at Sec-145, Noida.” is the part of Project “DFCCIL Integrated Office Cum Residential Complex with Pre-Certified GRIHA 5 Star Rating” in the National Capital Region at Noida-Greater Noida Expressway in village Jhatta, Sector-145, Noida.

DFCCIL Management desire to build in phases a very vibrant and dynamic complex which should be self-contained and self- sustaining, with state of art physical, social and economic infrastructure. This complex *would be developed on Green Building Concept* and will be eco-friendly, energy efficient, modern and integrated with its inspiring existing landscapes.

(iii) **PROJECT LOCATION:**



(iv) PROJECT BACKGROUND & OVERVIEW:

1. DFCCIL is in possession of free hold land measuring 16.8491 hectares (approx. 40 Acres) at Noida-Greater Noida Expressway in village Jhatta, Noida. The schematic site plan is as shown above having exact location, adjacent features and boundaries of the land. DFCCIL is fully entitled to develop the said land. The land is almost flat and located in village Jhatta, G.B. Nagar (U.P).
2. On the western & southern side, the site is bounded by Noida-Greater Noida Expressway & Noida-Gr. Noida Metro Line and on the eastern site it is bounded by Hindon river, its bund & forest area. The DFCCIL site lies between two functional Metro Stations Sec145 & Sec-146 Noida of Noida-Greater Noida metro line.
3. The plot enjoys excellent linkages with other parts of Noida & Greater Noida and is approachable by Noida-Greater Noida Expressway and is approx. 16 km from Mahamaya Flyover in Noida.

(v) General Instructions (*for only E-Tendering system*):

Submission of Online Bids is mandatory for this Notice Inviting Tender. E-Tendering is a new methodology for conducting Public Procurement in a transparent and secured manner. Suppliers/Vendors will be the biggest beneficiaries of this new system of procurement. The E-Tendering portal of Indian Railways can be accessed on <http://www.ireps.gov.in> for participation in Dedicated Freight Corridor Corporation of India (DFCCIL) tenders.

A) ACCESSING/OBTAINING/PURCHASING PROCESS OF TENDER DOCUMENT:

- (i) It is mandatory for all the Tenderers to have class-III digital signature (in the name of person who will sign the Bid and will submit the online tender and is authorized to do so) certified from any of the licensed certifying agency (“CA”) to participate in E-Tendering of DFCCIL [*Tenderers can see the list of licensed CAs from the link www.cca.gov.in*].
- (ii) To participate in the E-Tender, it is mandatory for the Tenderers to get themselves registered with the IREPS (www.ireps.gov.in) and to have user ID & password. Instructions regarding registration are available on www.ireps.gov.in > Learning Centre > General > User Manual for registration of new Vendors and Contractors.
- (iii) www.ireps.gov.in is the only website for submission of online tender. Instructions regarding E-Tendering process are available on www.ireps.gov.in > Learning Centre > E-Tender(Works) > User Manual for Contractor.

- (iv) Tender shall be submitted through online mode only at www.ireps.gov.in. Tender submitted by any other mode will not be accepted.
- (v) All the required documents (legible) as mentioned in Check list S.No. 1 to 15 have to be uploaded along with the offer on www.ireps.gov.in, failing which, the bid may not be considered.
- (vi) The Addendum/Corrigendum, if any; shall be hosted on the website www.ireps.gov.in only.
- (vii) The supporting documents for Eligibility Criteria are essentially required to be uploaded on the website www.ireps.gov.in as bid shall be accepted through Online mode only.
- (viii) Tenderers are required to give Un-Conditional offers. A Conditional Offer is liable to be rejected. DFCCIL reserves the right to modify, expand, restrict, cancel, reject and re-float tender without assigning any reasons whatsoever.
- (ix) The Tenderers shall closely peruse all the clauses, instructions, terms and conditions, scope of work, specification etc. as indicated in the Tender Document before quoting the rates. If the tenderer has any doubt about the meaning of any portion of the Tender Document or find discrepancies/omissions in the tender document issued or required clarification, he shall at once contact the authority inviting the tender for clarification at least fifteen days before the due date of submission of the tender.
- (x) Bid document shall be accompanied by all the documents required to be submitted as specified in the Tender Document along with all Addendums and Corrigendum.
- (xi) All Bids shall be submitted in accordance with the instructions contained in the Tender Document (Bid Document). Non-Compliance of any of the instructions contained in the Tender Document is liable in Bid being rejected.
- (xii) After award of contract to the Successful Contractor, if it is observed that there is any discrepancy or ambiguity about any terms and conditions mentioned in the Tender Document, the interpretation of same given by DFCCIL shall be considered as final and binding.
- (xiii) Order of precedence of Documents: In tender/contract, in case of any difference, contradiction, discrepancy, with regard to conditions of tender/contract, specifications, drawings, bill of quantities etc., forming part of the tender/contract, the following shall be the order of precedence:
 - a. Letter of Acceptance (LOA)
 - b. Schedule of items, Rates & Quantities.
 - c. Special Conditions of Contract.
 - d. Technical Specifications as given in tender documents.

- e. Drawings, if any.
- f. General Conditions of Contract.
- g. Relevant BIS Codes.

For example, if any item is found common in Special Conditions of contract and General Conditions of Contract then the provision given in Special Conditions of Contract will prevail over General Conditions of Contract for the same item.

- (xiv) Contractor must fill up all the schedules and furnish all the required information on e-mode as per the instructions given in various sections of the Tender Document.
- (xv) Submission of a tender by a tenderer implies that he had read all the tender document including amendments/corrigendum if any, visited the site and made himself aware of the scope of the work to be done, local conditions and other factors having any bearing on the execution of the work.
- (xvi) DFCCIL reserves all rights to reject any tender including of those tenders who fail to comply with the instructions without assigning any reason whatsoever and does not bind itself to accept the lowest or any specific tender. The decision of DFCCIL in this regard shall be final and binding. Any failure on the part of the tenderer to observe the prescribed procedure and any attempt to canvass for the work will prejudice the tenderer's bid.
- (xvii) Tenderers may note that they are liable to be disqualified at any time during tendering process in case any of the information furnished by them is not found to be true. Earnest Money Deposit (EMD) of such tenderer shall be forfeited. The decision of the DFCCIL in this regard shall be final and binding.
- (xviii) Evaluation of tenders will be made on the basis of fulfilment of Eligibility Criteria mentioned in the Bid Document. However, DFCCIL reserves the right to seek any clarification from the contractor.

B) PREPARATION & SUBMISSION OF TENDER:

- a. ***Documents mentioned at S.No. 1 to 16*** of the Check list [*Technical Bid (Packet-A)*] should be scanned and uploaded during bid submission as per detailed instructions for submission of bid available on website ***www.ireps.gov.in***.
- b. ***Documents mentioned at S.No. 17 & 18*** of the Check list [*Technical Bid (Packet-A)*] should be uploaded during bid submission as per detailed instructions for submission of bid available on website [***www.ireps.gov.in***](http://www.ireps.gov.in).
- c. ***For Document No. 19*** of the Check list [*Financial Bid (Packet-B)*],

Financial Bid to be filled and submitted on www.ireps.gov.in by following the steps available on the website.

C) Modification/ Substitution/ Withdrawal of bids:

- (i) Once bid is submitted, the tenderer will not be allowed to withdraw the offer.
- (ii) The tenderer can however submit revised bid till closing time of tender. In case of revising the bid, the revised bid will supersede the earlier bid. Only the last bid submitted by the tenderer shall be considered for evaluation and earlier bids shall be ignored.

D) PRE-BID MEETING/ AMENDMENT IN TENDER:

Pre –Bid meeting is not scheduled for the tender. At any time before the submission of tender, DFCCIL may modify/amend the bid document and extend the last date of submission/opening of the tender by issuing a corrigendum/addendum as per IREPS guidelines.

Any Corrigendum/Addendum thus issued shall form part of tender document and shall be posted only on www.ireps.gov.in and the Bidders are thus advised to update their information by using said website www.ireps.gov.in. To give the Bidders reasonable time to take an amendment into account in their bids and on account of any other reasonable circumstances, DFCCIL may at its discretion, extend the deadline for the submission/opening of the tender.

E) OPENING AND EVALUATION OF BIDS:

- (i) Opening of Bids will be done through online process at www.ireps.gov.in.
- (ii) E-Tender shall be opened Online at the address given below at the time and date as specified in Part-1 (Notice Inviting Tender) in the presence of Tenderers or their authorized representatives, if they choose to attend the Online Tender Opening.

Address for Online Opening of Tender:

Dedicated Freight Corridor Corporation of India Ltd./Noida Unit,
Sector 145, Noida.

- (iii) For participating in the tender, the authorized signatory holding Power of Attorney shall be the Digital Signatory.
- (iv) The Authority shall Open Bid Documents received in electronic form online on the date and time as specified in the NIT.

- (v) The Authority will subsequently examine and evaluate the Technical Bids in accordance with the provisions set out in the BID DOCUMENTS.
- (vi) The Financial Bids will be opened only of the technically qualified Bidders *(after evaluation of Technical Bids)* & the date of opening of Financial Bids will be notified later on.

DISCLAIMER

The Bidder must read all the instructions in the BID DOCUMENTS and ensure to complete the tender submission process by due date and time as www.ireps.gov.in will not accept any online tender after tender closing date and time as specified in the NIT.

The agency may visit the site on any working day to assess the site conditions and scope of work before submitting their offer.

(vii) Scope of Work

Chief General Manager, Dedicated Freight Corridor Corporation of India Limited, Sector 145, Noida-201310 India, hereinafter referred to as 'DFCCIL' is inviting E-Tenders from Firms/ Companies/Joint Ventures having requisite experience and financial capacity for execution of the following work:-

“Supply, Erection, Testing and Commissioning of 33 kV Sub-stations, DG Set and Related Works for DFCCIL Integrated Office Cum Residential Complex at Sec-145, Noida”.

Two nos 33/0.4 KV Substations are included in the proposed work. The brief scope of work is given below:-

S.No.	Description of Work
1	Supply & Installation of 33 kV HT Panel with One VCB
2	Supply & Installation of 33 kV HT Panel with One Incomer and Three Outgoing VCBs
3	Supply & Installation of 33 kV/415 V Transformers
4	Supply & Installation of LT Panels
5	Supply & Installation of APFC Panel with Capacitors
6	Supply & Installation of Ornamental Street Light Poles(7M/9M) with LED Luminaries
7	Supply & Installation of High Mast with LED Luminaries
8	Supply & Laying of HT & LT Cables
9	Supply and installation of Diesel Generator Sets
10	Supply and installation of Diesel storage tank and pipeline
11	Building/Civil work of the two Sub-Stations, Meter Room & HSD Tank

Foundation

Some reference drawings for guidance have been enclosed with the tender document.

- (viii) **Cost of the work:** The estimated cost of the tendered work is 18,27,43,008/-
(Rupees Eighteen Crore Twenty Seven Lakh Forty Three Thousand Eight Only)
(Including GST @18%)
- (ix) The tenderer(s) shall be governed by General Conditions of Contract (GCC), Preamble and General Instructions to Tenderers (ITT) and Special Conditions of Contract (SCC). Wherever, there is a conflict in any condition between GCC and Special Conditions of Contract mentioned in the tender documents, the condition mentioned in Special Conditions of Contract will prevail. However, Engineer's decision in this connection shall be final and binding.

1.3.2 Form of Tender

The Tender bid shall have to be submitted in **Two Packet System through IREPS i.e. www.ireps.gov.in**.

"Packet-A"

Eligibility/Qualifying Element of the tender bid along with other requisite documents as mentioned in Technical bid (Packet-A) of Check List, Part-I, Chapter-I of the Tender Document.

"Packet-B"

Price Element of tender bid with percentage above/below/at par on the Schedule of Prices duly filled in as mentioned in Financial bid (Packet-B) of Check List, Part-I, Chapter-I of the Tender Document.

The technical bid (Packet-A) shall be opened on the date of tender opening and the detailed scrutiny of Technical bid shall be carried out. The "Financial Bid" (Packet-B) shall be opened only of those tenderers who qualify in "Technical Bid". The detailed procedure for tender opening and processing is defined in Para 1.3.5.

1.3.3 Tender Document

The tender document consists of following four parts:

PART/CHAPTERS	DESCRIPTION
PART – I	
Chapter I	Check list of documents to be uploaded/submitted in the E-Tender

Chapter II	Notice Inviting E-Tender
Chapter III	Preamble and General Instructions to Tenderers
Chapter IV	General Conditions of Contract
Chapter V	Special Conditions of Contract
PART – II	Technical Specifications
Chapter I	Technical Specifications for Substation
Chapter II	Technical Specifications for External Lighting
Chapter III	Technical Specification for DG Set, HSD Tank and Piping
Chapter-IV	Technical Specifications for Civil
Chapter V	Make List
PART – III	
Chapter I	Milestones and Time Schedule
Chapter II	Tender Forms
PART – IV	Drawings

1.3.4 Sale & Submission of Tender Document:

1.3.4.1 Cost of Tender document: -

Tender document is available on **www.ireps.gov.in** and the same can be downloaded and used as tender documents for submitting the offer. The cost of tender document as prescribed in the NIT shall be deposited online through payment gateway of **www.ireps.gov.in** by the tenderer.

1.3.4.2 Earnest Money Deposit: -

- (a) The tenderer shall be required to deposit earnest money with the tender for the due performance with the stipulation to keep the offer open till such date as specified in the tender, under the conditions of tender.
 - (i) Any firm recognized by Department of Industrial Policy and Promotion (DIPP) as ‘Startups’ shall be exempted from payment of earnest money deposit detailed above.
 - (ii) 100% Govt. owned PSUs shall be exempt from payment of earnest money deposit detailed above.
 - (iii) Labour Cooperative Societies shall deposit only 50% of above earnest money deposit detailed above.
- (b) The tenderer must deposit the amount of Earnest Money for the amount prescribed, online through the payment gateway on **www.ireps.gov.in** as mentioned in the NIT.
- (c) Tenderers received without Earnest Money in full in the manner prescribed above **shall be summarily rejected.**
- (d) The earnest money shall remain deposited with the DFCCIL for the period of validity of the offer prescribed in this tender i.e. 120 days from the date of

opening of tender. If the validity of the offer is extended, the validity of earnest money should also be extended failing which, the offer, after the expiry of the aforesaid period, may not be considered by DFCCIL.

- (e) It is understood that the tender documents have been sold/issued to the tenderer(s) and the tenderer(s) is/are permitted to tender in consideration of stipulation on his/their part, that after submitting his/their tender (subject to the period being extended further), he will not resale from his offer or modify the terms and conditions, thereof in a manner not acceptable to DFCCIL. Should the tenderer fail to observe or comply with the foregoing stipulation, the amount deposited as earnest money for the due performance of the above stipulation, shall be forfeited by DFCCIL.
- (f) The Earnest Money Deposit of the successful Tenderer, will be retained towards part of Security Deposit for the due and faithful fulfillment of the contract in terms of clause 16 of the General Conditions of the contract.
- (g) The earnest money of the unsuccessful tenderer(s) shall, save as herein before provided, be returned to the unsuccessful tenderer(s) within a reasonable time, but the DFCCIL shall not be responsible for any loss or depreciation that may happen thereto while in their possession, nor be liable to pay interest thereon.
- (h) DFCCIL reserves the rights of forfeiture of Earnest Money Deposit (EMD) in case of successful tenderers if: -
 - i. Does not execute the Contract Agreement within stipulated time: or
 - ii. Does not submit Performance Security in the form of Bank Guarantee of the requisite value within stipulated time: or
 - iii. Does not commence the work after receipt of Letter of Acceptance or date as specified in the Letter Acceptance.
 - iv. Withdraws the offer during the period of validity/extended validity.
 - v. When any of the information furnished by the tenderer not found true.
 - vi. If the work is terminated at any stage as per terms and conditions of the contract.
- (i) In case contractor submit Term Deposit Receipt/Bank Guarantee bond towards full Security Deposit, the DFCCIL shall return the earnest money so retained to the contractor.

1.3.4.3 Clause applicable for tender documents downloaded from Internet

Tenderer/s are free to download tender documents at their own cost, for the purpose of perusal as well as for using the same as tender document for submitting their offer. **Master copy of the tender document will be available in the office of Chief General Manager, Sector 145, Noida, U.P., India.**

After award of the work, an agreement will be drawn up. The agreement shall be prepared based on the master copy available in the office of Chief General Manager, Dedicated Freight Corridor Corporation of India Limited, Sector 145, Noida- 201310, U.P., India and not based on the tender documents submitted by the Tenderer. In case of any discrepancy between the tender documents downloaded from the internet and the master copy, later shall prevail and will be binding on the Tenderers. No claim on this account shall be entertained.

- 1.3.4.4** Complete tender documents must be submitted online duly completed in all respect on www.ireps.gov.in **upto date and time mentioned in NIT. The “Packet-A (TECHNICAL BID)”** will be opened at the time and date mentioned in NIT and read out in the presence of such tenderer(s) as is/are present. In case the intended date for opening of tenders is declared a holiday, the tenders will be opened on the next working day at the same time. Any modified date and time for submission of tenders shall be uploaded on www.ireps.gov.in. The detail procedure of tender opening will be as per para- 1.3.5.
- 1.3.4.5** The rates should be quoted in figures as well as in words. If there is variation between rates quoted in figures and in words, the rate quoted in ‘words’ shall be taken as correct. If more than one or improper rates are tendered for the same item, the tender is liable to be rejected. However guidelines given on www.ireps.gov.in shall prevail.
- 1.3.4.6** Each page of the tender papers is to be signed by the tenderers or such person/s on his/their behalf who is/are legally authorized to sign for him/them. However guidelines given on www.ireps.gov.in shall prevail.
- 1.3.4.7** Tenders containing erasures and/or alteration of the tender documents are liable to be rejected.
- 1.3.4.8 Care in Submission of Tenders–**
- (a) (i) Before submitting a tender, the tenderer will be deemed to have satisfied himself by actual inspection of the site and locality of the works, that all conditions liable to be encountered during the execution of the works are taken into account with that the rates he enters in the tender forms are adequate and all-inclusive to accord with the provisions in Clause 37 of the Standard General Conditions of Contract for the completion of works to the entire satisfaction of the Engineer/DFCCIL.
 - (a)(ii) Tenderers will examine the various provisions of the Central Goods and Services Tax Act, 2017(CGST)/Integrated Goods and Services Tax Act, 2017(IGST)/Union Territory Goods and Services Tax Act, 2017(UTGST)/respective state’s State Goods and Services Tax Act (SGST) also, as notified by Central/State Govt & as amended from time to time and applicable taxes before bidding. Tenders will ensure that full benefit of Input Tax (ITC) likely to be availed by them is duly considered while quoting rates.
 - (a)(iii) The successful tenderer who is liable to be registered under CGST/IGST/UTGST/SGST Act shall submit GSTIN along with other details required under

CGST/IGST/UTGST/SGST Act to Railway/DFCCIL immediately after the award of contract, without which no payment shall be released to the contractor. The contractor shall be responsible for deposition of applicable GST to the concerned authority.

- (a)(iv) In case, the successful tenderer is not liable to be registered under CGST/IGST/UTGST/SGST Act, the railway/DFCCIL shall deduct the applicable GST from his/their bills under reverse charge mechanism (RCM) and deposit the same to the concerned authority.
- (b) When work is tendered for by a firm or company the tender shall be signed by the individual legally authorized to enter into commitments on their behalf.
- (c) The Railway/DFCCIL will not be bound by any power of attorney granted by the tenderer or by changes in the composition of the firm made subsequent to the execution of the contract. It may however, recognize such power of attorney and changes after obtaining proper legal advice, the cost of which will be chargeable to the contractor.

1.3.5 Opening of Tender: Two packet system of tendering shall be adopted in this tender

- (a) Tender will be opened at the scheduled date and time mentioned in NIT, in the office of Chief General Manager/Noida, **Dedicated Freight Corridor Corporation of India Limited, Sector 145, Noida-201310, U.P, India** in the presence of the tenderers or their representatives as may be present at the prescribed date and time.
- (b) After the opening of “**TECHNICAL BID**” (**Packet-A**) of all the eligible tenderers, these bids shall be scrutinized and analysed. DFCCIL reserve the right to seek clarifications on the submitted documents from the tenderers. The names of the tenderers whose bid are considered complete and meet eligibility criteria shall be shortlisted.
- (c) The **FINANCIAL BID (Packet-B)** shall be opened on a subsequent date and time duly notified well in advance. The Financial bids of only those tenderers shall be opened who are shortlisted after scrutiny of their Technical bid. The Financial bid of the tenderers who do not qualify during scrutiny of Technical bid shall not be opened. The time and date of opening of Financial Bid shall be advised to qualified tenderers well in advance on www.ireps.gov.in only.

1.3.6 Validity of Tender: -

Tenderer shall keep his offer open for a minimum period of **120 days** from the date of opening of the tender or as mentioned in the Tender Notice.

1.3.7 Execution of Contract Agreement: -

The Tenderer whose tender is accepted shall be required to appear in person at the office of **Chief General Manager, Dedicated Freight Corridor Corporation of India Limited, Sector-145, Noida-201310**, as the case may be, or if tenderer is a firm or corporation, a duly authorized representative shall appear and execute the contract agreement within 07 days of notice from DFCCIL that the contract agreement

is ready. The Contract Agreement shall be entered into by DFCCIL only after submission of valid Performance Guarantee by the Contractor. Failure to do so shall constitute a breach of the agreement affected by the acceptance of the tender. In such cases, the DFCCIL may determine that such tenderer has abandoned the contract and there upon his tender and acceptance thereof shall be treated as cancelled and the DFCCIL shall be entitled to forfeit the full amount of the earnest money and other dues payable to the Contractor under this contract. The failed Contractor shall be debarred from participating in the re-tender for that work.

1.3.8 Security Deposit on Acceptance of Tender:

The security deposit/rate of recovery/mode of recovery on acceptance of tender shall be as per the Para 16. (1) to 16. (3) of General Conditions of Contract (GCC).

1.3.9 Tenderer's Address

The tenderer should state in the tender his postal/electronic e-mail address(s) legibly and clearly. Any communication sent in time, to the tenderer by post at his said address shall be deemed to have reached the tenderer duly and in time. Important documents should be sent by registered post.

1.3.10 Right of DFCCIL to Deal with Tenders

- (a) The DFCCIL reserves the right of not to invite tenders for any of DFCCIL work or works or to invite open or limited tenders and when tenders are called to accept a tender in whole or in part or to reject any tender or all tenders without assigning reasons for any such action.
- (b) The authority for the acceptance of the tender will rest with the DFCCIL. It shall not be obligatory on the said authority to accept the lowest tender or any other tender and no tenderer(s) shall demand any explanation for the cause of rejection of his/their tender nor the DFCCIL undertake to assign reasons for declining to consider or reject any particular tender or tenders.
- (c) If the tenderer(s) deliberately gives / give wrong information in his / their tender or creates / create circumstances for the acceptance of his / their tender, the Railway reserves the right to reject such tender at any stage.
- (d) If the tenderer(s) expire(s) after the submission of his / their tender or after the acceptance of his /their offer, the Railway shall deem such tender cancelled. If a partner of a firm expires after the submission of their tender or after the acceptance of their tender, the Railway shall deem such tender as cancelled, unless the firm retains its character.
- (e) *Provisions of Make in India Policy 2017 issued by Govt. of India, as amended from time to time, shall be followed for consideration of tenders.*

1.3.11 Eligibility Criteria

1.3.11.1 Technical Eligibility Criteria

The tenderer must have successfully completed any of the following during last 07 (seven) years, ending last day of month previous to the one in which tender is invited:

Three similar works each costing not less than the amount equal to 30% of advertised value of tender, or

Two similar works each costing not less than the amount equal to 40% of advertised value of tender, or

One similar work costing not less than the amount equal to 60% of advertised value of tender.

Similar Work:

Work of Supply, Installation, Testing and Commissioning of 33 KV or above Sub-Station shall be considered as Similar Work for the tendered work. **Upgradation/ Augmentation of existing Sub Station shall not be considered as Similar Work.**

Note for Item 1.3.11.1:

1. Work experience certificate from private individual shall not be considered. However, in addition to work experience certificates issued by any Govt. Organisation, work experience certificate issued by Public listed company having average annual turnover of Rs 500 crore and above in last 3 financial years excluding the current financial year, listed on National Stock Exchange or Bombay Stock Exchange, incorporated/registered at least 5 years prior to the date of opening of tender, shall also be considered provided the work experience certificate has been issued by a person authorized by the Public listed company to issue such certificates.

In case tenderer submits works, experience certificate issued by Public listed company, the tenderer shall also submit along with work experience certificate, the relevant copy of work order, bill of quantities, bill wise details of payment received duly certified by Chartered Accountant, TDS certificates for all payments received and copy of final/last bill paid by company in support of above work experience certificate.

2. Value of complete work done by a member in an earlier JV Firm shall be reckoned only to the extent of the concerned member's share in that JV firm for the purpose of satisfying his or her compliance to the above-mentioned technical eligibility criteria in the tender under consideration.
3. In case the tenderer (s) is a partnership firm, the work experience shall be in the name of partnership firm only.

1.3.11.2 Financial Eligibility Criteria

The tenderer must have received contractual payments in the previous three financial years and the current financial year upto the date of inviting of tender, at least 150% of the advertised value of the Tender. The tenderers shall submit Certificates to this effect which may be an attested certificate from the concerned department/client or Audited Balance Sheet duly certified by the Chartered Accountant/Certificate from Chartered Accountant duly supported by Audited Balance sheets.

Note for Item 1.3.11.2:

1. Contractual payments received by a Member in an earlier JV firm shall be reckoned only to extent to the concerned member's share in that JV Firm for the purpose of satisfying compliance of the above-mentioned financial eligibility criteria in tender under considerations.
2. In case the tenderer/s is a partnership firm, the turnover etc shall be in the name of partnership firm only.
3. Client certificate from other than Govt. Organization should be duly supported by Form 16A/26AS generated through TRACES of Income Tax Department of India.

1.3.11.3 Credentials if submitted in foreign currency shall be converted into Indian currency i.e., Indian Rupee as under:

The conversion rate of US Dollars into Rupees shall be the daily representative exchange rates published by the Reserve Bank of India for the relevant date. Where, relevant date shall be as on the last day of month previous to the one in which tender is invited. In case of any other currency, the same shall first be converted to US Dollars as on the last day of month previous to the one in which tender is invited, and the amount so derived in US Dollars shall be converted into Rupees at the aforesaid rate. The conversion rate of such currencies shall be the daily representative exchange rates published by the International Monetary Fund for the relevant date.

1.3.11.4 Explanation for clause 1.3.11 including clause 1.3.11.1 to 1.3.11.3 - Eligibility Criteria:

1. In case a work is started prior to 07 (seven) years, ending last day of month previous to the one in which tender is invited, but completed in last 07 (seven) years, ending last day of month previous to the one in which tender is invited, the completed work shall be considered for fulfillment of credentials.
2. If a work is physically completed and completion certificate to this extent is issued by the concerned organization but final bill is pending, such work shall be considered for fulfillment of credentials.

3. If a part or a component of work is completed but the overall scope of contract is not completed, this work shall not be considered for fulfillment of technical credentials even if the cost of part completed work/component is more than required for fulfillment of credentials.
4. **In case a work is considered similar in nature for fulfillment of technical credentials, the overall cost of that work including PVC amount if any shall be considered and no separate evaluation for each component of that work shall be made to decide eligibility.**
5. The value of final bill including PVC amount-if paid, or otherwise in case final bill is pending the contract cost in last approved variation statement plus PVC amount paid or cumulative amount paid up to last on-account bill including PVC amount and statutory deductions whichever is less, shall be considered as the completion cost of work.
6. In case of newly formed partnership firm, the credentials of individual partners from previous propriety firm(s) or dissolved previous partnership firm(s) or split previous partnership firm(s), shall be considered only to the extent of their share in previous entity on the date of dissolution / split and their share in newly formed partnership firm. For example, a partner A had 30% share in previous entity and his share in present partnership firm is 20%. In the present tender under consideration, the credentials of partner A will be considered to the extent of $0.3 \times 0.2 \times \text{value of the work done in the previous entity}$. For this purpose, the tenderer shall submit along with his bid all the relevant documents which include copy of previous partnership deed(s), dissolution deed(s) and proof of surrender of PAN No.(s) in case of dissolution of partnership firm(s) etc.
7. In case of existing partnership firm, if any one or more partners quit the partnership firm, the credentials of remaining partnership firm shall be re-worked out i.e., the quitting partner(s) shall take away his credentials to the extent of his share on the date of quitting the partnership firm (e.g. in a partnership firm of partners A, B & C having share 30%, 30% & 40% respectively and credentials of Rs 10 crore; in case partner C quits the firm, the credentials of this partnership firm shall remain as Rs 6 crore). For this purpose, the tenderer shall submit along with his bid all the relevant documents which include copy of previous partnership deed(s), dissolution deed(s) and proof of surrender of PAN No.(s) in case of dissolution of partnership firm(s) etc.
8. In case of existing partnership firm if any other partner(s) joins the firm, the credentials of partnership firm shall get enhanced to the extent of credentials of newly added partner(s) on the same principles as mentioned in item 6 above. For this purpose, the tenderer shall submit along with his bid all the relevant documents which include copy of previous partnership deeds, dissolution/splitting deeds and proof of surrender of PAN No.(s) in case of dissolution of partnership firm etc.
9. Any partner in a partnership firm cannot use or claim his credentials in any other firm without leaving the partnership firm i.e., In a partnership firm of A&B partners, A or B partner cannot use credentials of partnership firm of A&B partners in any other partnership firm or propriety firm without leaving partnership firm of A&B partners.
10. In case a partner in a partnership firm is replaced due to succession as per succession law, the proportion of credentials of the previous partner will be passed on to the successor.
11. If the percentage share among partners of a partnership firm is changed, but the partners remain the same, the credentials of the firm before such modification in the share will

continue to be considered for the firm as it is without any change in their value. Further, in case a partner of partnership firm retires without taking away any credentials from the firm, the credentials of partnership firm shall remain the same as it is without any change in their value.

12. In a partnership firm “AB” of A&B partners, in case A also works as propriety firm “P” or partner in some other partnership firm “AX”, credentials of A in propriety firm “P” or in other partnership firm “AX” earned after the date of becoming a partner of the firm AB shall not be added in partnership firm AB.
13. In case a tenderer is LLP, the credentials of tenderer shall be worked out on above lines similar to a partnership firm.
14. In case company A is merged with company B, then company B would get the credentials of company A also.

1.3.11.5 Credentials of Tenderer:

The tenderer shall provide satisfactory evidence in support of their technical and financial eligibility, which are acceptable to DFCCIL, alongwith the tenderer:

- (a) For **Technical eligibility criteria**, the details will be submitted in **Form No.2A/2AA** along with supporting documents.
- (b) For **Financial eligibility criteria**, the details will be submitted in “**Form No.2B**” alongwith supporting documents.
- (d) The tenderer shall submit the completion certificates/certified completion certificates from the client(s) or Photostat of original certificates of client. These certificates should indicate the details of works carried out and successful commissioning of similar type of work executed by the tenderer. ***Completion certificate from Govt. organisation/Semi Govt. organizations/PSUs/Public Listed Company will only be accepted. The certificate from Private individual/Private Company for whom such works are executed shall not be accepted.*** In case, the work is executed for Public Listed Company, copy of work order, bill of Quantity, Billwise details of payment received duly certified by Chartered Accountant, TDS certificates for all payments received and copy of final/last bill paid by Company in support of above work experience certificate shall be submitted.
- (e) Tenderer shall submit a statement of contractual payments received during last three financial years and current financial year on the prescribed Performa as per “**Form No. 2B**”. The details shall be based on the form 16-A issued by the employer i.e. the certificate of deduction of tax at source as per Income Tax Act, 1961 and Form-26AS issued by Income Tax Department. The photocopies of Form 16-A/Form-26AS shall be closed or a certificate from auditor or audited balance sheet certified by Chartered Accountant clearly indicating the contractual amount received. DFCCIL may invite the Tenderer for offline/online verification of Form-16A & Form-26AS.

- (f) The tenderers shall submit a copy of certificate stating that they are not liable to be disqualified and all their statements/documents submitted alongwith bid are true and factual. Standard format of the certificate to be submitted by the bidder is enclosed as “**Form-1B**”. Non submission of “**Form-1B**” by the bidder shall result in **summarily** rejection of his/their bid. It shall be mandatorily incumbent upon the tenderer to identify, state and submit the supporting documents by which they/he are/is qualifying the Qualifying Criteria mentioned in the Tender Document.
- (g) The Railway/DFCCIL reserves the right to verify all statements, information and documents submitted by the bidder in his tender offer, and the bidder shall, when so required by the Railway/DFCCIL, make available all such information, evidence and documents as may be necessary for such verification. Any such verification or lack of such verification, by the Railway/DFCCIL shall not relieve the bidder of its obligations or liabilities hereunder nor will it affect any rights of the Railway/DFCCIL thereunder.
- (h) (i) In case of any information submitted by tenderer is found to be false forged or incorrect at any time during process for evaluation of tenders, it shall lead to forfeiture of the tender Earnest Money Deposit besides banning of business for a period of upto five years.
- (ii) In case of any information submitted by tenderer is found to be false forged or incorrect after the award of contract, the contract shall be terminated. Earnest Money Deposit (EMD), Performance Guarantee and Security Deposit available with the railway shall be forfeited. In addition, other dues of the contractor, if any, under this contract shall be forfeited and agency shall be banned for doing business for a period of upto five years.
- (i) The tenderer shall be considered disqualified/ineligible if:
 - (a) The Tenderer or any of its partners and/or subcontractors included in the tender has been banned for business with Ministry of Railways/DFCCIL along with any of its attached and subordinate offices through an order issued by Ministry of Railways as per list available on Web site (<http://www.indianrailways.gov.in/railwayboard>) of Railway Board pertaining to banning of Business, with the banning being valid as on the date of submission of the Tender.
 - (b) The Tenderer or any of its partners has suffered bankruptcy/insolvency or it is in the process of winding-up or there is a case of insolvency pending before any Court on the deadline of submission of application.

1.3.12 Non-compliance with any of the conditions set forth therein above is liable to result in the tender being rejected.

1.3.13 Execution of Contract Documents:

The successful Tenderer(s) shall be required to execute an agreement with the DFCCIL for carrying out the work according to Standard General Conditions of Contract, Special Conditions/Specifications annexed to the tender and Standard Specifications (Works and Materials) of CPWD/DFCCIL as amended/corrected upto latest correction slips, mentioned in tender form.

1.3.14 Documents to be submitted alongwith Tender (Constitution of the Firm, Partnership Deeds, Power of Attorney etc): -

(i) The tenderer shall clearly specify whether the tender is submitted on his own (Proprietary Firm) or on behalf of a Partnership Firm / Company / Joint Venture (JV) / Registered Society / Registered Trust/ HUF etc. The tenderer(s) shall enclose the attested copies of the constitution of their concern, and copy of PAN Card along with their tender. Tender Documents in such cases are to be signed by such persons as may be legally competent to sign them on behalf of the firm, company, association, trust or society, as the case may be.

(ii) Following documents shall be submitted by the tenderer:

(a) Sole Proprietorship Firm:

(i) An undertaking that he is not blacklisted or debarred by Railways/DFCCIL or any other Ministry/ Department of Govt. of India from participation in tender on the date of opening of bids, either in individual capacity or as a member of the partnership firm or JV in which he was/ is a partner/member. Concealment / wrong information in regard to above shall make the contract liable for determination under Clause 62 of the General Conditions of Contract.

(ii) All other documents in terms of explanatory notes in clause 1.3.11.1 to 1.3.11.5 above.

(b) HUF:

(i) A copy of notarized affidavit on Stamp Paper declaring that he who is submitting the tender on behalf of HUF is in the position of 'Karta' of Hindu Undivided Family (HUF) and he has the authority, power and consent given by other members to act on behalf of HUF.

(ii) An undertaking that the HUF is not blacklisted or debarred by Railways/DFCCIL or any other Ministry / Department of Govt. of India from participation in tender on the date of opening of bids, either in individual capacity or as a member of the partnership firm or JV in which HUF was/ is a partner/member. Concealment / wrong information in regard to above shall make the contract liable for determination under Clause 62 of the General Conditions of Contract.

(iii) All other documents in terms of explanatory notes in clause 1.3.11.1 to 1.3.11.5 above.

(c) Partnership Firm:

- (i) The tenderer shall submit documents as mentioned in Clause 1.3.18 of the Part-I, Chapter-III of the Tender Document.

(d) Joint Venture (JV): The tenderer shall submit documents as mentioned in Clause 1.3.17 of the Part-I, Chapter-III of the Tender Document.

(e) Company registered under Companies Act 2013:

- (i) The copies of MOA (Memorandum of Association) / AOA (Articles of Association) of the company
- (ii) A copy of Certificate of Incorporation
- (iii) A copy of Authorization/Power of Attorney issued by the Company (backed by the resolution of Board of Directors) in favour of the individual to sign the tender on behalf of the company and create liability against the company.
- (iv) An undertaking that the Company is not blacklisted or debarred by Railways/DFCCIL or any other Ministry / Department of Govt. of India from participation in tender on the date of opening of bids, either in individual capacity or as a member of the partnership firm or JV in which the Company was / is a partner/member. Concealment / wrong information in regard to above shall make the contract liable for determination under Clause 62 of the General Conditions of Contract.
- (v) All other documents in terms of explanatory notes in clause 1.3.11.1 to 1.3.11.5 above.

(f) LLP (Limited Liability Partnership): If the tender is submitted on behalf of a LLP registered under LLP Act-2008, the tenderer shall submit along with the tender:

- (i) A copy of LLP Agreement
- (ii) A copy of Certificate of Incorporation
- (iii) A copy of Power of Attorney/Authorization issued by the LLP in favour of the individual to sign the tender on behalf of the LLP and create liability against the LLP.
- (iv) An undertaking that the LLP is not blacklisted or debarred by Railways or any other Ministry / Department of Govt. of India from participation in tender on the date of opening of bids, either in individual capacity or as a member of JV in which the LLP was / is a member. Concealment / wrong information in regard to above shall make the contract liable for determination under Clause 62 of the General Conditions of Contract.
- (v) All other documents in terms of explanatory notes in clause 1.3.11.1 to 1.3.11.5 above.

(g) Registered Society & Registered Trust: The tenderer shall submit:

- (i) A copy of the Certificate of Registration
- (ii) A copy of Deed of Formation
- (iii) A copy of Power of Attorney in favour of the individual to sign the tender documents and create liability against the Society/Trust.
- (iv) All other documents in terms of explanatory notes in clause 1.3.11.1 to 1.3.11.5 above.
- (v) If it is NOT mentioned in the submitted tender that tender is being submitted on behalf of a Sole Proprietorship firm/ Partnership firm/ Joint Venture/ Registered

Company etc., then the tender shall be treated as having been submitted by the individual who has signed the tender.

(vi) After opening of the tender, any document pertaining to the constitution of Sole Proprietorship Firm / Partnership Firm/ Registered Company/ Registered Trust / Registered Society / HUF etc. shall be neither asked nor considered, if submitted. Further, no suo moto cognizance of any document available in public domain (i.e., on internet etc.) or in Railway's/DFCCIL's record/office files etc. will be taken for consideration of the tender, if no such mention is available in tender offer submitted.

(vii) A tender from JV/ Partnership firm etc. shall be considered only where permissible as per the tender conditions.

(viii) The Railway/DFCCIL will not be bound by any change in the composition of the firm made subsequent to the submission of tender. Railway/DFCCIL may, however, recognize such power of attorney and changes after obtaining proper legal advice, the cost of which will be chargeable to the Contractor.

1.3.15 The tenderer whether sole proprietor/ a company or a partnership firm /joint venture (JV)/registered society/ registered trust/HUF etc if they want to act through agent or individual partner(s), should submit along with the tender, a copy of power of attorney duly stamped and authenticated by a Notary Public or by Magistrate in favour of the specific person whether he/they be partner(s) of the firm or any other person specifically authorizing him/them to submit the tender, sign the agreement, receive money, co-ordinate measurements through contractor's authorized engineer, witness measurements, sign measurement books, compromise, settle, relinquish any claim(s) preferred by the firm and sign "No Claim Certificate" and refer all or any disputes to arbitration. The above power of attorney shall be submitted even if such specific person is authorized for above purposes through partnership deed/ Memorandum of Understanding/ Article of Association or such other document, failing which tender is liable to be rejected.

1.3.16 Employment/Partnership etc. of Retired Railway Employees:

(a) Should a tenderer

i) be a retired Engineer of the gazetted rank or any other gazetted officer working before his retirement, whether in the executive or administrative capacity or whether holding a pensionable post or not, in the Engineering or any other department of any of the railways/DFCCIL owned and administered by the President of India for the time being, OR

ii) being partnership firm / joint venture (JV) / registered society / registered trust etc have as one of its partners a retired Engineer of the gazetted rank or any other gazetted officer working before his retirement, OR

iii) being an incorporated company have any such retired Engineer of the gazetted rank or any other gazetted officer working before his retirement as one of its directors

AND

in case where such Engineer or officer had not retired from government service at least 1 year prior to the date of submission of the tender

THEN

the tenderer will give full information as to the date of retirement of such Engineer or gazetted officer from the said service and as to whether permission for taking such contract, or if the Contractor be a partnership firm or an incorporated company, to become a partner or director as the case may be, has been obtained by the tenderer or the Engineer or officer, as the case may be from the President of India or any officer, duly authorized by him in this behalf, shall be clearly stated in writing at the time of submitting the tender.

- b) In case, upon successful award of contract, should a tenderer depute for execution of the works under or to deal matters related with this contract, any retired Engineer of gazette rank or retired gazetted officer working before his retirement in the Engineering or any other department of any of the railways/DFCCIL owned and administered by the President of India for the time being, and now in his employment, then the tenderer will ensure that retired Engineer or retired gazetted officer had retired from government service at least 1 year prior to the date of his employment with tenderer and in case he had retired from service within a year then he possesses the requisite permission from the President of India or any officer, duly authorized by him in this behalf, to get associated with the tenderer.
- c) Should a tenderer or Contractor being an individual, have member(s) of his family or in the case of partnership firm/ company / joint venture (JV) / registered society / registered trust etc. one or more of his partner(s)/shareholder(s) or member(s) of the family of partner(s)/shareholder(s) having share of more than 1% in the tendering entity employed in gazetted capacity in the Engineering or any other department of the railway/DFCCIL, then the tenderer at the time of submission of tender, will inform the authority inviting tenders the details of such persons.

Note: - If information as required as per 1.3.16 (a), (b), (c) above has not been furnished, contract is liable to be dealt in accordance with provision of clause 62 of Standard General Condition of contract.

1.3.17 JOINT VENTURE (JV) IN WORKS TENDERS

Participation of Joint Venture (JV) in Works Tender: This Clause shall be applicable for works tenders wherein tender documents provide for the same.

1.3.17.1 Separate identity/name shall be given to the Joint Venture.

1.3.17.2 Number of members in a JV shall not be more than three, if the work involves only one department (say Civil or S&T or Electrical or Mechanical) and shall not be more than five, if the work involves more than one Department. One of the members of the JV shall be its Lead Member who shall have a majority (at least 51%) share of interest in

the JV. The other members shall have a share of not less than 20% each in case of JV with upto three members and not less than 10% each in case of JV with more than three members. In case of JV with foreign member(s), the Lead Member has to be an Indian firm/company with a minimum share of 51%.

1.3.17.3 A member of JV shall not be permitted to participate either in individual capacity or as a member of another JV in the same tender.

1.3.17.4 The tender form shall be purchased and submitted only in the name of the JV and not in the name of any constituent member. The tender form can however be submitted by JV or any of its constituent member or any person authorized by JV through Power of Attorney to submit tender.

1.3.17.5 Earnest Money Deposit (EMD) shall be deposited by JV or authorized person of JV through e-payment gateway or as mentioned in tender document.

1.3.17.6 A copy of Memorandum of Understanding (MoU) duly executed by the JV members on a stamp paper, shall be submitted by the JV along with the tender. The complete details of the members of the JV, their share and responsibility in the JV etc. particularly with reference to financial, technical and other obligations shall be furnished in the MoU. (The MoU format for this purpose is enclosed along with the tender).

1.3.17.7 Once the tender is submitted, the MoU shall not be modified / altered / terminated during the validity of the tender. In case the tenderer fails to observe/comply with this stipulation, the full Earnest Money Deposit (EMD) shall be liable to be forfeited.

1.3.17.8 Approval for change of constitution of JV shall be at the sole discretion of the Railway/DFCCIL. The constitution of the JV shall not be allowed to be modified after submission of the tender bid by the JV, except when modification becomes inevitable due to succession laws etc., provided further that there is no change in qualification of minimum eligibility criteria by JV after change of composition. However, the Lead Member shall continue to be the Lead Member of the JV. Failure to observe this requirement would render the offer invalid.

1.3.17.9 Similarly, after the contract is awarded, the constitution of JV shall not be allowed to be altered during the currency of contract except when modification become inevitable due to succession laws etc. and minimum eligibility criteria should not get vitiated. Failure to observe this stipulation shall be deemed to be breach of contract with all consequential penal action as per contract conditions.

1.3.17.10 On award of contract to a JV, a single Performance Guarantee shall be submitted by the JV as per tender conditions. All the Guarantees like Performance Guarantee, Bank Guarantee for Mobilization Advance, Machinery Advance etc. shall be accepted only in the name of the JV and no splitting of guarantees amongst the members of the JV shall be permitted.

1.3.17.11 On issue of LOA (Letter of Acceptance), the JV entity to whom the work has been

awarded, with the same shareholding pattern as was declared in the MOU/JV Agreement submitted along with the tender, shall be got registered before the Registrar of the Companies under 'The Companies Act -2013' (in case of Company) or before the Registrar/Sub-Registrar under the 'The Indian Partnership Act, 1932' (in case of Partnership Firm) or under 'The LLP Act 2008' (in case of LLP). A separate PAN shall be obtained for this entity. The documents pertaining to this entity including its PAN shall be furnished to the Railways/DFCCIL before signing the contract agreement for the work. In case the tenderer fails to observe/comply with this stipulation within 60 days of issue of LOA, contract is liable to be terminated. In case contract is terminated Railway/DFCCIL shall be entitled to forfeit the full amount of the Earnest Money Deposit and other dues payable to the Contractor under this contract. The entity so registered, in the registered documents, shall have, inter-alia, following Clauses:

- 1.3.17.11.1 Joint And Several Liability** - Members of the entity to which the contract is awarded, shall be jointly and severally liable to the Railway/DFCCIL for execution of the project in accordance with General and Special Conditions of Contract. The members of the entity shall also be liable jointly and severally for the loss, damages caused to the Railways/DFCCIL during the course of execution of the contract or due to non-execution of the contract or part thereof.
- 1.3.17.11.2 Duration of the Registered Entity** - It shall be valid during the entire currency of the contract including the period of extension, if any and the maintenance period after the work is completed.
- 1.3.17.11.3 Governing Laws** - The Registered Entity shall in all respect be governed by and interpreted in accordance with Indian Laws.
- 1.3.17.12 Authorized Member** - Joint Venture members in the JV MoU shall authorize one of the members on behalf of the Joint Venture to deal with the tender, sign the agreement or enter into contract in respect of the said tender, to receive payment, to witness joint measurement of work done, to sign measurement books and similar such action in respect of the said tender/contract. All notices/correspondences with respect to the contract would be sent only to this authorized member of the JV.
- 1.3.17.13** No member of the Joint Venture shall have the right to assign or transfer the interest right or liability in the contract without the written consent of the other members and that of the Railway/DFCCIL in respect of the said tender/contract.
- 1.3.17.14** Documents to be enclosed by the JV along with the tender:
 - 1.3.17.14.1** In case one or more of the members of the JV is/are partnership firm(s), following documents shall be submitted:
 - (i) A notarized copy of the Partnership Deed,
 - (ii) A copy of consent of all the partners or individual authorized by partnership firm, to enter into the Joint Venture Agreement on a stamp paper,

- (iii) A notarized or registered copy of Power of Attorney in favour of the individual to sign the MOU/JV Agreement on behalf of the partnership firm and create liability against the firm.

1.3.17.14.2 In case one or more members is/are HUF, the following documents shall be enclosed:

- (i) A copy of notarized affidavit on Stamp Paper declaring that he who is signing the affidavit on behalf of HUF is in the position of 'Karta' of Hindu Undivided Family (HUF) and he has the authority, power and consent given by other members to act on behalf of HUF.

1.3.17.14.3 In case one or more members of the JV is/are companies, the following documents shall be submitted:

- (i) A copy of resolutions of the Directors of the Company, permitting the company to enter into a JV agreement,
- (ii) The copies of MOA (Memorandum of Association) / AOA (Articles of Association) of the company
- (iii) A copy of Certificate of Incorporation
- (iv) A copy of Authorization/copy of Power of Attorney issued by the Company (backed by the resolution of Board of Directors) in favour of the individual to sign the tender, sign MOU/JV Agreement on behalf of the company and create liability against the company

1.3.17.14.4 All the Members of JV shall certify that they are not blacklisted or debarred by Railways/DFCCIL or any other Ministry/Department of the Govt. of India from participation in tenders/contract on the date of opening of bids either in their individual capacity or as a member of the JV in which they were/are members.

1.3.17.14.5 All other documents in terms of explanatory notes in clause 1.3.11.1 to 1.3.11.5 above.

1.3.17.15 Credentials & Qualifying Criteria: Technical, financial eligibility and Bid capacity of the JV shall be adjudged based on satisfactory fulfillment of the following criteria:

1.3.17.15.1 Technical Eligibility Criteria:

The technical eligibility for the work as per para 1.3.11.1 above, shall be satisfied by either the 'JV in its own name & style' or 'any member of JV having min 26% share'. Each other member of JV shall have technical capacity of minimum 10% of the cost of work i.e., each JV member must have satisfactorily completed during the last 07 (seven) years, ending last day of month previous to the one in which tender is invited, one similar single work for a minimum of 10% of advertised value of the tender.

Note for Clause 17.15.1:

Value of a completed work done by a Member in an earlier JV shall be reckoned only to the extent of the concerned member's share in that JV for the purpose of satisfying his/her compliance to the above-mentioned technical eligibility criteria in the tender under consideration.

1.3.17.15.2 Financial Eligibility Criteria

The JV shall satisfy the requirement of “Financial Eligibility” mentioned at para 1.3.11.2 above. The “financial capacity” of the lead partner of JV shall not be less than 51% of the financial eligibility criteria mentioned at para 1.3.11.2 above.

The arithmetic sum of individual “financial capacity” of all the members shall be taken as JV’s “financial capacity” to satisfy this requirement.

Note: Contractual payment received by a Member in an earlier JV shall be reckoned only to the extent of the concerned member’s share in that JV for the purpose of satisfying compliance of the above-mentioned financial eligibility criteria in the tender under consideration.

1.3.18 Participation of Partnership Firms in works tenders:

- 1.3.18.1** The Partnership Firms participating in the tender should be legally valid under the provisions of the Indian Partnership Act.
- 1.3.18.2** The partnership firm should have been in existence or should have been formed prior to submission of tender. Partnership firm should have either been registered with the Registrar or the partnership deed should have been notarized prior to date of tender opening as per the Indian Partnership Act.
- 1.3.18.3** Separate identity / name should be given to the partnership firm. The partnership firm should have PAN / TAN number in its own name and PAN / TAN number in the name of any of the constituent partners shall not be considered. The valid constituents of the firm shall be called partners.
- 1.3.18.4** Once the tender has been submitted, the constitution of the firm shall not normally be allowed to be modified / altered / terminated during the validity of the tender as well as the currency of the contract except when modification becomes inevitable due to succession laws etc., in which case prior permission should be taken from Railway/DFCCIL and in any case the minimum eligibility criteria should not get vitiated. The re-constitution of firm in such cases should be followed by a notary certified Supplementary Deed. The approval for change of constitution of the firm, in any case, shall be at the sole discretion of the Railways/DFCCIL and the tenderer shall have no claims what-so-ever. Any change in the constitution of Partnership firm after opening of tender shall be with the consent of all partners and with the signatures of all partners as that in the Partnership Deed. Failure to observe this requirement shall render the offer invalid and full EMD shall be forfeited.

If any Partner/s withdraws from the firm after opening of the tender and before the award of the contract, the offer shall be rejected and EMD of the tenderer will be forfeited. If any new partner joins the firm after opening of tender but prior to award of contract, his / her credentials shall not qualify for consideration towards eligibility criteria either individually or in proportion to his share in the previous firm. In case the tenderer fails to inform Railway/DFCCIL beforehand about any such changes / modification in the constitution which is inevitable due to succession laws etc. and the contract is awarded to such firm, then it will be considered a breach of the contract

conditions liable for determination of the contract under Clause 62 of General Conditions of Contract.

1.3.18.5 A partner of the firm shall not be permitted to participate either in his individual capacity or as a partner of any other firm in the same tender.

1.3.18.6 The tender form shall be submitted only in the name of partnership firm. The EMD shall be deposited by partnership firm through e-payment gateway or as mentioned in tender document. The EMD submitted in the name of any individual partner or in the name of authorized partner (s) shall not be considered.

1.3.18.7 One or more of the partners of the firm or any other person (s) shall be designated as the authorized person (s) on behalf of the firm, who will be authorized by all the partners to act on behalf of the firm through a “Power of Attorney”, specially authorizing him / them to submit & sign the tender, sign the agreement, receive payment, witness measurements, sign measurement books, make correspondences, compromise / settle / relinquish any claim (s) preferred by the firm, sign “No Claim Certificate”, refer all or any dispute to arbitration and to take similar such action in respect of the said tender / contract. Such “Power of Attorney” shall be notarized / registered and submitted along with the tender.

1.3.18.8 On issue of Letter of Acceptance (LOA) to the partnership firm, all the guarantees like Performance Guarantee, guarantee for various Advances to the Contractor shall be submitted only in the name of the partnership firm and no splitting of guarantees among the partners shall be acceptable.

1.3.18.9 On issue of Letter of Acceptance (LOA), contract agreement with partnership firm shall be executed in the name of the firm only and not in the name of any individual partner.

1.3.18.10 In case the Letter of Acceptance (LOA) is issued to a partnership firm, the following undertakings shall be furnished by all the partners through a notarized affidavit, before signing of contract agreement.

(a) Joint and several liabilities:

The partners of the firm to which the Letter of Acceptance (LOA) is issued, shall be jointly and severally liable to the Railway/DFCCIL for execution of the contract in accordance with General and Special Conditions of the Contract. The partners shall also be liable jointly and severally for the loss, damages caused to the Railway/DFCCIL during the course of execution of the contract or due to non-execution of the contract or part thereof.

(b) Duration of the partnership deed and partnership firm agreement:

The partnership deed/partnership firm agreement shall normally not be modified/altered/terminated during the currency of contract and the maintenance period after the work is completed as contemplated in the conditions of the contract. Any change carried out by partners in the constitution of the firm without permission of Railway/DFCCIL, shall constitute a breach of the contract, liable for determination of the contract under Clause 62 of the General Conditions of Contract.

- (c) Governing laws: The partnership firm agreement shall in all respect be governed by and interpreted in accordance with the Indian laws.
- (d) No partner of the firm shall have the right to assign or transfer the interest right or liability in the contract without the written consent of the other partner/s and that of the Railway/DFCCIL.

1.3.18.11 The tenderer shall clearly specify that the tender is submitted on behalf of a partnership firm. The following documents shall be submitted by the partnership firm, with the tender:

- (i) A notarized copy of partnership deed.
- (ii) A notarized or registered copy of Power of Attorney in favour of the individual to tender for the work, sign the agreement etc. and create liability against the firm.
- (iii) An undertaking by all partners of the partnership firm that they are not blacklisted or debarred by Railways/DFCCIL or any other Ministry / Department of the Govt. of India from participation in tenders / contracts as on the date of opening of bids, either in their individual capacity or in any firm in which they were / are partners. Concealment / wrong information in regard to above shall make the contract liable for determination under Clause 62 of the General Conditions of Contract.

1.3.18.12 Evaluation of eligibility of a partnership firm:

Technical and financial eligibility of the firm shall be adjudged based on satisfactory fulfillment of the eligibility criteria laid down in clause 1.3.11 above.

1.3.19 Period of Completion

The entire work is required to be completed in all respects within **09 months** (*Nine Months*) from the date of issue of the acceptance letter. The civil works of substations should be completed within **04 months** (*Four Months*) from the date of issue of the acceptance letter. Time is the essence of contract. The contractor shall be required to

maintain steady and regular progress to the satisfaction of the Engineer/DFCCIL to ensure that the work will be completed in all respects within the stipulated time.

- 1.3.20** If the Tenderer/s deliberately gives any wrong information about credentials / documents in his/their tenders and thereby create(s) circumstances for acceptance of his/their tender, DFCCIL reserves the right to reject such tender at any stage, besides, shall suspend business with such tenderer. **The EMD** of such tenderers shall *also be forfeited*.

1.3.21 Quantum of work and materials:

The indicative schedule of quantities of various items of works is included in **Form No – 3 & 4** of the tender document.

1.3.22 Employer not bound to accept any tender:

The Employer shall not be bound to accept the lowest or any tenderor to assign any reason for non-acceptance or rejection of a tender. The employer reserves the right to accept any tender in respect of the whole or any portion of the work specified in the tender papers or to reduce the work or to accept any tender for less than the tendered quantities without assigning any reason whatsoever.

1.3.23 Schedule of Prices

The Schedule as given in the Tender Document, list out the Schedule of Prices of various items. Based on these, the total tender value has also been worked out.

1.3.24 Performance Guarantee: Refer clause no. 16(4) of GCC-2020.

- 1.3.25** The tenderer shall furnish information for making payment through ECS/NEFT/RTGS (*Tender Form No. 8 placed at Part III, Chapter-II of the tender document*).

1.3.26 Negotiation:

Should DFCCIL decide to negotiate with a view to bring down the rates, the tenderer called for negotiations should furnish the following form of declaration before commencement of negotiations:

"I..... do declare that in the event of failure of contemplated negotiations relating to Tender No..... datedmy original tender shall remain open for acceptance on its original terms and conditions,".

1.3.27 Site Inspection:

Tenderers are requested to inspect the site and carry out careful examination to satisfy

them as to the nature of work involved and facilities available at the site. They should note carefully all the existing structures and those under construction through other agencies. They should also study the suitability of utilizing the different equipments and the machinery that they intend to use for the execution of the work. The tenderers should also select suitable sites for the purpose of locating their store yard, laboratory, staff quarters etc.

1.3.28 No form C & D shall be issued to the contractor for this work.

1.3.29 The rates quoted by the contractor are deemed to be inclusive of site clearance, setting outwork, profile, setting lay out on ground, establishment of reference benchmark(s), installing various signage, taking spot levels, survey with total station, construction of all safety and protection devices, compulsory use of helmet and safety shoes, and other appropriate safety gadgets by workers, imparting continuous training for all the workers, barriers, preparatory works, construction of clean, hygienic and well ventilated workers housings in sufficient numbers working during monsoon or odd season, working beyond normal hours, working at all depths, height, lead, lift, levels and location etc. and any other unforeseen or essential incidental works required to complete this work. *Nothing extra shall be payable* on this account and *no extension of time* for completion of work shall be granted on these accounts.

In the Estimated Value of tender, GST @ 18% has been taken on the Basic Value. The Basic Value is inclusive of all taxes, duties and levies except GST. The % (above/below/at par) rates quoted by the tenderer shall apply on the Basic Value. The GST as legally leviable and payable by the Bidder under the provisions of applicable law/act shall be paid extra by DFCCIL.

The Bidders should quote their rates after considering the Input Tax Credits on their input materials and services. Hence, Bidders should ensure that, full benefit of Input Tax Credit (ITC) likely to be availed by them is duly considered while quoting their rates.

1.3.30 Price Variation Clause (PVC) will be applicable for this work as per Clause 1.7 of Special Conditions of Contract (Electrical) (Part-I, Chapter-V, Section-1 of Tender Document).

1.3.31 No Mobilization or Secured Advance would be paid by DFCCIL for this work.

1.3.32 Contract value:

The Contract Value shall be inclusive of all taxes and duties including ESIC, PF, contribution & all other statutory taxes and levies (*if any*) applicable to the Contractors/Workers etc.

1.3.33 Taxes, Duties etc.:

- (i) GSTIN of DFCCIL will be provided to the contractor along with the letter of acceptance (*LOA*).
- (ii) Payment to the contractor will be subjected to TDS as per rules inforce from time to time. The tax deduction at source (*TDS*) shall be done as per the provisions of Income Tax Act & GST, as amended from time to time and a certificate to this effect shall be provided to the contractor by the DFCCIL.
- (iii) Contractor shall submit GST compliant tax invoice containing (*GSTIN of DFCCIL*) and all the particulars as stipulated under invoice rules of GST law. Payment shall be made to the contractor only after submission of GST compliant Tax Invoice.
- (iv) Increase/ decrease in rate of existing GST or cess on GST for Works Contract shall be dealt as per para 37 of GCC (Part-I, Chapter-IV of Tender document).

PART- I

CHAPTER- IV

GENERAL CONDITIONS OF CONTRACT

PART- I

CHAPTER- IV

GENERAL CONDITIONS OF CONTRACT

DEFINITIONS AND INTERPRETATION

1. (1) Definition: - In these General conditions of Contract, the following terms shall have the meaning assigned hereunder except where the context otherwise requires: -

- (a) **“DFCCIL”** shall mean Dedicated Freight Corridor Corporation of India Ltd, a Govt. of India Enterprise (under Ministry of Railways) and a company incorporated under the provisions of the Companies Act, 1956 having its registered office at 5th Floor, Supreme Court Metro Station Complex, New Delhi-110001 represented through its Managing Director or CGM/GM (hereinafter referred to as **“DFCCIL”**) which expression shall, unless repugnant to the context, be deemed to include its successors and assigns.
- (b) **“MD/DFCCIL”** shall mean the officer - in-charge of the General Superintendence and Control of the DFCCIL (MD) and shall mean and include their successors, of the successor of DFCCIL (hereinafter referred to as **“MD/DFCCIL”**).
- (c) **“CGM”** shall mean the officer - in-charge of the CGM unit of DFCCIL and shall also include GM(Co) of DFCCIL.
- (d) **“Engineer”** shall mean Dy. CPM/DFCCIL or any other superior official of DFCCIL or PMC appointed by DFCCIL.
- (e) **“Engineer’s Representative”** shall mean the PM/Dy.PM/APM / Sr. Executive/Executive in direct charge of the work and shall include appointed by the DFCCIL and shall mean and include the Engineer’s Representative of the successor DFCCIL.
- (f) **“Contractor”** shall mean the Person / Firm /Co-operative Society or Company whether incorporated or not who enters into the contract with the DFCCIL and shall include their executors, administrators, and successors and permitted assigns.
- (g) **“Contract”** shall mean and include the Agreement of Work Order, the accepted Schedule of Rates or the Schedule or Rates of CPWD modified by the tender percentage for items of works quantified, or not quantified, the Standard General Conditions of Contract, the Special Conditions of Contracts, if any; the Drawing, the Specifications, the Special Specifications, if any and Tender Forms, if any and all other documents included as part of contract.
- (h) **“Works”** shall mean the works to be executed in accordance with the contract.

- (i) **"Specifications"** shall mean the Standard Specifications for Materials & Works referred/mentioned in tender documents or CPWD or as specified by DFCCIL under the authority of the CGM or as amplified, added to or superseded by Special Specifications, if any.
- (j) **"Schedule of rates of DFCCIL"** shall mean rates specified in "Schedules" of the tender document or Delhi Schedule of Rates (DSR) of CPWD issued by CPWD from time to time.
- (k) **"Drawing"** shall mean the maps, drawings, plans and tracings or prints there of annexed to the contract and shall include any modifications of such drawings and further drawings as may be issued by the Engineer from time to time.
- (l) **"Constructional Plant"** shall mean all appliances or things of whatsoever nature required for the execution, completion or maintenance of the works or temporary works (*as hereinafter defined*) but does not include materials or other things intended to form or forming part of the permanent work.
- (m) **"Temporary Works"** shall mean all temporary works of every kind required for the execution completion and/or maintenance of the works.
- (n) **"Site"** shall mean the lands and other places on, under, in or through which the works are to be carried out and any other lands or places provided by the DFCCIL for the purpose of the contract.
- (o) **"Period of Maintenance"** shall mean the specified period of maintenance from the date of completion of the works, as certified by the Engineer.
- (p) **'Contractor's authorized Engineer'** shall mean a graduate Engineer or equivalent, having experience in the relevant field of construction work involved in the contract, duly approved by Engineer.
- (q) Date of inviting tender shall be the date of publishing tender notice on Tender Wizard/IREPS website if tender is published on website or the date of publication in newspaper in case tender is not published on website.

1. (2) Singular and Plural: - Words importing the singular number shall also include the plural and vice versa where the context requires.

1.(3) Headings & marginal headings: -The headings and marginal headings in these Standard General Conditions are solely for the purpose of facilitating reference and shall not be deemed to be part thereof or be taken into consideration in the interpretation or construction thereof or the contract.

GENERAL OBLIGATION

- 2.(1) Execution Co-relation and intent of contract Documents:** -The contract documents shall be signed in triplicate by the DFCCIL and the Contractor. The contract documents are complementary, and what is called for by any-one shall be as binding as if called for by all, the intention of the documents is to include all labour and materials, equipments and transportation necessary for the proper execution of work. Materials or work not covered by or properly inferable from any heading or class of the specifications shall not be supplied by the DFCCIL to the contractors unless distinctly specified in the contract documents. Materials or works described in words which so applied have a well-known technical or trade meaning shall be held to refer to such recognized standards.
- 2.(2)** If a work is transferred from one CGM unit to another CGM or vice versa while contract is in subsistence, the contract shall be binding on the Contractor and the Successor CGM unit in the same manner & take effect all respects as if the Contractor and the Successor CGM unit were parties there to from the inception and the corresponding officer or the Competent Authority in the Successor CGM unit will exercise the same powers and enjoy the same authority as conferred to the Predecessor CGM unit under the original contract/agreement entered into.
- 2.(3)** If for administrative or other reasons, the contract is transferred to the Successor CGM unit of DFCCIL, the contract shall notwithstanding any things contained herein contrary there to, be binding on the Contractor and the Successor CGM unit of DFCCIL in the same manner and take effect in all respects as if the Contractor and the Successor CGM unit of DFCCIL had been parties thereto from the date of this contract.
- 3.(1) Law governing the contract:** -The contract shall be governed by the law for the time being in force in the Republic of India.
- 3.(2) Compliance to regulations and bye-laws:** -The contractor shall conform to the provision of any statute relating to the works and regulations and bye-laws of any local authority and of any water and lighting companies or undertakings, with whose system the work is proposed to be connected and shall before making any variation from the drawings or the specifications that may be necessitated by so confirming give to the Engineer notice specifying the variation proposed to be made and the reasons for making the variation and shall not carry out such variation until he has received instructions from the Engineer in respect thereof. The contractor shall be bound to give all notices required by statute, regulations or bye-laws as aforesaid and to pay all fees and taxes payable to any authority in respect thereof.
- 4. Communications to be in writing:** - All notices, communications, reference and complaints made by the DFCCIL or the Engineer or the Engineer's representative or the contractor inter-se concerning the work shall be in writing or e-mail on registered e-mail

ID's and no notice, communication, reference or complaint not in writing or through e-mail, shall be recognized.

5. **Service of Notices on Contractors:-**The contractor shall furnish to the Engineer the name designation and address of his authorized agent and all complaints, notices, communications and references shall be deemed to have been duly given to the contractor if delivered to the contractor or his authorized agent or left at or posted to the address so given and shall be deemed to have been so given in the case of posting on day on which they would have reached such address in the ordinary course of post or on the day on which they were so delivered or left. In the case of contract by partners, any change in the constitution of the firm shall be forthwith notified by the contractor to the Engineer.
6. **Occupation and use of land:** - No land belonging to or in the possession of the DFCCIL shall be occupied by the Contractor without the permission of the DFCCIL. The Contractor shall not use, or allow to be used; the site for any purposes other than that of executing the works. Whenever non-railway bodies/persons are permitted to use DFCCIL premises with competent authority's approval, conservancy charges as applicable from time to time may be levied.
7. **Assignment or subletting of contract:** - The contractor shall not assign or sublet the contract or any part thereof or allow any person to become interested therein any manner whatsoever without the special permission in writing of the CGM, save as provided below. Any breach of this condition shall entitle the DFCCIL to rescind the contract under clause 62 of these conditions and also render the contractor liable for payment to the DFCCIL in respect of any loss or damage arising or ensuing from such cancellation; provided always that execution of the details of the work by petty contractor under the direct and personal supervision of the Contractor or his agent shall not be deemed to be sub-letting under this clause.

In case Contractor intends to subcontract part of work, he shall submit a proposal in writing seeking permission of CGM for the same. While submitting the proposal to DFCCIL, Contractor shall ensure the following:

- (a) (i) Total value of work to be assigned to sub-contractor(s) shall not be more than 50% of total contract value.
- (ii) The subcontractor shall have successfully completed at least one work similar to work proposed for subcontract, costing not less than 35% value of work to be subletted, in last 5 years through a works contract. For fulfillment of above, work experienced certificate issued by a Govt. Department/organization shall be considered. Further work experienced certificate issued by a Public listed company shall be considered provided the company is having average annual turnover of Rs 500 crore and above in last 3 financial years excluding the current financial year, listed on National Stock Exchange or Bombay Stock Exchange, registered at least 5 years back from the date of submission of proposal by Contractor to DFCCIL and work experience certificate issued by a person authorised by the Public Listed

Company to issue such certificates.

Note:- For subletting of work costing upto Rs. 50 lakh no previous work experience shall be asked for by the DFCCIL.

In case contractor submits subcontractor's work experience certificate issued by public listed company, the contractor shall also submit along with work experience certificate, the relevant copy of work order, bill of quantities, bill wise details of payment received duly certified by Chartered Accountant, TDS certificates for all payments received and copy of final/last bill paid by company in support of above work experience certificate.

- (iii) There is no banning of business with the sub-contractor in force over Railway/DFCCIL.
- (b) The Contractor shall provide to the Engineer/ DFCCIL a copy of the agreement to be entered into by Contractor with subcontractor. No subcontractor shall be permitted without a formal agreement between Contractor and subcontractor. This agreement shall clearly define the scope of work to be carried out by subcontractor and the terms of payment in clear & unambiguous manner.
- (c) On receipt of approval from CGM, Contractor shall enter into a formal agreement legally enforceable in Court of Law with subcontractor and submit a copy of the same to the Engineer.
- (d) The Contractor shall intimate to the Engineer not less than 7 days in advance, the intended date of commencement of subcontractor's work.
- (e) Once having entered into above arrangement, Contractor shall discontinue such arrangement, if he intends to do so at his own or on the instructions of DFCCIL, with prior intimation to CGM.
- (f) The Contractor shall indemnify DFCCIL against any claim of subcontractor.
- (g) The Contractor shall endeavour to resolve all matters and payments amicably and speedily with the subcontractor.
- (h) In addition to issuance of work experience certificate to Contractor, the Engineer, when, based on documents, is satisfied that subcontracted work has been carried out by subcontractor, shall issue work experience certificate to the subcontractor also for the portion of work subcontracted and successfully completed by the sub-contractor.

Note- *Work Experience Certificate to the subcontractor shall be issued only when the contractor's work is complete and contractor is entitled for the issuance of work Experience certificate. However, in the same contract, when the CGM, based on documents, is satisfied that the subcontractor has successfully carried out subletted work; without issuance of work experience certificate to subcontractor at this stage, the CGM can, only once, consider the successfully completed subletted work for the*

fulfilment of eligibility for further subletting of work to the subcontractor in the same contract. When the contractor's work is complete and contractor is entitled for the issuance of work experience certificate, the subcontractor shall be issued one Work Experience Certificate for total scope of work executed by the subcontractor in the contract.

- (i) The responsibility of successful completion of work by subcontractor shall lie with Contractor. Subcontracting will in no way relieve the Contractor to execute the work as per terms of the Contract.
- (j) Further, in case Engineer is of the view that subcontractor's performance is not satisfactory, he may instruct the Contractor to remove the subcontractor from the work and Contractor has to comply with the above instructions with due promptness. Contractor shall intimate the actual date of discontinuation of subcontract to Engineer. No claim of Contractor whatsoever on this account shall be entertained by the DFCCIL and this shall be deemed as 'excepted matter' (matter not arbitrable).
- (k) The permitted subcontracting of work by the Contractor shall not establish any contractual relationship between the sub-contractor and the DFCCIL and shall not relieve the Contractor of any responsibility under the Contract.

8. Assistance by the DFCCIL for the Stores to be obtained by the Contractor: - Owing to difficulty in obtaining certain materials (including Tools & Plant) in the market, the DFCCIL may have agreed without any liability therefore to endeavour to obtain or assist the contractor in obtaining the required quantities of such materials as may be specified in the tender. In the event of delay or failure in obtaining the required quantities of the aforesaid material the contractor shall not be deemed absolved of his own responsibility and shall keep in touch with day to day positions regarding their availability and accordingly adjust progress of works including employment of labour and the DFCCIL shall not in any way be liable for the supply of materials or for the non-supply thereof for any reasons whatsoever nor for any loss or damage arising in consequence of such delay or non-supply.

9. Deleted

10. Deleted

11. Deleted

12. Representation on Works:- The contractor shall, when he is not personally present on the site of the works place and keep a responsible agent at the works during working hours who shall on receiving reasonable notice, present himself to the Engineer and orders given by the Engineer or the Engineer's representative to the agent shall be deemed to have the same force as if they had been given to the Contractor. Before absenting himself, the contractor shall furnish the name and address of his agent for the purpose of this clause and failure on the part of the Contractor to comply with this provision at any time will entitle

the DFCCIL to **rescind the contract** under clause 62 of these conditions.

13. **Relics and Treasures:-** All gold, silver, oil, other minerals of any description, all precious stones, coins, treasures relics antiquities and other similar things which shall be found in or upon the site shall be the property of the DFCCIL and the Contractor shall duly preserve the same to the satisfaction of the DFCCIL and shall from time to time deliver the same to such person or persons as the DFCCIL may appoint to receive the same.
14. **Excavated material:-** The contractor shall not sell or otherwise dispose of or remove except for the purpose of this contract, the sand, stones, clay, ballast, earth, trees, rock or other substances or materials which may be obtained from any excavation made for the purpose of the works or any building or produced upon the site at the time of delivery of the possession thereof but all the substances, materials, buildings and produce shall be the property of the DFCCIL provided that the contractor may, with the permission of the Engineer, use the same for the purpose of the works either free of cost or pay the cost of the same at such rates as may be determined by the Engineer.
15. **Indemnity by Contractors:** The Contractor shall indemnify and save harmless the DFCCIL from and against all actions, suit, proceedings, losses, costs, damages, charges, claims and demands of every nature and description brought or recovered against the DFCCIL by reason of any act or omission of the contractor, his agents or employees, in the execution of the works or in his guarding of the same. All sums payable by way of compensation under any of these conditions shall be considered as reasonable compensation to be applied to the actual loss or damage sustained, and whether or not any damage shall have been sustained.
- 16.(1)**Security Deposit:** - The Earnest Money deposited by the Contractor with his tender will be retained by the DFCCIL as part of security for the due and faithful fulfillment of the contract by the Contractor. The Security Deposit shall be 5% of the contract value. Security Deposit may be deposited by the Contractor before release of first on account bill in cash or Term Deposit Receipt issued from Scheduled Bank, or may be recovered at the rate of 6% of the bill amount till the full Security Deposit is recovered. Provided also that in case of defaulting Contractor, the DFCCIL may retain any amount due for payment to the Contractor on the pending "on account bills" so that the amounts so retained (including amount guaranteed through Performance Guarantee) may not exceed 10% of the total value of the contract.

Further, in case of contracts having value equal to or more than ₹ 50 crore (Rs Fifty crore) the Security Deposit may be deposited as Bank Guarantee Bond also, issued by a scheduled bank after execution of contract documents, but before payment of 1st on account bill. Provided further that the validity of Bank Guarantee Bond shall be extended from time to time, depending upon extension of contract granted in terms of Clause 17 of the Standard General Conditions of Contract.

Further, in case Security Deposit has been submitted as Term Deposit Receipt/Bank Guarantee Bond in full amount, the Earnest Money deposited by the Contractor with his tender will be returned by the DFCCIL.

Note: After the work is physically completed as certified by competent authority, Security Deposit recovered from the running bills of a Contractor can be returned to him, if he so desires, in lieu of Term Deposit Receipt/irrevocable Bank Guarantee for equivalent amount from Scheduled Bank, to be submitted by him.

16.(2)(i) Refund of Security Deposit: Security Deposit mentioned in sub clause (1) above shall be returned to the Contractor along with or after, the following:

- (a) Final Payment of the Contract as per clause 51. (1) **and**
- (b) Execution of Final Supplementary Agreement or Certification by EngineerL that DFCCIL has No Claim on Contractor **and**
- (c) Maintenance Certificate issued, on expiry of the Defect Liability Period (DLP) period as per clause 50. (1), in case applicable.

16.(2)(ii) Forfeiture of Security Deposit: Whenever the contract is rescinded as a whole under clause 62 (1) of GCC, the Security Deposit already with DFCCIL under the contract shall be forfeited. However, in case the contract is rescinded in part or parts under clause 62 (1) of GCC, the Security Deposit shall not be forfeited.

16.(3) No interest shall be payable upon the Earnest Money and Security Deposit or amounts payable to the Contractor under the Contract, but Government Securities deposited in terms of Sub-Clause 16. (4)(b) of this clause will be payable with interest accrued thereon.

16.(4) Performance Guarantee

The procedure for obtaining Performance Guarantee is outlined below:

- (a) The successful bidder shall have to submit a Performance Guarantee (PG) within 21 (Twenty-one) days from the date of issue of Letter of Acceptance (LOA). Extension of time for submission of PG beyond 21 (Twenty-one) days and upto 60 days from the date of issue of LOA may be given by the Authority who is competent to sign the contract agreement. However, a penal interest of 12% per annum shall be charged for the delay beyond 21(Twenty-one) days, i.e. from 22nd day after the date of issue of LOA. Further, if the 60th day happens to be a declared holiday in the concerned office of the DFCCIL, submission of PG can be accepted on the next working day.

In all other cases, if the Contractor fails to submit the requisite PG even after 60 days from the date of issue of LOA, the contract is liable to be terminated. In case contract is terminated DFCCIL shall be entitled to forfeit Earnest Money Deposit and other dues payable against that contract. In case a tenderer has not submitted Earnest Money Deposit on the strength of their registration as a Startup recognized by Department of Industrial Policy and Promotion (DIPP) under Ministry of Commerce and Industry, DIPP shall be

informed to this effect.

The failed Contractor shall be debarred from participating in re-tender for that work.

- (b) **The successful bidder shall submit the Performance Guarantee (PG) in the form of Irrevocable Bank Guarantee amounting to 3% of the Contract value.**
- (c) The Performance Guarantee shall be submitted by the successful bidder after the Letter of Acceptance (LOA) has been issued, but before signing of the contract agreement. This P.G. shall be initially valid upto the stipulated date of completion plus 60 days beyond that. In case, the time for completion of work gets extended, the Contractor shall get the validity of P.G. extended to cover such extended time for completion of work plus 60 days.
- (d) The value of PG to be submitted by the Contractor will not change for variation upto 25% (either increase or decrease). In case during the course of execution, value of the contract increases by more than 25% of the original contract value, an additional Performance Guarantee amounting to 5% (five percent) for the excess value over the original contract value shall be deposited by the Contractor. On the other hand, if the value of contract decreases by more than 25% of the original contract value, Performance Guarantee amounting to 5% (five percent) of the decrease in the contract value shall be returned to the Contractor. The PG amount in excess of required PG for decreased contract value, available with DFCCIL, shall be returned to Contractor as per his request duly safeguarding the interest of DFCCIL.
- (e) The Performance Guarantee (PG) shall be released after physical completion of the work based on 'Completion Certificate' issued by the competent authority stating that the Contractor has completed the work in all respects satisfactorily.
- (f) Whenever the contract is rescinded, the Performance Guarantee already submitted for the contract shall be encashed in addition to forfeiture of Security Deposit available with DFCCIL.
- (g) The Engineer/DFCCIL shall not make a claim under the Performance Guarantee except for amounts to which the President of India/DFCCIL is entitled under the contract (not withstanding and/or without prejudice to any other provisions in the contract agreement) in the event of:
 - (i) Failure by the Contractor to extend the validity of the Performance Guarantee as described herein above, in which event the Engineer/DFCCIL may claim the full amount of the Performance Guarantee.
 - (ii) Failure by the Contractor to pay President of India/DFCCIL any amount due, either as agreed by the Contractor or determined under any of the Clauses/Conditions of the Agreement, within 30 days of the service of notice to this effect by Engineer/DFCCIL.
 - (iii) The Contract being determined or rescinded under clause 62 of the GCC.
- (h) **Deleted.**

17. Force Majeure Clause:- If at any time, during the continuance of this contract, the performance in whole or in part by either party of any obligation under this contract shall be prevented or delayed by reason of any war, hostility, acts of public enemy, civil commotion, sabotage, serious loss or damage by fire, explosions, epidemics/pandemics, strikes, lockouts or acts of God (hereinafter, referred to events) provided, notice of the happening of any such event is given by either party to the other within 30 days from the date of occurrence thereof, neither party shall by reason of such event, be entitled to terminate this contract nor shall either party have any claim for damages against the other in respect of such non-performance or delay in performance, and works under the contract shall be resumed as soon as practicable after such event has come to an end or ceased to exist, and the decision of the Engineer as to whether the works have been so resumed or not shall be final and conclusive, PROVIDED FURTHER that if the performance in whole or in part of any obligation under this contract is prevented or delayed by reason of any such event for a period exceeding 120 days, either party may at its option terminate the contract by giving notice to the other party.

17-A Extension of time in Contracts:- Subject to any requirement in the contract as to completion of any portion or portions of the works before completion of the whole, the Contractor shall fully and finally complete the whole of the works comprised in the contract (with such modifications as may be directed under conditions of this contract) by the date entered in the contract or extended date in terms of the following clauses:

- (i) **Extension due to modification:-** If any modifications have been ordered which in the opinion of the Engineer have materially increased the magnitude of the work, then such extension of the contracted date of completion may be granted as shall appear to the Engineer to be reasonable in the circumstances, provided moreover that the Contractor shall be responsible for requesting such extension of the date as may be considered necessary as soon as the cause thereof shall arise and in any case not less than one month before the expiry of the date fixed for completion of the works.
- (ii) **Extension for Delay not due to DFCCIL or Contractor:** If in the opinion of the Engineer, the progress of work has any time been delayed by any act or neglect of DFCCIL's employees or by other contractor employed by the DFCCIL under Sub-Clause (4) of Clause 20 of these Conditions or in executing the work not forming part of the contract but on which Contractor's performance necessarily depends or by reason of proceeding taken or threatened by or dispute with adjoining or to neighbouring owners or public authority arising otherwise through the Contractor's own default etc. or by the delay authorized by the Engineer pending arbitration or in consequences of the Contractor not having received in due time necessary instructions from the DFCCIL for which he shall have specially applied in writing to the Engineer or his authorized representative then upon happening of any such event causing delay, the Contractor shall immediately give notice thereof in writing to the Engineer within 15 days of such happening, but shall nevertheless make constantly his best endeavours to bring down or make good the delay and shall do all that may be reasonably required of him to the satisfaction of the Engineer to proceed with the works. The Contractor may also indicate the period for which the work is likely to be delayed and shall be bound to ask for necessary extension of time. The Engineer on receipt of such request from the Contractor shall consider the same and shall grant such extension of time as in his opinion is reasonable having regard to the nature and period of delay and the type and

quantum of work affected thereby. No other compensation shall be payable for works so carried forward to the extended period of time; the same rates, terms and conditions of contract being applicable as if such extended period of time was originally provided in the original contract itself.

- (iii) **Extension for Delay due to DFCCIL:** In the event of any failure or delay by the DFCCIL to hand over the Contractor possession of the lands necessary for the execution of the works or to give the necessary notice to commence the works or to provide the necessary drawings or instructions or any other delay caused by the DFCCIL due to any other cause whatsoever, then such failure or delay shall in no way affect or vitiate the contract or alter the character thereof or entitle the Contractor to damages or compensation therefor, but in any such case, the DFCCIL may grant such extension or extensions of the completion date as may be considered reasonable.

17-B Extension of Time with Liquidated Damages (LD) for delay due to Contractor: The time for the execution of the work or part of the works specified in the contract documents shall be deemed to be the essence of the contract and the works must be completed not later than the date(s) as specified in the contract. If the Contractor fails to complete the works within the time as specified in the contract for the reasons other than the reasons specified in Clause 17 and 17-A, the DFCCIL may, if satisfied that the works can be completed by the Contractor within reasonable short time thereafter, allow the Contractor for further extension of time (**Proforma at Form-14**) as the Engineer may decide. On such extension the DFCCIL will be entitled without prejudice to any other right and remedy available on that behalf, to recover from the Contractor as agreed damages and not by way of penalty for each week or part of the week, a sum calculated at the following rates of the contract value of the works.

For the purpose of this Clause, the contract value of the works shall be taken as value of work as per contract agreement including any supplementary work order/contract agreement issued. Provided also, that the total amount of liquidated damages under this condition shall not exceed 5% of the contract value or of the total value of the item or groups of items of work for which a separate distinct completion period is specified in the contract.

SN	Duration of extension of time under Clause 17-B	Rate of Liquidated Damages
(i)	Up to Twenty percent of original period of completion including period of extension of DOC granted under Section 17A(i)	As decided by Engineer, between 0.01% to 0.10% of contract value for each week or part of the week
(ii)	Above Twenty percent but upto Thirty percent of original period of completion including period of extension of DOC granted under Section 17A(i)	0.20% of contract value for each week or part of the week
(iii)	Above Thirty percent but upto Forty percent of original period of completion including period of extension of DOC granted under Section 17A(i)	0.30% of contract value for each week or part of the week
(iv)	Above Forty percent of original period of completion including period of extension of	0.50% of contract value for each week or part of the week

	DOC granted under Section 17A(i)	
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Provided further, that if the DFCCIL is not satisfied that the works can be completed by the Contractor and in the event of failure on the part of the contractor to complete the work within further extension of time allowed as aforesaid, the DFCCIL shall be entitled without prejudice to any other right or remedy available in that behalf, to appropriate the contractor's Security Deposit and rescind the contract under Clause 62 of these Conditions, whether or not actual damage is caused by such default.

17-C Deleted

18.(1) Illegal Gratification:- Any bribe, commission, gift or advantage given, promised or offered by or on behalf to the contractor or his partner, agent or servant or, anyone on his behalf, to any officer or employee of the DFCCIL, or to any person on his behalf in relation to obtaining or execution of this or any other contract with the DFCCIL shall, in addition to any criminal liability which he may incur, subject contractor to the ***rescission of the contract*** and all other contracts with the DFCCIL and to the payment of any loss or damage resulting from such decision and the DFCCIL shall be entitled to deduct the amounts so payable from the Contractor(s)/bills/security deposite or any other dues of contractor with Government of India/DFCCIL.

18.(2) The contractor shall not lend or borrow from or have or enter into any monitory dealings and transactions either directly or indirectly with any employee of the DFCCIL and if he shall do so, the DFCCIL shall be entitled forthwith to **rescind the contract** and all other contracts with the DFCCIL. Any question or dispute as to the commission or any such offence or compensation payable to the DFCCIL under this clause shall be settled by the Chief General Manager/Noida of the DFCCIL, in such a manner as he shall consider fit and sufficient and his decision shall be final and conclusive. In the event of rescission of the contract under this clause, the contractor will not be paid any compensation whatsoever except payments for the work done up to the date of rescission.

EXECUTION OF WORKS

19.(1) Contractor's understanding:- It is understood and agreed that the contractor has, by careful examination, satisfied himself as to the nature and location of the work, the conformation of the ground, the character, quality and quantity of the materials to be encountered, the character of equipment and facilities needed preliminary to and during the progress of the works, the general and local conditions, the labour conditions prevailing therein and all other matters which can in any way affect the works under the contract.

19.(2) Commencement of works:- The contractor shall commence the works within 15 days after the receipt by him of an order in writing to this effect from the Engineer and shall proceed with the same with due expedition and without delay.

19.(3) Accepted Programme of work:- The contractor who has been awarded the work shall

as soon as possible but not later than 30 days after the date of receipt of the acceptance letter in respect of contracts with initial completion period of two years or less or not later than 90 days for other contracts have to submit the detailed programme of work indicating the time schedule of various items of works in the form of Bar Chart/CPM. He shall also submit the details of organization (*in terms of labour and supervisors*) plant and machinery, that he intends to utilize (*from time to time*) for execution of the work within stipulated date of completion. The programme of work amended as necessary by discussions with the Engineer, shall be treated as the agreed programme of the work for the purpose of this contract and the contractor shall endeavour to fulfil this programme of work. The progress of work will be watched accordingly and the ***liquidated damages will be with reference to the overall completion date***. Nothing stated herein shall preclude the contractor in achieving earlier completion of item or whole of the works than indicated in the programme.

19.(4)Setting out of works: - The contractor shall be responsible for the correct setting out of all works in relation to original points, lines and levels of reference at his cost. The contractor shall execute the work true to alignment, grade, levels and dimensions as shown in the drawing and as directed by the Engineer's representative and shall check these at frequent intervals. The contractor shall provide all facilities like labour and instruments and shall co-operate with the Engineer's representative to check all alignment, grades, levels and dimensions. If, at any time, during the progress of the works any error shall appear or arise in any part of the work, the contractor, on being required so to do by the Engineer's representative shall, at his own cost rectify such errors, to the satisfaction of the Engineer's representative.

Such checking shall not absolve the contractor of his own responsibility of maintaining accuracy in the work. The contractor shall carefully protect and preserve all bench marks, sight rails, pegs and other things used in setting out the work.

20.(1) Compliance to Engineer's instructions:-The Engineer shall direct the order in which the several parts of the works shall be executed and the contractor shall execute without delay all orders given by the Engineer from time to time but the contractor shall not be relieved thereby from responsibility for the due performance of the works in all respects.

20.(2) Alterations to be authorized: -No alterations in or additions to or omissions or abandonment of any part of the works shall be deemed authorized, except under instructions from the Engineer. The contractor shall be responsible to obtain such instructions in each and every case in writing from the Engineer.

20.(3)Extra works: - Should works over and above those included in the contract require to be executed at the site, the contractor shall have no right to be entrusted with the execution of such works which may be carried out by another contractor or contractors or by other

means at the option of the DFCCIL.

20.(4) Separate contracts in connection with works: - The DFCCIL shall have the right to let other contracts in connection with the works. The contractor shall afford other contractors' reasonable opportunity for the storage of their materials and the execution of their works and shall properly connect and coordinate his work with theirs. If any part of the contractor's work depends for proper execution or result upon the work of another contractor(s), the contractor shall inspect and promptly report to the Engineer any defects in such works that render it unsuitable for such proper execution and results. The contractor's failure so-to inspect and report shall constitute an acceptance of the other contractor's work as fit and proper for the reception of his work, except as to defects which may develop in the other contractor's work after the execution of his work.

21. Instruction of Engineer's Representative: - Any instructions or approval given by the Engineer's/DFCCIL's representative to contractor in connection with the works shall bind the contractor as though it had been given by the Engineer provided always as follows.

- (a) Failure of the Engineer's representative to disapprove any work or materials shall not prejudice, the power of the Engineer thereafter to disapprove such work or material and to order the removal or breaking up thereof.
- (b) If the Contractor shall be dissatisfied by reason of any decision of the Engineer's representative, he shall be entitled to refer the matter to the Engineer who shall there upon confirm or vary such decision.

22.(1) Adherence to specifications and drawings: - The whole of the works shall be executed in perfect conformity with the specifications and drawings of the contract. If contractor performs any works in a manner contrary to the specifications or drawings or any of them and without such reference to the Engineer, he shall bear all the costs arising or ensuing therefore and shall be responsible for all loss to the DFCCIL.

22.(2) Drawings and specifications of the works: - The contractor shall keep one copy of drawings and specifications at the site, in good order, and such contract documents as may be necessary available to the Engineer or the Engineer's representative.

22.(3) Ownership of drawings and specifications: - All drawings and specifications and copies thereof furnished by the DFCCIL to the Contractor are deemed to be the property of the DFCCIL. They shall not be used on other works and with the exception of the signed contract set, shall be returned by the contractor to the DFCCIL on completion of the work or termination of the contract.

22.(4) Compliance with Contractor's requests for details: - The Engineer shall furnish with reasonable promptness, after receipt by him of the contractor's request for the same,

additional instructions by means of drawings or otherwise, necessary for the proper execution of the works or any part thereof. All such drawing and instructions shall be consistent with the contract Documents and reasonably inferable there from.

- 22.(5) Meaning and intent of specification and drawings:-** If any ambiguity arises as to the meaning and intent of any portion of the specifications and drawings or as to execution or quality of any work or material, or as to the measurements of the works the decision of the Engineer thereon shall be final subject to the appeal (*within 7 days of such decision being intimated to the contractor*) to the CGM who shall have the power to correct any errors, omissions, or discrepancies in aforementioned items and whose decision in the matter in dispute or doubt shall be final and conclusive.
- 23 Working during night:** - The contractor shall not carry out any work between sun-set and sun-rise without the previous permission of the Engineer. However, if the Engineer is satisfied that the work is not likely to be completed in time except by resorting to night work, he may order the same without confirming any right on the Contractor for claiming any extra payment for the same.
- 24. Damage to DFCCIL property or private life and property:-**The contractor shall be responsible for all risk to the work and for trespass and shall make good at his own expense all loss or damage whether to the works themselves or to any other property of the DFCCIL or the lives, persons or property of others from whatsoever cause in connection with the works until they are taken over by the DFCCIL and this although all reasonable and proper precautions may have been taken by the contractor. In case the DFCCIL shall be called upon to make good any costs, loss or damages, or to pay an compensation, including that payable under the provisions of the Workmen's Compensation Act or any statutory amendments thereof to any person or persons sustaining damages as aforesaid by reason of any act, or any negligence or omissions on the part of the contractor the amount of any costs or charges including costs and charges in connection with legal proceedings, which the Railway / DFCCIL may incur in reference thereto, shall be charged to the contractor. The DFCCIL shall have the power and right to pay or to defend or compromise any claim of threatened legal proceedings or in anticipation of legal proceedings being instituted consequent on the action or default of the contractor, to take such steps as may be considered necessary or desirable to ward off or mitigate the effect of such proceedings, charging to contractor, as aforesaid any sum or sums of money which may be paid and any expenses whether for reinstatement or otherwise which may be incurred and the propriety of any such payment, defence or compromise, and the incurring of any such expenses shall not be called in question by the contractor.
- 25. Sheds, Stores houses and Yards:-**The contractor shall at his own expense provide himself with sheds, stores houses and yards in such situations and in such numbers as in the opinion of the Engineer is requisite for carrying on the works and the contractor shall keep at each such sheds, stores houses and yard a sufficient quantity of materials and plant in stock as not to delay the carrying out of the works with due expedition and the

Engineer and the Engineer's representative shall have free access to the said sheds, store houses and yards at any time for the purpose of inspecting the stock of materials or plant so kept in hand, and any materials or plan which the Engineer may object to shall not be brought upon or used in the works, but shall be forthwith removed from the sheds, store houses or yards by the contractor. The contractor shall at his own expenses provide and maintain suitable mortar mills, soaking vats or any other equipments necessary for the execution of the works.

26. Provision of efficient and competent Staff at work sites by the Contractor: -

26.1 The contractor shall place and keep on the works at all times efficient and competent staff to give the necessary directions to his workmen and to see that they execute their work in sound and proper manner and shall employ only such supervisors, workmen and labourers in or about the execution of any of these works as are careful and skilled in the various trades.

26.2 The contractor shall at once remove from the works any agents, permitted sub-contractor, supervisor, workman or labourer who shall be objected to by the Engineer and if and whenever required by the Engineer, he shall submit a correct return showing the names of all staff and workmen employed by him.

26.3 In the event of the Engineer being of the opinion that the contractor is not employing on the works a sufficient number of staff and workmen as is necessary for the proper completion of the works within the time prescribed, the contractor shall forthwith on receiving intimation to this effect deploy the additional number of staff and labour specified by the Engineer within seven days of being so required and failure on the part of the contractor to comply with such instructions will entitle the DFCCIL to *res-cind the contract* under clause 62 of these conditions.

26A. Deployment of Qualified Engineers at Work Sites by the Contractor: -

26A.1 The contractor shall also employ Qualified Graduate Engineer(s) or equivalent, or Qualified Diploma Engineer(s), as per Clause 2.3 of Special Conditions, Section-2 of Part-I Chapter-V OF TENDER DOCUMENT.

26A.2 In case qualified Engineer as per clause 26.A.1 is/are absent from site for more than a week period in a month when work is in progress of relevant discipline, then deduction on account of non providing qualified Engineer will be done on pro-rata basis for whole absentee period.

26A.3 Deleted

27.(1) Workmanship and testing:- The whole of the works and / or supply of materials specified and provided in the contract or that may be necessary to be done in

order to form and complete any part thereof shall be executed in the best and most substantial workman like manner with materials of the best and most approved quality of their respective kinds, agreeable to the particulars contained in or implied by the specifications and as referred to in and represented by the drawings or in such other additional particulars, instructions and drawings given during the carrying on of the works and to the entire satisfaction of the Engineer according to the instructions and directions which the contractors may from time to time receive from the Engineer. The materials may be subjected to tests by means of such machines, instruments and appliances as the Engineer may direct and wholly at the expense of the contractor.

27.(2) Removal of improper work and materials: - The Engineer or the Engineer's Representative shall be entitled to order from time to time:

- (a) The removal from the site within the time specified in the order of any materials which in his opinion are not in accordance with the specifications or drawings.
- (b) The substitution of proper and suitable materials, and
- (c) the removal and proper re-execution, notwithstanding any previous tests thereof or on account payments therefore, of any work which in respect of materials or workmanship; is not in his opinion in accordance with the specifications and in case of default on the part of the contractor in carrying out such order the DFCCIL shall be entitled to **rescind the contract** under clause 62 of these conditions.
- (d) The provision of Construction and Demolition Waste Management Rule 2016 issued by Ministry of Environment Forest and Climate Change dated 29.03.2016 and published in the Gazette of India, Part – II, Section -3, Sub-section (ii) are binding upon the Contractor. Contractor shall implement these provisions at worksites, for which no extra payment will be payable.

28. Facilities for inspection:- The contractor shall afford the Engineer and the Engineer's Representative every facility for entering in and upon every portion of the work at all hours for the purpose of inspection or otherwise and shall provide all labour, materials, planks, ladders, pumps, appliances and things of every kind required for the purpose and the Engineer and the Engineer's Representative shall at all times have free access to every part of the works and to all places at which materials for the works are stored or being prepared.

29. Examination of work before covering up:- The contractor shall give 7 days' notice to the Engineer or the Engineer's representative whenever any work or materials are intended to be covered up in the earth, in bodies or walls or otherwise to be placed beyond the reach of measurements in order that the work may be inspected or that correct dimensions may be taken before being so covered, placed beyond the reach of measurement in default whereof, the same shall at the option of the Engineer or the

Engineer's representative be uncovered and measured at the contractor's expense or no allowance shall be made for such work or materials.

30. Temporary Works: - All temporary works necessary for the proper execution of the works shall be provided and maintained by the contractor and subject to the consent of the Engineer shall be removed by him at his expenses when they are no longer required and in such manner as the Engineer shall direct. In the event of failure on the part of the contractor to remove the temporary works, the Engineer will cause them to be removed and cost as increased by supervision and other incidental charges *shall be recovered from the contractor*. If temporary huts are provided by the contractor on the Railway land for labour engaged by him for the execution of works, the contractor shall arrange for handing over vacant possession of the said land after the work is completed; if the contractor's labour refuse to vacate, and have to be evicted by the Railway necessary expenses incurred by the Railway in connection therewith shall be borne by the contractor.

31.(1) Contractor to supply water for works: - Unless otherwise provided in the contract, the contractor shall be responsible for the arrangements to obtain supply of water necessary for the works.

31.(2) Deleted

31.(3) Deleted

31.(4)(a) Contractor to arrange supply of Electric power for works: - Unless otherwise provided in the contract, the contractor shall be responsible for arrangements to obtain supply of electric power for the works.

31.(4)(b) Deleted

32. Property in materials and plant: - The materials and plant brought by the Contractor upon the site or on the land occupied by the Contractor in connection with the works and intended to be used for the execution thereof shall immediately, they are brought upon the site of the said land, be deemed to be the property of the DFCCIL. Such of them as during the progress of the works are rejected by the Engineer under Clause 25 of these conditions or are declared by him not to be needed for the execution of the works or such as on the grant of the certificate of completion remain unused shall immediately on such rejection, declaration or grant cease to be deemed the property of the DFCCIL and the Contractor may then (*but not before*) remove them from the site or the said land. This clause shall not in any way diminish the liability of the Contractor nor shall the DFCCIL be in any way answerable for any loss or damage which may happen to or in respect of any such materials or plant either by the same being lost, stolen, injured or destroyed by fire, tempest or otherwise.

33. (1) Deleted

33.(2) Deleted

34.(1)Precaution during progress of works:- During the execution of works, unless otherwise specified, the Contractor shall at his own cost provide the materials for and execute all shoring, timbering and strutting works as is necessary for the stability and safety of all structures, excavations and works and shall ensure that no damage, injury or loss is caused or likely to be caused to any person or property.

34.(2)Roads and Water courses: - Existing roads or water courses shall not be blocked, cut through, altered, diverted or obstructed in any way by the Contractor, except with the permission of the Engineer. All compensations claimed for any unauthorized closure, cutting through, alterations, diversion or obstruction to such roads or water courses by the Contractor or his agent or his staff shall be recoverable from the Contractor's bill/security deposit or any other dues of contractor with the Government of India or DFCCIL.

34.(3)Provision of access to premises:- During progress of work in any street or thoroughfare, the Contractor shall make adequate provision for the passage of traffic, for securing safe access to all premises approached from such street or thoroughfare and for any drainage, water supply or means of lighting which may be interrupted by reasons of the execution of the works and shall erect and maintain at his own cost barriers, lights and other safeguards as prescribed by the Engineer, for the regulation of the traffic, and provide watchmen necessary to prevent accidents. The works shall in such cases be executed night and day if, so ordered by the Engineer and with such vigour so that the traffic way be impeded for as short a time as possible.

34.(4)Safety of Public: - The Contractor shall be responsible to take all precautions to ensure the safety of the public whether on public or DFCCIL property and shall post such look out men as may in the opinion of the Engineer, be required to comply with regulations appertaining to the work. Contractor shall ensure placement of barricading/partitions at the place of work to ensure safety of habitants of adjacent area, failing which Engineer may advise stoppage of work as per his discretion.

34.(5)Display Board: - The contractor shall be responsible for displaying the details of works i.e. name of work, approximate cost, expected date of completion, name and address of the Contractor and address of Engineer on a proper steel Board of size not less than 1m x 1m.

35. Use of Explosives: Explosives shall not be used on the works or on the site by the Contractor without the permission of the Engineer and then also only in the manner and to the extent to which such permission is given. Where explosives are required for the works, they shall be stored in a special magazine to be provided by and at the cost of the Contractor in accordance with the Explosive Rules. The Contractor shall obtain the necessary license for the storage and the use of explosives. All operations in which or for which explosives are

employed shall be at the sole risk and responsibility of the Contractor and the Contractor shall indemnify the DFCCIL in respect thereof.

36.(1) Suspension of works:- The Contractor shall on the order of the Engineer, suspend the progress of the works or any part thereof for such time or times and in such manner as the Engineer may consider necessary and shall during such suspension properly protect and secure the work so far as is necessary in the opinion of the Engineer. If such suspension is: -

- (a) Provided for in the contract, or
- (b) Necessary for the proper execution of the works or by the reason of weather conditions or by some default on the part of the Contractor, and/or
- (c) Necessary for the safety of the works or any part thereof.

36.(2) The Contractor shall not be entitled to the extra costs, if any, incurred by him during the period of suspension of the works, but in the event of any suspension ordered by the Engineer for reasons other than aforementioned and when each such period of suspensions exceeds 14 days, the contractor shall be entitled to such extension of time for completion of the work as the Engineers may consider proper having regard to the period or periods of such suspensions and to such compensations as the Engineer may consider reasonable in respect of salaries or wages paid by the Contractor to his employees during the periods of such suspension.

36.(3) Suspension lasting more than 3 months:- If the progress of the works or any part thereof is suspended on the order of the Engineer for more than three months at a time, the Contractor may serve a written notice on the Engineer requiring permission within 15 days from the receipt thereof to proceed with the works or that part thereof in regard to which progress is suspended and if such permission is not granted within that time the Contractor by further written notice so served may, but is not bound to, elect to treat the suspension where it affects part only of the works as an omission of such part or where it affects the whole of the works, as an abandonment of the contract by the DFCCIL.

37. Rates for items of works:- The rates, entered in the accepted Schedule of Rates of the Contract are intended to provide for works duly and properly completed in accordance with the general and special (if any) conditions of the contract and the specifications and drawings together with such enlargements, extensions, diminutions, reductions, alterations or additions as may be ordered in terms of Clause 42 of these conditions and without prejudice to the generality thereof and shall be deemed to include and cover superintendence and labour, supply, including full freight of materials, stores, patterns, profiles, moulds, fittings, centring, scaffolding, shoring props, timber, machinery, barracks, tackle, roads, pegs, posts, tools and all apparatus and plant required on the works, except such tools, plant or materials as may be specified in the contract to be supplied to the Contractor by the DFCCIL, the erection, maintenance and removal of all temporary

works and, buildings, all watching, lighting, bailing, pumping and draining, all prevention of or compensation for trespass, all barriers and arrangements for the safety of the public or of employees during the execution of works, all sanitary and medical arrangements for labour camps as may be prescribed by the DFCCIL, the setting of all work and of the construction, repair and upkeep of all centre lines, bench marks and level pegs thereon, site clearance, all fees duties, royalties, rent and compensation to owners for surface damage or taxes and impositions payable to local authorities in respect of land, structures and all material supplied for the work or other duties of expenses for which the Contractor may become liable or may be put to under any provision of law for the purpose of or in connection with the execution of the contract, and all such other incidental charges or contingencies as may have been specially provided for in the specifications.

However, if rates of existing GST or cess on GST for Works Contract is increased or any new tax / cess on Works Contract is imposed by Statute after the date of opening of tender but within the original date of completion/date of completion extended under clause 17 & 17A and the Contractor thereupon properly pays such taxes/cess, the Contractor shall be reimbursed the amount so paid.

Further, if rates of existing GST or cess on GST for Works Contract is decreased or any tax/cess on Works Contract is decreased / removed by Statute after the date of opening of tender, the reduction in tax amount shall be recovered from Contractor's bills/Security Deposit or any other dues of Contractor with the Government of India or DFCCIL.

38. Deleted

39.(1) Rates for extra items of works:- Any item of work carried out by the Contractor on the instructions of the Engineer which is not included in the accepted schedules of rates shall be executed at the rates set forth in the "Delhi Schedule of Rates of CPWD" modified by the tender percentage and such items are not contained in the latter, at the rate agreed upon between the Engineer and the Contractor before the execution of such items of work and the Contractors shall be bound to notify the Engineer at least seven days before the necessity arises for the execution of such items of works that the accepted schedule of rates does not include rate or rates for the extra work involved. The rates payable for such items shall be decided at the meeting to be held between the Engineer and Contractor, in as short a period as possible after the need for the special item has come to the notice. In case the Contractor fails to attend the meeting after being notified to do so or in the event of no settlement being arrived at, the DFCCIL shall be entitled to execute the extra works by other means and the Contractor shall have no claim for loss or damage that may result from such procedure.

The assessment of rates for extra items shall be arrived at based on the prevailing rates and by taking guidance from the following documents in order of priority:

- (i) Analysis of Delhi Schedule of Rates issued by CPWD

- (ii) Analysis of Unified Schedule of Rates of Indian Railways
- (iii) Market Analysis

39.(2) Provided that if the Contractor commences work or incurs any expenditure in regard thereto before the rates as determined and agreed upon as lastly hereunto fore-mentioned, then and in such a case the Contractor shall only be entitled to be paid in respect of the work carried out or expenditure incurred by him prior to the date of determination of rates as aforesaid according to the rates as shall be fixed by the Engineer. However, if the Contractor is not satisfied with the decision of the Engineer in this respect, he may appeal to the CGM within 30 days of getting the decision of the Engineer, supported by analysis of the rates claimed. The CGM's decision after hearing both the parties in the matter would be final and binding on the Contractor and the DFCCIL.

40. (1)Handing over of works: - The Contractor shall be bound to hand over the works executed under the contract to the DFCCIL complete in all respects to the satisfaction of the Engineer. The Engineer shall determine the date on which the work is considered to have been completed, in support of which his certificate shall be regarded as sufficient evidence for all purposes. The Engineer shall determine from time to time, the date on which any particular section of the work shall have been completed, and the contractor shall be bound to observe any such determination of the Engineer.

40.(2)Clearance of site on completion: - On completion of works, the Contractor shall clear away and remove from the site all constructional plant, surplus materials, rubbish and temporary works of every kind and leave the whole of the site and works clean and in a workman like condition to the satisfaction of the Engineer. No final payment in settlement of the accounts for the works shall be paid, held to be due or shall be made to the, Contractor till, in addition to any other condition necessary for final payment, site clearance shall have been affected by him, and such clearance may be made by the Engineer at the expense of the Contractor in the event of his failure to comply with this provision within 7 days after receiving notice to that effect. Should it become necessary for the Engineer/DFCCIL to have the site cleared at the expenses of the Contractor, the DFCCIL shall not be held liable for any loss or damage to such of the Contractor's property as may be on the site and due to such removal there from which removal may be effected by means of public sales of such materials and property or in such a way as deemed fit and convenient to the Engineer.

Clause 40A: At the final stage of completion and commissioning of work, in case the contractor's failure is limited to only some of the works costing not more than 2% of the original contract value, and the Contractor request the Engineer that such works may be offloaded from him and got executed through another agency and additional cost incurred, if any, should be recovered from his dues; the Engineer on being convinced that the anticipated additional cost for such works will not be substantial and can be recovered from the dues of the contractor and that such offloading will help in completion and commissioning of work, may agree to such offloading without any adverse repercussion on the performance guarantee and security deposit of the Contractor. However, the Engineer

will not be under any compulsion to agree to such a request. Further, before issuing letter of acceptance to another agency for such work, the Contractor shall be informed of the rates at which the work will be got executed and the Contractor should give his consent to do so and certify that he would have no future claim on this account and that the extra expenditure so incurred, if any, by the Engineer in getting the offloaded work done, shall be recovered from subsequent Bills or any other dues of the Contractor. In case the Contractor fails to give such consent within three working days, the Engineer may treat the same as not acceptable to Contractor and proceed accordingly. In any case, DFCCIL shall deduct 10% of cost of such work or Rs one lakh whichever is lower, from the Contractor's dues as administrative charges for the process of finalizing new agency for such work irrespective of whether or not such work is finally offloaded from Contractor or not.

VARIATIONS IN EXTENT OF CONTRACT

- 41. Modification to contract to be in writing:** - In the event of any of the provisions of the contract required to be modified after the contract documents have been signed, the modifications shall be made in writing and signed by the DFCCIL and the Contractor and no work shall proceed under such modifications until this has been done. Any verbal or written arrangement abandoning, modifying, extending, reducing or supplementing the contract or any of the terms thereof shall be deemed conditional and shall not be binding on the DFCCIL unless and until the same is incorporated in a formal instrument and signed by the DFCCIL and the Contractor, and till then the DFCCIL shall have the right to repudiate such arrangements.
- 42.(1) Powers of modification to contract:-** The Engineer on behalf of the DFCCIL shall be entitled by order in writing to enlarge or extend, diminish or reduce the works or make any alterations in their design, character position, site, quantities, dimensions or in the method of their execution or in the combination and use of materials for the execution thereof or to order any additional work to be done or any works not to be done and the contractor will not be entitled, to any compensation for any increase/reduction in the quantities of work but will be paid only for the actual amount of work done and for approved materials supplied against a specific order.
- 42.(2) (i)** Unless otherwise specified in the contract, the accepted variation in quantity of each individual item of the contract would be up to 25% of the quantity originally contracted, except in case of foundation work.
- (ii) The contractor shall be bound to carry out the work at the agreed rates and shall not be entitled to any claim or any compensation whatsoever up to the limit of 25% variation in quantity of individual item of works.

(iii) In case an increase in quantity of an individual item by more than 25% of the agreement quantity is considered unavoidable, then same shall be excuted at following rates:

(a)Quantities operated in excess of 125% but upto 140% of the agreement quantity of the concerned item, shall be paid at 98% of the rate awarded for that item in that particular tender;

(b)Quantities operated in exess of 140% but upto 150% of the agreement quantity of the concerned item shall be paid 96% of the rate awarded for that item in that particular tender;

(c)Variation in quantity of individual items beyond 150% will be avoided and would be permitted only in exceptional unavoidable circumstances and shall be paid at 96% of the rate awarded for that item in that particular tender.

(d)Variation to quantities for Minor value item:

The limit for varying quantities for minor value items shall be 100% (as against 25% prescribed for other items). A minor value item for this purpose is defined as an item whose original agreement value is less than 1% of the total original agreement value.

(i) Quantities operated upto and including 100% of the agreement quantity of the concerned minor value item, shall be paid at the rate awarded for that item in that particular tender;

(ii) Quantities operated in excess of 100% but upto 200% of the agreement quantity of the concerned minor value item, shall be paid at 98% of the rate awarded for that item in that particular tender;

(iii)Variation in quantities of individual minor value item beyond 200% will be avoided and would be permitted only in exceptional unavoidable circumstances and shall be paid at 96% of the rate awarded for that item in that particular tender.

(iv)In case of earthwork, the variation limit of 25% shall apply to the gross quantity of earth work and variation in the quantities of individual classifications of soil shall not be subject to this limit.

(v) In case of foundation work, no variation limit shall apply and the work shall be carried out by the contractor on agreed rates irrespective of any variation.

(vi)As far as SOR items are concerned, the limit of 25% would apply to the value

of SOR schedule as a whole and not on individual SOR items. However, in case of NS items, the limit of 25% would apply on the individual items irrespective of the manner of quoting the rate (single percentage rate or individual item rate).

42.(3)Valuation of variations:- The enlargements, extensions, diminution, reduction, alterations or additions referred to in sub-clause (2) of this clause shall in no degree affect the validity of the contract but shall be performed by the Contractor as provided therein and be subject to the same conditions, stipulations and obligations as if they had been originally and expressively included and provided for in the specifications and drawings and the amounts to be paid therefore shall be calculated in accordance with the accepted schedule of rates. Any extra items / quantities of work falling outside the purview of the provisions of sub-clause (2) above shall be paid for at the rates determined under clause-39 of these conditions.

CLAIMS

43.(1)Quarterly Statement of Claims: The Contractor shall prepare and furnish to the Engineer/DFCCIL once in every quarter commencing from the month following the month of issue of Letter of Acceptance, an account giving full and detailed particulars of all claims for any additional expenses to which the Contractor may consider himself entitled to and of all extra or additional works ordered by the Engineer which he has executed during the preceding ~~month~~ quarter and no claim for payment for such work will be considered which has not been included in such particulars.

43.(2)Signing of “No Claim” Certificate:- The Contractor shall not be entitled to make any claim whatsoever against the DFCCIL under or by virtue of or arising out of this contract, nor shall the DFCCIL entertain or consider any such claim, if made by the Contractor, after he shall have signed a “No Claim” Certificate in favour of the DFCCIL in such form as shall be required by the DFCCIL after the works are finally measured up. The contractor shall be debarred from disputing the correctness of the items covered by “No Claim” Certificate or demanding a clearance to arbitration in respect thereof.

MEASUREMENTS, CERTIFICATES AND PAYMENTS

44. Quantities in schedule annexed to Contract: - The quantities set out in the accepted schedule of rates with items of works quantified are the estimated quantities of the works and they shall not be taken as the actual and correct quantities of the work to be executed by the Contractor in fulfilment of his obligations under the contract.

45.(i)Measurement of works:- The Contractor shall be paid for the works at the rates in the accepted schedule of rates and for extra works at rates determined under Clause 39 of these

conditions on the measurements taken by the Engineer or the Engineer's representative in accordance with the rules prescribed for the purpose by the DFCCIL. The quantities for items the unit of which in the accepted schedule of rates is 100 or 1000 shall be calculated to the nearest whole number, any fraction below half being dropped and half and above being taken as one; for items the unit of which in the accepted schedule of rates is single, the quantities shall be calculated to two places of decimals. Such measurements will be taken of the work in progress from time to time and at such intervals as in the opinion of the Engineer shall be proper having regard to the progress of works. The date and time on which "on account" or final measurements are to be made shall be communicated to the Contractor who shall be present at the site and shall sign the results of the measurements (which shall also be signed by the Engineer or the Engineer's representative) recorded in the official measurements book as an acknowledgement of his acceptance of the accuracy of the measures. Failing the Contractor's attendance, the work may be measured up in his absence and such measurements shall, notwithstanding such absence, be binding upon the Contractor whether or not he shall have signed the measurement books provided always that any objection made by him to measurement shall be duly investigated and considered in the manner set out below: -

- (a) It shall be open to the Contractor to take specific objection to any recorded measurements or Classification on any ground within seven days of the date of such measurements. Any re-measurement taken by the Engineer or the Engineer's representative in the presence of the Contractor or in his absence after due notice has been given to him in consequence of objection made by the Contractor shall be final and binding on the Contractor and no claim whatsoever shall thereafter be entertained regarding the accuracy and classification of the measurements.
- (b) If an objection raised by the Contractor is found by the Engineer to be incorrect the Contractor shall be liable to pay the actual expenses incurred in measurements.

45. (ii) Measurement of works by Contractor's Authorized Representative (In case the Contract provides for the same)

- (a) The Contractor shall be paid for the works at the rates in the accepted Schedule of Rates and for extra works at rates determined under Clause 39 of these Conditions on the measurements taken by the contractor's authorized engineer in accordance with the rules prescribed for the purpose by DFCCIL. The quantities for items the unit of which in the accepted Schedule of Rates is 100 or 1000 shall be calculated to the nearest whole number, any fraction below half being dropped and half above being taken as one; for items the unit of which in the accepted Schedule of Rates is single, the quantity shall be calculated to two places of decimals. Such measurements will be taken of the works in progress from time to time. The date and time on which 'on account or final' measurements are to be made shall be communicated to the Engineer.

Date and time of test checks shall be communicated to the Contractor, who shall be present at the site and shall witness the test checks, failing Contractor's adherence, the test check may be conducted in his absence and such test checks shall not, withstanding such absence be binding upon Contractor provided always that any objections made by Contractor to test check shall be duly investigated and considered in the manner set out below:

- (i) It shall be open to Contractor to take specific objections to test check of any recorded measurements within 7 days of date of such test checks. Any re-test check done by the concerned DFCCIL's Authority in the presence of the Contractor or in his absence after due notice, given to him in consequent of objections made by the Contractor shall be final and binding on the Contractor and no claim whatsoever shall thereafter be entertained regarding the accuracy and classification of the measurements.
- (ii) If an objection raised by the Contractor is found by the Engineer to be incorrect, the Contractor shall be liable to pay the actual expenses incurred in measurements.

(b) **Incorrect measurement/action to be taken:** If in case during test check or otherwise, it is detected by the Engineer that Agency has claimed any exaggerated measurement or as claimed any false measurement for the work which have not been executed; amounting to variation of 5% or more of claimed gross bill amount, action shall be taken as following:

- (i) On first occasion of noticing, exaggerated/false measurement, Engineer shall impose a penalty of 10% of claimed gross bill value.
- (ii) On any next occasion of noticing any exaggerated/false measurement, DFCCIL shall impose penalty of 15% of claimed gross bill value. In addition, the facility of recording of measurement by Contractor as well as release of provisional payment shall be withdrawn. Once withdrawn, measurement shall be done by DFCCIL as per Clause-45(i) above.

46. (1) " On-Account" Payments: - The Contractor shall be entitled to be paid from time to time by way of "One-Account" payment only for such works as in the opinion of the Engineer he has executed in terms of the contract. All payments due on the Engineer's representative's certificates of measurements or Engineer's Certified "Contractor's Authorized Engineer's measurements" shall be subject to any deductions which may be made under these presents and shall further be subject to, unless otherwise required by Clause 16 of these conditions, a retention of ten percent by way of security deposits, until the amount of security deposit by way of retained earnest money and such retentions shall amount to 5% of the total value of the contract provided always that the Engineer may by any certificate make any correction or modification in any previous certificate which shall have been issued by him and that the Engineer may

withhold any certificate if the works or any part thereof are not being carried out to his satisfaction.

46.(2) Rounding off amounts: - The total amount due on each certificate shall be rounded off to the nearest rupee i.e. sum less than 50 paise shall be omitted and sums of 50 paise and more upto Re. 1/- will be reckoned as Re. 1/-.

46.(3) On Account Payments not prejudicial to final settlement:- “On- Account” payments made to the ‘Contractor shall be without prejudice to the final making up of the accounts (except where measurements are specifically noted in the Measurement Book as “Final Measurements” and as such have been signed by the Contractor Engineer’s/Engineer’s Representative) and shall in no respect be considered or used as evidence of any facts stated in or to be inferred from such accounts nor of any particular quantity of work having been executed nor of the manner of its execution being satisfactory.

46.(4)Manner of payment: - Unless otherwise specified payments to the Contractor will be transferred electronically to his bank account.

46A PRICE VARIATION CLAUSE:

46A.1Applicability: Price Variation Clause (PVC) shall be applicable only in those contracts where tender conditions specifically permits it. Materials supplied free of cost by Railway to the Contractors and any extra item(s) included in subsequent variation falling outside the purview of the Schedule of Items of tender shall fall outside the purview of Price Variation Clause. If, in any case, accepted offer includes some specific payment to be made to consultants or some materials supplied by Railway free or at fixed rate, such payments shall be excluded from the gross value of the work for the purpose of payment/recovery of price variation.

46A.2Base Month: The Base Month for ‘Price Variation Clause’ shall be taken as month 28 days prior to opening of tender including extensions, if any, unless otherwise stated elsewhere. The quarter for applicability of PVC shall commence from the month following Base Month. The Price Variation shall be based on the average Price Index of the quarter under consideration.

46A.3Validity:

Rates accepted by Railway Administration shall hold good till completion of work and no additional individual claim shall be admissible except:

- (a) Payment/recovery for increase/decrease in GST on works contract or imposition/removal of any tax/cess on Works Contract as per Clause 37,
- (b) Payment/recovery for overall market situation as per Price Variation Clause given hereunder.

46A.4 Adjustment for variation in prices of material, labour, fuel, explosives, detonators, steel, concreting, ferrous, non-ferrous, insulators, zinc and cement shall be determined in the manner prescribed.

46A.5 Components of various items in a contract on which variation in prices be admissible, shall be Material, Labour, Fuel, Explosives & Detonators, Steel, Cement, Concreting, Ferrous, Non-ferrous, Insulator, Zinc, Erection etc. However, for fixed components, no price variation shall be admissible.

46A.6 The percentages of labour component, material component, fuel component etc. in various types of Engineering contracts shall be as under:

S. No	Component	E/Work & Minor Bridges Contracts, Ballast Supply Contracts, Tunneling Contracts (without explosive)	Tunneling Contracts (with explosives)	Major and Important Bridges Contracts	Building Contracts	Permanent Way linking Contracts (Manual)	Other Works Contracts
1	Labour Component	20	20	20	40	50	20
2	Other Material Components	10	15	30	35	5	20
3	Plant Machinery & Spares	30	15	20	5	15	30
4	Fuel & Lubricants Component	25	15	15	5	15	15
5	Fixed Component*	15	15	15	15	15	15
6	Detonators & Explosive Component	-	20	-	-	-	-

* It shall not be considered for any price variation.

46A.7 Formulae: The Amount of variation in prices in several components (labour, material etc.) shall be worked out by the following formulae:

$$(i) \quad L = \frac{W \times (L_Q - L_B)}{L_B} \times \frac{LC}{100}$$

$$(ii) \quad M = \frac{W \times (M_Q - M_B)}{M_B} \times \frac{MC}{100}$$

$$\begin{aligned}
\text{(iii) } F &= \frac{W \times (F_Q - F_B) \times F_C}{F_B \times 100} \\
\text{(iv) } E &= \frac{W \times (E_Q - E_B) \times E_C}{E_B \times 100} \\
\text{(v) } PM &= \frac{W \times (PM_Q - PM_B) \times PM_C}{PM_B \times 100} \\
\text{(vi) } S &= \frac{S_W \times (S_Q - S_B)}{S_B} \\
\text{(vii) } C &= C_V \times (C_Q - C_B) / C_B
\end{aligned}$$

For Railway Electrification Works:

$$\begin{aligned}
\text{(viii) } T &= [(C_S - C_O) / C_O \times 0.4136] \times T_C \\
\text{(ix) } R &= [(R_T - R_O) / R_O + (Z_T - Z_O) / Z_O \times 0.06] \times R_C \\
\text{(x) } N &= [(P_T - P_O) / P_O] \times N_C \\
\text{(xi) } Z &= [(Z_T - Z_O) / Z_O] \times Z_C \\
\text{(xii) } I &= [(I_T - I_O) / I_T] \times 85
\end{aligned}$$

Where,

L	Amount of price variation in Labour
M	Amount of price variation in Materials
F	Amount of price variation in Fuel
E	Amount of price variation in Explosives
PM	Amount of price variation in Manufacture of machinery for mining, Quarrying and Construction
S	Amount of price variation in Steel
C	Amount of price variation in Cement
T	Amount of price variation in Concreting
R	Amount of price variation in Ferrous Items
N	Amount of price variation in Non-Ferrous Items
Z	Amount of price variation in Zinc
I	Amount of price variation in Insulator
L _C	% of Labour Component
M _C	% of Material Component
F _C	% of Fuel Component
E _C	% of Explosive Component
PM _C	% of Manufacture of machinery for mining, Quarrying and Construction Component
T _C	% of Concreting Component
R _C	% of Ferrous Component
N _C	% of Non-Ferrous Component
Z _C	% of Zinc Component
W	Gross value of work done by Contractor as per on-account bill(s) excluding cost of materials supplied by Railway at fixed price, minus the price values of cement and steel. This will also exclude specific payment, if any, to be made to

	the consultants engaged by Contractors (such payment shall be indicated in the Contractor's offer)
L _B	Consumer Price Index for Industrial Workers - All India: Published in R.B.I. Bulletin for the base period
L _Q	Consumer Price Index for Industrial Workers - All India: Published in R.B.I. Bulletin for the average price index of the 3 months of the quarter under consideration
M _B	Wholesale Price Index: All commodities – as published in the R.B.I. Bulletin for the base period
M _Q	Wholesale Price Index: All commodities – as published in the R.B.I. Bulletin for the average price index of the 3 months of the quarter under consideration
F _B	Wholesale Price Index for the group Fuel & Power as published in the R.B.I. Bulletin for the base period
F _Q	Index Number of Wholesale Price Index – By Groups and Sub-Groups for the group Fuel & Power as published in the R.B.I. Bulletin for the average price index of the 3 months of the quarter under consideration
E _B	Index number of Monthly Whole Sale Price Index for the category 'Explosive' of (g). Manufacture of other chemical products under (J). MANUFACTURE OF CHEMICALS AND CHEMICAL PRODUCTS, published by Office of Economic Adviser, Govt. of India, Ministry of Commerce & Industry, Department of Industrial Policy & Promotion (DIPP), for the base period.
E _Q	Index number of Monthly Whole Sale Price Index for the category 'Explosive' of (g). Manufacture of other chemical products under (J). MANUFACTURE OF CHEMICALS AND CHEMICAL PRODUCTS, published by Office of Economic Adviser, Govt. of India, Govt. of India, Ministry of Commerce & Industry, Department of Industrial Policy & Promotion (DIPP), for the average price index of 3 months of the quarter under consideration.
PM _B	Index number of Monthly Whole Sale Price Index for the category 'k. Manufacture of machinery for mining, quarrying and construction' under (R) MANUFACTURE OF MACHINERY AND EQUIPMENT, published by Office of Economic Adviser, Govt. of India, Ministry of Commerce & Industry, Department of Industrial Policy & Promotion (DIPP), for the base period.
PM _Q	Index number of Monthly Whole Sale Price Index for the category 'k. Manufacture of machinery for mining, quarrying and construction' under (R) MANUFACTURE OF MACHINERY AND EQUIPMENT, published by Office of Economic Adviser, Govt. of India, Ministry of Commerce & Industry, Department of Industrial Policy & Promotion (DIPP), for the average price index of 3 months of the quarter under consideration.
S _W	Gross value of steel supplied by the Contractor as per the 'on-account' bill for the month under consideration
S _B	Index number of Monthly Whole Sale Price Index for the relevant category of mild steel item as mentioned in Clause 46A.9, published by Office of Economic Adviser, Govt. of India, Ministry of Commerce & Industry Department of Industrial Policy & Promotion (DIPP); for the base period.
S _Q	Index number of Monthly Whole Sale Price Index for the relevant category of mild steel item as mentioned in Clause 46A.9, published by Office of Economic Adviser, Govt. of India, Ministry of Commerce & Industry Department of Industrial Policy & Promotion (DIPP); for the average price index of the 3 months of the quarter under consideration.
C _V	Value of Cement supplied by Contractor as per on account bill in the quarter under consideration

C _B	Index No. of Wholesale Price Index of sub-group Cement, Lime & Plaster as published in RBI Bulletin for the base period
C _Q	No. of Wholesale Price Index of sub-group Cement, Lime & Plaster as published in RBI Bulletin for the average price index of the 3 months of the quarter under consideration
C _S	RBI wholesale price index for Cement, Lime & Plaster for the month which is six months prior to date of casting of foundation
C _O	RBI wholesale price index for Cement, Lime & Plaster for the month which is one month prior to date of opening of tender
R _T	IEEMA price index for Iron & Steel for the month which is two months prior to date of inspection of material.
R _O	IEEMA price index for Iron & Steel for the month which is one month prior to date of opening of tender.
P _T	IEEMA price index for Copper wire bar for the month which is two months prior to date of inspection of material.
P _O	IEEMA price index for Copper wire bar for the month which is one month prior to date of opening of tender.
Z _T	IEEMA price index for Zinc for the month which is two months prior to date of inspection of material
Z _O	IEEMA price index for Zinc for the month which is one month prior to date of opening of tender
I _T	RBI wholesale price index for the sub-group “other Portland and Ceramic product” for the month which is two months prior to date of inspection of material
I _O	RBI wholesale price index for the sub-group “other Portland and Ceramic product” for the month which is one month prior to date of opening of tender

46A.8 The demands for escalation of cost shall be allowed on the basis of provisional indices as mentioned above in Clause 46A.7. Any adjustment needed to be done based on the finally published indices shall be made as and when they become available.

46A.9: Relevant categories of steel for the purpose of operating Price Variation formula as mentioned in this Clause shall be as under:

S. No.	Category of Steel Supplied in Railway Work	Category of Steel Items as mentioned in Office of Economic Adviser, Govt. of India, Ministry of Commerce & Industry Department of Industrial Policy & Promotion (DIPP).
1.	Reinforcement bars and other rounds	‘MS Bright Bars’ individual commodity of group item (d) Mild Steel-Long Products under (N) MANUFACTURE OF BASIC METAL.
2.	All types and–sizes of angles, channels and joists-	‘Angles, Channels, Sections, Steel’ individual commodity of group item (d) Mild Steel-Long Products under (N) MANUFACTURE OF BASIC METAL.
3.	All types and sizes of plates	‘e. Mild Steel – Flat Products’ of (N) MANUFACTURER OF BASIC METAL.
4.	Any other section of steel not covered in the above categories and excluding HTS	Average of price for the 3 categories covered under SL 1, 2 & 3 above

46A.10 Price Variation During Extended Period of Contract

The price adjustment as worked out above, i.e. either increase or decrease shall be applicable up to the stipulated date of completion of work including the extended period of completion where such extension has been granted under Clause 17-A, of the Indian Railways Standard General Conditions of Contract. However, where extension of time has been granted due to contractor's failure under Clause 17-B of the Standard General Conditions of Contract, price adjustment shall be done as follows:

- (a) In case the indices increase above the indices applicable to the last month of original completion period or the extended period under clause 17-A, the price adjustment for the period of extension granted under Clause 17-B shall be limited to the amount payable as per the indices applicable to the last month of the original completion period or the extended period under Clause 17- A of the Standard General Conditions of Contract; as the case may be.
- (b) In case the indices fall below the indices applicable to the last month of original/extended period of completion under clause 17-A, as the case may be; then the lower indices shall be adopted for the price adjustment for the period of extension under Clause 17-B of the Standard General Conditions of Contract.

47.0 Maintenance of works :- The Contractor shall at all times during the progress and continuance of the works and also for the period of Defect Liability (**Defect Liability period**) specified in the Tender Form after the date of issue of the certificate of completion by the Engineer or any other earlier date subsequent to the completion of the works that may be fixed by the Engineer be responsible for and effectively maintain and uphold in good substantial, sound and perfect condition all and every part of the works and shall make good from time to time and at all times as often as the Engineer shall require, any damage or defect that may during the above period arise in or be discovered or be in any way connected with the works, provided that such damage or defect is not directly caused by errors in the contract documents, act of providence or insurrection or civil riot, and the contractor shall be liable for and shall pay and make good to the DFCCIL or other persons legally entitled thereto whenever required by the Engineer so to do, all losses, damages, costs and expenses they or any of them may incur or be put or be liable to by reasons or in consequence of the operations of the Contractor or of his failure in any respect.

48.(1) Certificate of completion of works:- As soon as in the opinion of the Engineer, the works has been completed and has satisfactorily passed any final test or tests that may be prescribed, the Engineer shall issue a certificate of completion duly indicating the date of completion in respect of the work and the period of maintenance of the work shall commence from the date of completion mentioned in such certificate. The certificate, inter alia, should mention that the work has been completed in all respects and that all the contractual obligations have been fulfilled by the Contractor and that there is no due from

the Contractor to DFCCIL against the contract concerned.

The Engineer may also issue such a certificate indicating date of completion with respect to any part of the work (*before the completion of the whole of work*), which has been both completed to the satisfaction of the Engineer and occupied or used by the DFCCIL. When any such certificate is given in respect of part of a work, such part shall be considered as completed and the period of maintenance of such part shall commence from the date of completion mentioned in the completion certificate issued for that part of the work.

48.(2) Contractor not absolved by completion Certificate:- The Certificate of completion in respect of the works referred to in sub-clause (1) of this clause shall not absolve the Contractor from his liability to make good any defects imperfections, shrinkages or faults which may appear during the period of maintenance specified in the tender arising in the opinion of the Engineer from materials or workmanship not in accordance with the drawings or specifications or instruction of the Engineer, which defects, imperfections, shrinkages or faults shall upon the direction in writing of the Engineer be amended and made good by the Contractor at his own cost: and in case of default on the part of Contractor the Engineer may employ labour and materials or appoint another Contractor to amend and make good such defects, imperfections, shrinkages and faults and all expenses consequent thereon and incidental thereto shall be borne by the Contractor and shall be recoverable from any moneys due to him under the contract.

48.(3) Final Supplementary Agreement: After the work is completed or otherwise concluded by the parties with mutual consent, and taken over by the DFCCIL as per terms and conditions of the contract agreement, and there is unequivocal no claim on either side under the Contract other than as mentioned in item 4 of Form no. 20, the parties shall execute the Final Supplementary Agreement as per **Form No. 20**.

49. Approval only by maintenance Certificate: - No certificate other than maintenance certificate referred to in Clause 50 of the conditions shall be deemed to constitute approval of any work or other matter in respect of which it is issued or shall be taken as an admission of the due performance of the contract or any part thereof.

50.(1) Maintenance Certificate: - The Contract shall not be considered as completed until a Maintenance Certificate shall have been signed by the Engineer stating that the works have been completed, Defect liability Period is over and created asstes are maintained to his satisfaction. The Maintenance Certificate shall be given by the Engineer upon the expiration of the Defect liability Period or as soon thereafter as any works ordered during such period pursuant to sub clause (2) Clause 48 of these conditions shall have been completed to the satisfaction of the Engineer and full effect shall be given to this Clause notwithstanding the taking possession of or using the works or any part thereof by the DFCCIL.

The Competent Authority to issue above Maintenance Certificate shall normally be the authority who is competent to sign the contract. If this Competent Authority is of the rank lower than Dy.CPM Grade, then a Dy.CPM Grade Officer (concerned with the work) should issue the Certificate. The Certificate, inter alia, should mention that the work has been completed in all respects and that all the contractual obligations have been fulfilled by the Contractor and that there is no due from the Contractor to DFCCIL against the contract concerned.

50.(2) Cessation of DFCCIL Liability: - The DFCCIL shall not be liable to the Contractor for any matter arising out of or in connection with the contract of the execution of the works unless the contractor has made a claim in writing in respect thereof before the issue of the Maintenance Certificate under this clause.

50.(3) Unfulfilled Obligations: - Notwithstanding the issue of the Maintenance certificate the Contractor and (*subject to sub-clause 2 of this clause*) the DFCCIL shall remain liable for the fulfilment of any obligation incurred under the provision of the contract prior to the issue of the Maintenance Certificate which remains unperformed at the time such certificate is issued and for the purposes of determining the nature and extent of any such obligations the contract shall be deemed to remain in force between the parties thereto.

51.(1) Final Payment:- On the Engineer's certificate of completion in respect of the works, adjustment shall be made and the balance of account based on the Engineer or the Engineer's representative's certified measurements or Engineer's certified "Contractor's Authorized Engineer's measurements" of the total quantity of work executed by the contractor upto the date of completion and on the accepted schedule or rates and for extra works on rates determined under Clause 39 of these conditions shall be paid to the Contractor subject always to any deduction which may be made under these presents and further subject to the Contractor having signed delivered to the Engineer either a full account in detail of all claims he may have on the DFCCIL in respect of the works or having delivered "No Claim Certificate" and the Engineer having after the receipt of such account given a certificate in writing that such claims are not covered under excepted matter i.e. Clauses 7 (j), 8, 18, 22(5), 39, 43(2), 45(i)(a), 55, 55-A(5), 57, 57A, 61(1), 61(2) and 62(1)(i) to (xv) (B) of Standard General Conditions of Contract or in any Clause (stated as excepted matter) of the Special Conditions of the Contract, that the whole of the works to be done under the provisions of the Contracts have been completed, that they have been inspected by him since their completion and found to be in good and substantial order, that all properties, works and things, removed, disturbed or injured in consequence of the works have been properly replaced and made good and all expenses and demands incurred by or made upon the DFCCIL for or in the respect of damage or loss by from or in consequence of the works, have been satisfied agreeably and in conformity with the contract.

51.(2) Post Payment Audit:- It is an agreed term of contract that the DFCCIL reserves to itself the right to carry out a post-payment audit and or technical examination of the works and the final bill including all supporting vouchers, abstracts etc. and to make a claim on the contractor for the refund any excess amount paid to him till the release of Security

Deposit of settlement of claims, which ever is later, if as a result of such examination any over-payment to him is discovered to have made in respect of any works done or alleged to have been done by him under the contract.

51A. Production of vouchers etc. by the Contractor: -

- (i) For a contract of more than one crore of rupees, the contractor shall, whenever required, produce or cause to be produced for examination by the Engineer any quotation, invoice, cost or other account, book of accounts, voucher, receipt, letter, memorandum, paper of writing or any copy of or extract from any such document and also furnish information and returns verified in such manner as may be required in any way relating to the execution of this contract or relevant for verifying or ascertaining cost of execution of this contract (the decision of the engineer on the question of relevancy of any documents, information or return being final and binding in the parties). The contractor shall similarly produce vouchers; etc., if required to prove to the Engineer, that materials supplied by him, are in accordance with the specifications laid down in the contract.
- (ii) If any portion of the work in a contract of value more than one crore of rupees be carried out by a sub-contractor or any subsidiary or allied firm or company (as per Clause 7 of the General Conditions of Contract), the Engineer shall have power to secure the books of such sub-contract or any subsidiary or allied firm or company, through the contractor, and such books shall be open to his inspection.
- (iii) The obligations imposed by sub clause (i) & (ii) above is without prejudice to the obligations of the contractor under any statute rules or orders binding on the contractor.

52.0 Withholding and lien in respect of sums claimed:- Whenever any claim or claims for payment of a sum of money arises out of or under the contract against the contractor, the DFCCIL shall be entitled to withhold and also have a lien to retain such sum or sums in whole or in part from the security, if any, deposited by the contractor and for the purpose aforesaid, the DFCCIL shall be entitled to withhold the said cash security deposit or the security if any, furnished as the case may be and also have a lien over the same pending finalization or adjudication of any such claim. In the event of the security being insufficient to cover the claimed amount or amounts or if no security has been taken from the contractor, the DFCCIL shall be entitled to withhold and have a lien to the extent of the such claimed amount or amounts referred to supra, from any sum or sums found payable or which at any time thereafter may become payable to the contractor under the same contract or any other contract with this or any other DFCCIL or any Department of the Central Government pending finalization or adjudication of any such claim.

It is an agreed term of the contract that the sum of money or moneys so withheld or retained under the lien referred to above, by the DFCCIL will be kept withheld or retained as such by the DFCCIL till the claim arising out of or under the contract is determined by the arbitrator (if the contract governed by the arbitration clause) or by the competent court as the case may be and that the contractor will have no claim for interest or damages whatsoever on any account in respect of such withholding or retention under the lien referred to supra and duly notified as such to the contractor. For the purpose of this clause, where the contractor is a partnership firm or a limited company, the DFCCIL shall be entitled to withhold and also have a lien to retain towards such claimed amount or amounts in whole or in part from any sum found payable to any partner/limited company, as the case may be whether in his individual capacity or otherwise.

52A. Lien in respect of claims in Other Contracts: -

- (i) Any sum of money due and payable to the contractor (including the security deposit returnable to him) under the contract may be withheld or retained by way of lien by the DFCCIL, against any claim of this or any other DFCCIL or any other Department of the Central Government in respect of a payment of a sum of money arising out of or under any other contract made by the contractor with this or any other Department of the Central Government.
- (ii) However, recovery of claims of DFCCIL in regard to terminated contracts may be made from the Final Bills, Security Deposits and Performance Guarantees of other contract or contracts, executed by the contractor. The Performance Guarantees submitted by the Contractor against other contracts, if required, may be withheld and encashed. In addition, 10% of each subsequent 'on-account bill' may be withheld, if required, for recovery of DFCCIL dues against the terminated contract.
- (iii) It is an agreed term of the contract that the sum of money so withheld or retained under this clause by the DFCCIL will be kept withheld or retained as such by the DFCCIL till the claim arising out of or under any other contract is either mutually settled or determined by arbitration, if the other contract is governed by arbitration clause or by the competent court as the case may be and contractor shall have no claim for interest or damages whatsoever on this account or on any other ground in respect of any sum of money withheld or retained under this clause and duly notified as such to the contractor.

53.0 Signature on Receipts for Amounts:- Every receipt for money which may become payable or for any security which may become transferable to the Contractors under these presents, shall, if signed in the partnership name by anyone of the partners of a Contractor's firm be a good and sufficient discharge to the DFCCIL in respect of the moneys or security purported to be acknowledged thereby and in the event of death of any of the Contractor, partners during the pendency of the contract it is hereby expressly agreed that every receipt by anyone of the surviving Contractor partners shall if so signed

as aforesaid be good a sufficient discharge as aforesaid provided that nothing in this clause contained shall be deemed to prejudice or effect any claim which the DFCCIL may hereafter have against the legal representative of any contractor partner so dying for or in respect to any breach of any of the conditions of the contract, provided also that nothing in this clause contained shall be deemed to prejudice or effect the respective rights or obligations of the Contractor partners and of the legal representatives of any deceased Contractor partners interse.

LABOUR

54.0 Wages to Labour: - The Contractor shall be responsible to ensure compliance with the provision of the Minimum Wages Act, 1948 (hereinafter referred to as the “said Act”) and the Rules made there under in respect of any employees directly or through petty contractors or subcontractors employed by him for the purpose of carrying out this contract.

If, in compliance with the terms of the contract, the Contractor supplied any labour to be used wholly or partly under the direct orders and control of the DFCCIL whether in connection with any work being executed by the Contractor or otherwise for the purpose of the DFCCIL such labour shall, for the purpose of this clause, still be deemed to be persons employed by the Contractor.

If any moneys shall, as a result of any claim or application made under the said Act be directed to be paid by the DFCCIL, such money shall be deemed to be moneys payable to the DFCCIL by the Contractor and on failure by the Contractor to repay the DFCCIL any moneys paid by it as aforesaid within seven days after the same shall have been demanded, the DFCCIL shall be entitled to recover the same from Contractor’s bills/Security Deposit or any other dues of Contractor with the Government of India or DFCCIL.

54A. Apprentices Act: - The Contractor shall be responsible to ensure compliance with the provisions of the Apprentices Act, 1961 and the Rules and Orders issued there under from time to time in respect of apprentices directly or through petty contractors or sub-contractors employed by him for the purpose of carrying out the Contract.

If the contractor directly or through petty contractors or sub-contractors fails to do so, his failure will be a breach of the contract and the DFCCIL may, in its discretion, rescind the contract. The contractor shall also be liable for any pecuniary liability arising on account of any violation of the provisions of the Act.

55. Provisions of payments of Wages Act: - The Contractor shall comply with the provisions of the Payment of Wages Act, 1936 and the rules made there under in respect of all employees employed by him either directly or through petty Contractors or sub-contractors in the works. If in compliance with the terms of the contract, the Contractor directly or through petty Contractors or sub-contractors shall supply any labour to be used wholly or

partly under the direct orders and control of the Engineer whether in connection with the works to be executed hereunder or otherwise for the purpose of the Engineer, such labour shall nevertheless be deemed to comprise persons employed by the Contractor and any moneys which may be ordered to be paid by the Engineer shall be deemed to be moneys payable by the Engineer on behalf of the Contractor and the Engineer may on failure of the Contractor to repay such money to the DFCCIL deduct the same from any moneys due to the Contractor in terms of the contract. The DFCCIL shall be entitled to recover the same from Contractor's bills/Security Deposit or any other dues of Contractor with the Government of India or DFCCIL all moneys paid or payable by the DFCCIL by way of compensation of aforesaid or for costs of expenses in connection with any claim thereto and the decision of the Engineer upon any question arising out of the effect or force of this Clause shall be final and binding upon the Contractor.

55A.Provisions of Contract labour (Regulation and Abolition) Act, 1970:

- 55A.(1)** The contractor shall comply with the provision of the contract labour (Regulation and Abolition) Act, 1970 and the Contract labour (Regulation and Abolition) Central Rules 1971 as modified from time to time, wherever applicable and shall also indemnify the DFCCIL from and against any claims under the aforesaid Act and the Rules.
- 55A. (2)**The Contractor shall obtain a valid licence under the aforesaid Act as modified from time to time before the commencement of the work and continue to have a valid licence until the completion of the work. Any failure to fulfil the requirement shall attract the penal provision of the Act.
- 55A. (3)**The Contractor shall pay to the labour employed by him directly or through subcontractors the wages as per provision of the aforesaid Act and the Rules wherever applicable. The Contractor shall notwithstanding the provisions of the contract to the contrary, cause to be paid the wages to labour indirectly engaged on the works including any engaged by subcontractors in connection with the said work, as if the labour had been immediately employed by him.
- 55A. (4)** In respect of all labour directly or indirectly employed in the work for performance of the contractor's part of the contract, the Contractor shall comply with or cause to be complied with the provisions of the aforesaid Act and Rules wherever applicable.
- 55A.(5)** In every case in which, by virtue of the provisions of the aforesaid Act or the rules, the DFCCIL is obliged to pay any amount of wages to a workman employed by the Contractor or his sub-contractor in execution of the work or to incur any expenditure on account of the contingent, liability of the DFCCIL due to the Contractor's failure to fulfill his statutory obligations under the aforesaid Act or the rules, the DFCCIL will recover from the Contractor, the amount of wages so paid or the amount of expenditure so incurred and without prejudice to the rights of the DFCCIL under the Section 20, Sub-Section (2) and Section 2, Sub-Section (4) of the aforesaid Act, the DFCCIL shall be at liberty to recover

such amount or part thereof from Contractor's bills/Security Deposit or any other dues of Contractor with the DFCCIL. The DFCCIL shall not be bound to contest any claim made against it under Sub-Section (1) of Section 20 and Sub-Section (4) of Section 21 of the aforesaid Act except on the written request of the Contractor and upon his giving to the DFCCIL full security for all costs for which the DFCCIL might become liable in contesting such claim. The decision of the CGM regarding the amount actually recoverable from the Contractor as stated above shall be final and binding on the Contractor.

55B. Provisions of Employees Provident Fund and Miscellaneous Provisions Act, 1952:

The Contractor shall comply with the provisions of Para 30 & 36-B of the Employees Provident Fund Scheme, 1952; Para 3 & 4 of Employees' Pension Scheme, 1995; and Para 7 & 8 of Employees Deposit Linked Insurance Scheme, 1976; as modified from time to time through enactment of "Employees Provident Fund & Miscellaneous Provisions Act, 1952", wherever applicable and shall also indemnify the DFCCIL from and against any claims under the aforesaid Act and the Rules.

55C.(i) Contractor is to abide by the provisions of Payment of Wages act & Minimum Wages act in terms of clause 54, 55, 55A and 55B of Indian Railways General Condition of Contract. In order to ensure the same, an application has been developed and hosted on website 'www.shramikkalyan.indianrailways.gov.in'. Contractor shall register his firm/company etc. and upload requisite details of labour and their payment in this portal. These details shall be available in public domain. The Registration/ updation of Portal shall be done as under:

- (a) Contractor shall apply for one-time registration of his company/firm etc. in the Shramikkalyan portal with requisite details subsequent to issue of Letter of Acceptance. Engineer shall approve the contractor's registration in the portal within 7 days of receipt of such request.
- (b) Contractor once approved by any Engineer, can create password with login ID (PAN No.) for subsequent use of portal for all Letter of Acceptances (LoAs) issued in his favour.
- (c) The contractor once registered on the portal, shall provide details of his Letter of Acceptances (LoA) / Contract Agreements on shramikkalyan portal within 15 days of issue of any LoA for approval of concerned Engineer. Engineer shall update (if required) and approve the details of LoA filled by contractor within 7 days of receipt of such request.
- (d) After approval of LoA by Engineer, contractor shall fill the salient details of contract labours engaged in the contract and ensure updating of each wage payment to them on shramikkalyan portal on monthly basis.

- (e) It shall be mandatory upon the contractor to ensure correct and prompt uploading of all salient details of engaged contractual labour & payments made thereof after each wage period.
- (ii) While processing payment of any 'On Account bill' or 'Final Bill' or release of 'Advances' or 'Performance Guarantee / Security deposit', contractor shall submit a certificate to the Engineer or Engineer's representatives that "I have uploaded the correct details of contract labours engaged in connection with this contract and payments made to them during the wage period in Railway's Shramikkalyan portal at 'www.shramikkalyan.indianrailways.gov.in' till ____Month, ____Year."

55-D Provisions of "The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996" and "The Building and Other Construction Workers' Welfare Cess Act, 1996":

The tenderers, for carrying out any construction work, shall get themselves registered with the Registering Officer under Section-7 of the Building and Other Construction Workers Act, 1996 and rules made thereto by the concerned State Govt., and submit certificate of Registration issued from the Registering Officer of the concerned State Govt. (Labour Dept.). The Cess shall be deducted from contractor's bills as per provisions of the Act.

56.0 Reporting of Accidents: - The Contractor shall be responsible for the safety of all employees directly or through petty contractors or sub-contractor employed by him on the works and shall report serious accidents to any of them however and wherever occurring on the works to the Engineer or the Engineers Representative and shall make every arrangement to render all possible assistance.

57.0 Provision of Workmen's Compensation Act:- In every case in which by virtue of the provisions of section 12 sub-section (1) of the Workmen's Compensation Act 1923, DFCCIL is obliged to pay compensation to a workman directly or through petty contractor or subcontractor employed by the Contractor in executing the work, DFCCIL will recover from the Contractor the amount of the compensation so paid, and, without prejudice to the rights of DFCCIL under Section 12 Sub-section (2) of the said Act, DFCCIL shall be at liberty to recover such amount or any part thereof from contractor's bills/Security Deposit or any other dues of Contractor with the Government of India. DFCCIL shall not be bound to contest any claim made against it under Section 12 Sub-section (1) of the said Act except on the written request of the Contractor and upon his giving to DFCCIL full security for all costs for which DFCCIL might become liable in consequence of contesting such claim.

57A. Provision of Mines Act:- The contractor shall observe and perform all the provisions of the Mines Act, 1952 or any statutory modifications or re-enactment thereof for the time being in force and any rules and regulations made there under in respect of all the persons directly or through the petty contractors or sub-contractors employed by him under this contract and shall indemnify the DFCCIL from and against any claims under the Mines Act, or the rules

and regulations framed there under, by or on behalf of any persons employed by him or otherwise.

58.0 Railway/DFCCIL not to provide quarters for Contractors: - No quarters shall normally be provided by the DFCCIL for the accommodation of the contractor or any of his staff employed on the work. In exceptional cases where accommodation is provided to the Contractor at the DFCCIL discretion, recoveries shall be made at such rates as may be fixed by the DFCCIL for the full rent of the buildings and equipments therein as well as charges for electric current, water supply and conservancy.

59.(1) Labour Camps: - The contractor shall at his own expense make adequate arrangements for the housing, supply of drinking water and provision of latrines and urinals for his staff and workmen, directly or through the petty contractors or sub-contractors and for temporary crèche (*Bal-mandir*) where 50 or more women are employed at a time. Suitable sites on DFCCIL land, if available, may be allotted to the contractor for the erection of labour camps, either free of charge or on such terms and conditions that may be prescribed by the DFCCIL. All camp sites shall be maintained in clean and sanitary conditions by the contractor at his own cost.

59.(2) Compliance to rules for employment of labour:- The contractor(s) shall conform to all laws, by-laws rules and regulations for the time being in force pertaining to the employment of local or imported labour and shall take all necessary precautions to ensure and preserve the health and safety of all staff employed directly or through petty contractors or sub-contractors on the works.

59.(3) Preservation of peace: - The contractor shall take requisite precautions and use his best endeavours to

(i) Prevent any riotous or unlawful behaviour by or amongst his workmen and other employed directly or through the petty contractors or sub-contractors on the works and for the preservation of peace and protection of the inhabitants and

(ii) Security of property in the neighbourhood of the works. In the event of the DFCCIL requiring the maintenance of a special Police Force at or in the vicinity of the site during the tenure of works, the expenses thereof shall be borne by the contractor and if paid by the DFCCIL shall be recoverable from the contractor.

59.(4) Sanitary Arrangements: - The contractor shall obey all sanitary rules and carry out all sanitary measures that may from time to time be prescribed by the Local Medical Authority and permit inspection of all sanitary arrangements at all times by the Engineer, the Engineer's Representative or the Medical staff of the Local Medical Authority.

59.(5) Outbreak of infectious disease: - The contractor shall remove from his camp such labour and their families as refuse protective inoculation and vaccination when called upon

to do so by the Engineer or the Engineer's representative on the advice of the Local Medical Authority. Should cholera, plague or other infectious disease break out, the contractor shall burn the huts, beddings, clothes and other belongings of or used by the infected parties and promptly erect new huts on health sites as required by the Engineer, failing which within the time specified in the Engineer's requisition, the work may be done by the DFCCIL and the cost therefore recovered from the contractor.

59.(6) Deleted

59.(7) Medical facilities at site: - The Contractor shall provide medical facilities at the site as may be prescribed by the Engineer on the advice of the Local Medical Authority in relation to the strength of the Contractor's resident staff and workmen.

59.(8) Use of intoxicants: - The sale of ardent spirits or other intoxicating beverages upon the work or in any of the buildings, encampments or tenements owned, occupied by or within the control of the contractor or any of his employees shall be forbidden and the Contractor shall exercise his influence and authority to the utmost extent to secure strict compliance with this condition.

59.(9) Restrictions On The Employment Of Retired Engineers Of Railway/DFCCIL Services Within one Year Of Their Retirement: The Contractor shall not, if he is a retired Government Engineer of Gazetted rank, himself engage in or employ or associate a retired Government Engineer of Gazetted rank, who has not completed one year from the date of retirement, in connection with this contract in any manner whatsoever without obtaining prior permission of the President and if the Contractor is found to have contravened this provision it will constitute a breach of contract and administration will be entitled to terminate the contract and forfeit his Performance Guarantee as well as Security Deposit.

60.(1) Non-employment of labours below the age of 15: - The Contractor shall not employ children below the age of 15 as labourers directly or through petty contractors or subcontractors for the execution of work.

60.(2) Medical Certificate of fitness for labour: - It is agreed that the contractor shall not employ a person above 15 and below 19 years of age for the purpose of execution of work under the contract unless a medical certificate of fitness in the prescribed form (**Proforma at Form No. 15**) granted to him by a certifying surgeon certifying that he is fit to work as an adult, is obtained and kept in the custody of the contractor or a person nominated by him in this behalf and the person carries with him, while at work; a token giving a reference to such certificate. It is further agreed that the responsibility for having the adolescent examined medically at the time of appointment or periodically till he attains the age of 19 years shall devolve entirely on the contractor and all the expenses to be incurred on this account shall be borne by him and no fee shall be charged from the adolescent or his parent for such medical examination.

60.(3)Period of validity of medical fitness certificate: - A certificate of fitness granted or renewed for the above said purposes shall be valid only for a period of one year at a time. The certifying surgeon shall revoke a certificate granted or renewed if in his opinion the holder of it is, no longer fit for work in the capacity stated therein. Where a certifying surgeon refuses to grant or renew a certificate or revoke a certificate, he shall, if so, required by the person concerned, state his reasons in writing for doing so.

60.(4)Medical re-examination of labourer:- Where any official appointed in this behalf by the Ministry of labour is of the opinion that any person employed in connection with the execution of any work under this contract in the age group 15 to 19 years is without a certificate of fitness or is having a certificate of fitness but no longer fit to work in the capacity stated in the certificate, he may serve on the Contractor, or on the person nominated by him in the regard, a notice requiring that such persons shall be examined by a certifying surgeon and such person shall not if the concerned official so directs, be employed or permitted to do any work under this contract unless he has been medically examined and certified that he is fit to work in the capacity stated in the certificate.

EXPLANATIONS:

(1)Only qualified medical practitioners can be appointed as “Certifying Surgeons” and the term “Qualified Medical Practitioners” means a person holding a qualification granted by an authority specified in the Schedule to the Indian Medical Degrees Act, 1916 (*VII to 1916*) or in the Schedule to the Indian Medical Council Act, 1933 (*XXVII*) of 1933.

(2)The Certifying surgeon may be a medical officer in the service of State or Municipal Corporation.

DETERMINATION OF CONTRACT

61.(1) Right of DFCCIL of determine the contract:- The DFCCIL shall be entitled to determine and terminate the contract at any time should, in the DFCCIL’s opinion, the cessation of work becomes necessary owing to paucity of funds or from any other cause whatever, in which case the value of approved materials at site and of work done to date by the Contractor will be paid for in full at the rate specified in the contract. Notice in writing from the DFCCIL of such determination and the reasons therefore shall be conclusive evidence thereof.

61. (2) Payment on determination of contract: - Should the contract be determined under sub clause (1) of this clause and the Contractor claims payment for expenditure incurred by him in the expectation of completing the whole of the work, the DFCCIL shall admit and consider such claims as are deemed reasonable and are supported by vouchers to the satisfaction of the Engineer. The DFCCIL’s decision on the necessity and propriety of such expenditure shall be final and conclusive.

61.(3) The contractor shall have no claim to any payment of compensation or otherwise, howsoever on account of any profit or advantage which he might have derived from the

execution of the work in full but which he did not derive in consequence of determination of contract.

62.(1) Determination of contract owing to default of contractor: - If the Contractor should: -

- (i) Becomes bankrupt or insolvent, or
- (ii) Make an arrangement with of assignment in favour of his creditors, or agree to carry out the contract under a Committee of Inspection of his creditors, or
- (iii) Being a Company or Corporation, go into liquidation (*other than a voluntary liquidation for the purposes of amalgamation or reconstruction*), or
- (iv) Have an execution levied on his goods or property on the works, or
- (v) Assign the contract or any part thereof otherwise than as provided in Clause 7 of these conditions, or
- (vi) Abandon the contract, or
- (vii) Persistently disregard the instructions of the Engineer, or contravene any provision of the contract, or
- (viii) Fail to adhere to the agreed programme of work by a margin of 10% of the stipulated period, or
- (ix) Fail to execute the contract documents in terms of Clause 1.3.7 of the Preamble and Instructions to Bidder in Part-I, Chapter-III of Tender Document.
- (x) Fails to submit the documents pertaining to identity of JV and PAN in terms of Clause 1.3.17.11 of Tender Form available in the Regulations for Tenders and Contracts.
- (xi) Fail to remove materials from the site or to pull down and replace work after receiving from the Engineer notice to the effect that the said materials or works have been condemned or rejected under Clause 25 and 27 of these Conditions, or
- (xii) Fail to take steps to employ competent or additional staff and labour as required under Clause 26 of the Conditions, or
- (xiii) Fail to afford the Engineer or Engineer's representative proper facilities for inspecting the work or any part thereof as required under clause 28 of the conditions, or
- (xiv) Promise, offer or give any bribe, commission, gift or advantage either himself or through his partner, agent or servant to any officer or employee of the DFCCIL or to any person on his or on their behalf in relation to the execution of this or any other

contract with this DFCCIL.

- (xv) Fail to adhere to the provisions specified in “**Preamble & Instructions to Tenderers**”, Part-I, Chapter-III of Tender Document or Provision of above Clause 59(9).
- (xvi) Submits copy of fake documents/certifications in support of credentials, submitted by the tenderer

Then and in any of the said Clause, the Engineer on behalf of the DFCCIL may serve the Contractor with a notice (**Proforma at Form no. 16**) in writing to that effect and if the Contractor does not within seven days after the delivery to him of such notice proceed to make good his default in so far as the same is capable of being made good and carry on the work or comply with such directions as aforesaid of the entire satisfaction of the Engineer, the DFCCIL shall be entitled after giving 48 hours’ notice (**Proforma at Form no. 17 or 17A, as the case may be**) in writing under the hand of the Engineer to rescind the contract as a whole or in part or parts (as may be specified in such notice) and after expiry of 48 hours’ notice, a final termination notice (**Proforma at Form no. 16 or 18A, as the case may be**) should be issued.

Note: Engineer at his discretion may resort to the part termination of contract with notices (**Proforma at Form no. 16, 17A and 18A**), only in cases where progress of work is more than or equal to 80% of the original scope of work.

62.(2) Right of DFCCIL after, rescission of contract owing to default of contractor:

In the event of any or several of the courses, referred to in sub-clause (1) of the clause, being adopted.

- (a) The Contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchased or procured any materials or entered into any commitments or made any advances on account of or with a view to the execution of the works or the performance of the contract and Contractor shall not be entitled to recover or be paid any sum for any work thereto for actually performed under the contract unless and until the Engineer shall have certified the performance of such work and the value payable in respect thereof and the Contractor shall only be entitled to be paid the value so certified.
- (b) In the contract which has been rescinded as a whole, the Security Deposit already with DFCCIL under the contract shall be encashed/ forfeited and the Performance Guarantee already submitted for the contract shall be encashed. The balance work shall be got done independently without risk & cost of the failed Contractor. The failed Contractor shall be debarred from participating in the tender for executing the balance work. If the failed Contractor is a JV or a Partnership firm, then every

member/partner of such a firm shall be debarred from participating in the tender for the balance work in his/her individual capacity or as a partner of any other JV /partnership firm.

Further the authorized representative of failed Contractor cannot be accepted as authorized representative in new contract.

- (c) In the contract rescinded in part or parts,
- (i) The full Performance Guarantee for the contract shall be recovered. No additional Performance Guarantee shall be required for balance of work being executed through the part terminated contract. The contract value of part terminated contract stands reduced to the balance value of work under the contract.
 - (ii) The Security Deposit of part terminated contract shall be dealt as per clause 16(2) of GCC.
 - (iii) The defaulting Contractor shall not be issued any completion certificate for the contract.
 - (iv) The balance work shall be got done independently without risk & cost of the failed Contractor. The failed Contractor shall be debarred from participating in the tender for executing the balance work. If the failed Contractor is a JV or a Partnership firm, then every member/partner of such a firm shall be debarred from participating in the tender for the balance work in his/her individual capacity or as a partner of any other JV /partnership firm.
 - (v) Further the authorized representative of failed Contractor will not be accepted as authorized representative in new contract.
- (d) The Engineer or the Engineer's Representative shall be entitled to take possession of any materials, tools, implements, machinery and buildings on the works or on the property on which these are being or ought to have been executed, and to retain and employ the same in the further execution of the works or any part thereof until the completion of the works without the Contractor being entitled to any compensation for the use and employment thereof or for wear and tear or destruction thereof.
- (e) The Engineer shall as soon as may be practicable after removal of the Contractor fix and determine ex-parte or by or after reference to the parties or after such investigation or enquiries as he may consider fit to make or institute and shall certify what amount (if any) had at the time of rescission of the contract been reasonably earned by or would reasonably accrue to the Contractor in respect of the work then actually done by him under the contract and what was the value of any unused, or partially used materials, any constructional plant and any temporary works upon the site. The legitimate amount due to the Contractor after making necessary deductions and certified by the Engineer should be released expeditiously.

SETTLEMENT OF DISPUTES

63.0 Conciliation of disputes: All disputes and differences of any kind whatsoever arising out of or in connection with the contract, whether during the progress of the work or after its completion and whether before or after the determination of the contract, shall be referred by the Contractor to the CGM)" through "Notice of Dispute" provided that no such notice shall be served later than 30 days after the date of issue of Completion Certificate by the Engineer. **MD/DFCCIL** shall, within 30 days after receipt of the Contractor's "Notice of Dispute", notify the name of conciliator(s) to the Contractor.

The Conciliator(s) shall assist the parties to reach an amicable settlement in an independent and impartial manner within the terms of contract.

If the parties reach agreement on a settlement of the dispute, they shall draw up and sign a written settlement agreement duly signed by DFCCIL, Contractor and conciliator(s). When the parties sign the settlement agreement, it shall be final and binding on the parties.

The parties shall not initiate, during the conciliation proceedings, any arbitral or judicial proceedings in respect of a dispute that is the subject matter of the conciliation proceedings.

The conciliation proceedings shall be terminated as per Section 76 of 'The Arbitration and Conciliation Act, 1996.

63.1 Matters Finally Determined by the DFCCIL: All disputes and differences of any kind whatsoever arising out of or in connection with the contract, whether during the progress of the work or after its completion and whether before or after the determination of the contract, shall be referred by the Contractor to the MD/DFCCIL and the MD/DFCCIL shall, within 120 days after receipt of the Contractor's representation, make and notify decisions on all matters referred to by the Contractor in writing provided that matters for which provision has been made in Clauses 7(j), 8, 18, 22(5), 39, 43(2), 45(i)(a), 55, 55-A(5), 57, 57A, 61(1), 61(2) and 62(1) of Standard General Conditions of Contract or in any Clause (stated as excepted matter) of the Special Conditions of the Contract, shall be deemed as 'excepted matters' (matters not arbitrable) and decisions of the DFCCIL Authority, thereon shall be final and binding on the Contractor; provided further that 'excepted matters' shall stand specifically excluded from the purview of the Arbitration Clause.

64. (1) Demand for Arbitration: -

64. (1)(i) In the event of any dispute or difference between the parties hereto as to the construction or operation of this contract, or the respective rights and liabilities of the parties on any matter in question, dispute or difference on any account or as to the withholding by the DFCCIL of any certificate to which the Contractor may claim to be entitled to, or if the DFCCIL fails to make a decision within 120 days, then and in any such case, but except in any of the "excepted matters" referred to in Clause 63.1 of these

Conditions, the Contractor, after 120 days but within 180 days of his presenting his final claim on disputed matters shall demand in writing that the dispute or difference be referred to arbitration.

- 64.(1)(ii)(a)** The demand for arbitration shall specify the matters which are in question, or subject of the dispute or difference as also the amount of claim item-wise. Only such dispute or difference, in respect of which the demand has been made, together with counter claims or set off, given by the DFCCIL, shall be referred to arbitration and other matters shall not be included in the reference.
- 64.(1)(ii)(b)** The parties may waive off the applicability of Sub-Section 12(5) of Arbitration and Conciliation (Amendment) Act 2015, if they agree for such waiver in writing, after dispute having arisen between them, in the format given under **(Form No. 25)** of these conditions.
- 64.(1)(iii)(a)** The Arbitration proceedings shall be assumed to have commenced from the day, a written and valid demand for arbitration is received by the DFCCIL.
- 64.(1)(iii)(b)** The claimant shall submit his claim stating the facts supporting the claims alongwith all the relevant documents and the relief or remedy sought against each claim within a period of 30 days from the date of appointment of the Arbitral Tribunal.
- 64.(1)(iii)(c)** The DFCCIL shall submit its defence statement and counter claim(s), if any, within a period of 60 days of receipt of copy of claims from Tribunal, unless otherwise extension has been granted by Tribunal.
- 64.(1)(iii)(d) Place of Arbitration:** The place of arbitration would be within the geographical limits of the CGM Unit where the cause of action arose or the Headquarters of the DFCCIL or any other place with the written consent of both the parties.
- 64.(1)(iv)** No new claim shall be added during proceedings by either party. However, a party may amend or supplement the original claim or defence thereof during the course of arbitration proceedings subject to acceptance by Tribunal having due regard to the delay in making it.
- 64.(1)(v)** If the Contractor(s) does/do not prefer his/their specific and final claims in writing, within a period of 90 days of receiving the intimation from the DFCCIL that the final bill is ready for payment, he/they will be deemed to have waived his/their claim(s) and the DFCCIL shall be discharged and released of all liabilities under the contract in respect of these claims.
- 64.(2) Obligation During Pendency of Arbitration:** Work under the contract shall, unless otherwise directed by the Engineer, continue during the arbitration proceedings, and no payment due or payable by the Railway shall be withheld on account of such proceedings, provided, however, it shall be open for Arbitral Tribunal to consider and decide whether or not such work should continue during arbitration proceedings.

64.(3) Appointment of Arbitrator

- 64.(3)(a)(i)** In cases where the total value of all claims in question added together does not exceed ₹ 1,00,00,000/- (Rupees One Crore), the Arbitral Tribunal shall consist of a Sole Arbitrator nominated by MD/DFCCIL from approved panel of Arbitrators in DFCCIL. The sole arbitrator shall be appointed within 60 days from the day when a written and valid demand for arbitration is received by MD/DFCCIL.
- 64.(3)(a)(ii)** In cases not covered by the Clause 64(3)(a)(i), the Arbitral Tribunal shall consist of a panel of three Officials, as the Arbitrators. For this purpose, the DFCCIL will send a panel of Three (3) names empanelled Arbitrators to work as Arbitrator to the contractor within 60 days from the day when a written and valid demand for Arbitration is received by the MD/DFCCIL. Contractor will be asked to suggest to MD/DFCCIL at least 2 names out of the panel for appointment as Contractor's nominee within 30 days from the date of dispatch of the request by DFCCIL. The MD/DFCCIL shall appoint at least one out of them as the Contractor's nominee and will, also simultaneously appoint the second Arbitrator.
- (b)** Third member, who will also act as the presiding member, will be appointed by mutual consent of the first two members from the list of empanelled DFCCIL Arbitrators. If these two members fail to reach an agreement on the third member then, on request by either or both parties, appointment will be made by the MD/DFCCIL.
 - (c)** The tribunal shall have full power to open up, review and revise any certificate, determination, instruction, opinion or valuation of the Engineer, and any decision of the conciliator/s relevant to the dispute.
 - (d)** Neither party shall be limited in the proceedings before the tribunal to the evidence or arguments previously put before the conciliator/s to obtain its decision, or to the reasons for dissatisfaction given in its notice of dissatisfaction.
 - (e)** Arbitration may be commenced prior to or after completion of the works. The obligations of the Parties, the Engineer and the conciliator/s shall not be altered by reason of any arbitration being conducted during the progress of the Works.
- 64.(3)(a)(iii)** If one or more of the arbitrators appointed as above refuses to act as arbitrator, withdraws from his office as arbitrator, or vacates his/their officer/offices or is/are unable or unwilling to perform his functions as arbitrator for any reason whatsoever or dies or in the opinion of the MD/DFCCIL fails to act without undue delay, the MD/DFCCIL shall appoint new arbitrator/arbitrators to act in his/their place in the same manner in which the earlier arbitrator/arbitrators had been appointed. Such re-constituted Tribunal may, at its discretion, proceed with the reference from the stage at which it was left by the previous arbitrator(s).
- 64.(3)(b)(i):(a)** The Arbitral Tribunal shall have power to call for such evidence by way of affidavits or otherwise as the Arbitral Tribunal shall think proper, and it shall be the duty of the parties hereto to do or cause to be done all such things as may be necessary to enable the Arbitral Tribunal to make the award without any delay. The proceedings shall normally be conducted on the basis of documents and written statements.

(b) Before proceedings into the merits of any dispute, the Arbitral Tribunal shall first decide and pass its orders over any plea submitted/objections raised by any party, if any, regarding appointment of Arbitral Tribunal, validity of arbitration agreement, jurisdiction and scope of the Tribunal to deal with the dispute(s) submitted to arbitration, applicability of time 'limitation' to any dispute, any violation of agreed procedure regarding conduct of the arbitral proceedings or plea for interim measures of protection and record its orders in day to day proceedings. A copy of the proceedings duly signed by all the members of tribunal should be provided to both the parties.

64.3(c)(i):The arbitral award shall state item wise, the sum and reasons upon which it is based. The analysis and reasons shall be detailed enough so that the award could be inferred therefrom.

64.3(c)(ii):A party may apply for corrections of any computational errors, any typographical or clerical errors or any other error of similar nature occurring in the award of a Tribunal and interpretation of a specific point of award to Tribunal within 60 days of receipt of the award.

64.3(c)(iii):A party may apply to Tribunal within 60 days of receipt of award to make an additional award as to claims presented in the arbitral proceedings but omitted from the arbitral award.

64.(4): In case of the Tribunal, comprising of three members, any ruling on award shall be made by a majority of members of Tribunal. In the absence of such a majority, the views of the Presiding Arbitrator shall prevail.

64.(5): Where the arbitral award is for the payment of money, no interest shall be payable on whole or any part of the money for any period till the date on which the award is made.

64.(6): The cost of arbitration shall be borne by the respective parties. The cost shall inter-alia include fee of the arbitrator(s), as per the rates fixed by DFCCIL from time to time and the fee shall be borne equally by both the parties, provided parties sign an agreement in the format given at **"Form No. 25"** to these conditions after/ while referring these disputes to Arbitration. Further, the fee payable to the arbitrator(s) would be governed by the instructions issued on the subject by DFCCIL from time to time irrespective of the fact whether the arbitrator(s) is/are appointed by the DFCCIL or by the court of law unless specifically directed by Hon'ble court otherwise on the matter.

64.(7) Subject to the provisions of the aforesaid Arbitration and Conciliation Act 1996 and the rules thereunder and relevant para of General Conditions of Contract (GCC) and any statutory modifications thereof shall apply to the appointment of arbitrators and arbitration proceedings under this Clause.

PART-I
CHAPTER-V
SPECIAL CONDITIONS OF CONTRACT

PART-I

CHAPTER-V SECTION-1

SPECIAL CONDITIONS OF CONTRACT (ELECTRICAL)

Note: The Special Conditions of contract (SCC) should be read in conjunction with the General Conditions of Contract (GCC). However, if there is any provision in the GCC, which is at variance with the provisions in SCC, the provisions in the Special Conditions of Contract (SCC) shall take precedence.

1.1 DEFINITION AND INTERPRETATIONS.

In the contract documents, the following terms shall have the meanings herein assigned to them except where the contract otherwise requires:

“Chief General Manager” shall mean the officer-in-charge of the general superintendence and control of the unit and shall also include General Manager/Electrical and shall mean and include their successors.

A **"day"** shall mean a day of 24 hours from midnight to mid night irrespective of the number of hours worked in that day.

A **"week"** shall mean seven days without regard to the number of hours worked on any day in that week.

A **“month”** shall mean gregorian calendar month irrespective of the number of hours worked on any day in that month.

“Contract” shall mean and include the agreement of work order, the accepted schedule of rates or the schedule or rates of railway modified by the tender percentage for items of works quantified, or not quantified, the standard general conditions of contract, the special conditions of contracts, if any; the drawing, the specifications, the special specifications, if any and tender forms, if any.

Singular and Plural: words importing the singular number shall also include the plural and vice versa where the context requires.

1.2 General

The special conditions of contract, shall be part of "contract documents" and the contractor shall satisfy himself/themselves in every respect as to the true intent and meaning of these contract documents and to the nature, extent and quality of the work required to be executed as no claim whatsoever arising through any misunderstanding of the intention, or the meaning of any of the terms or expressions in these contract documents, shall be entertained after the submission of the tender. The work shall be executed in conformity with the tender

documents such as the standard general conditions of contract – 2020, special conditions & special specifications mentioned in the contract, Indian Electricity Rules and other relevant IR/IS specifications.

- 1.2.1 As per provision of Make in India Policy 2017, local component should be minimum 50% of the Contract Value. Contractor shall be required to give undertaking along with supporting document for the same.
- 1.2.2 The amended provisions for Public procurement issued by Ministry of Finance (MoF), Department of Expenditure, Public Procurement Division OM No. F No.6/18/2019-PPD dated 23-07-2020 shall also be applicable in this tender.

1.2.3 Special Technical Compliance- Electrical Contractor License:

The tenderer shall have a valid Electrical Contractor License to work at 33KV issued by any State Govt. in the name of the firm. The copy of same has to be submitted alongwith the offer.

1.2.4 Intent of plans, specification and contract documents:

The work to be carried out under this contract shall, except as otherwise provided in these conditions, include all labour, materials, construction plant, equipment and transport which may be required in preparation of and for the full and entire execution and successful completion of the works. The description given in the schedule of works shall, unless otherwise stated, be held to include carriage and cartage, carrying and hoisting, setting, fitting and fixing in position and all other labour, necessary in and for the full and entire execution and successful completion of the works as aforesaid in accordance with good practice and recognized principles and any urgent and temporary works fully contingent upon the works.

1.3 Inspection and admission to site:

The contractor shall not be permitted to enter on (other than for inspection purpose) or take possession of the site until instructed to do so by the Engineer in writing. The portion of the site to be occupied by the contractor shall be defined and/or shown in the site plan, or this shall be indicated by the Engineer, and the contractor shall on no account be allowed to extend his operation beyond these areas. The contractor shall not use or allow it to be used the site so allowed to him by the DFCCIL for any purpose other than that of executing the work. The contractor shall make his own arrangement at his own cost for any additional land required by him for the purpose of execution of the work. The contractor shall at his own cost provide, if necessary or if required on the site, all temporary access thereto, to the satisfaction of the Engineer and shall alter, adopt and maintain the same as required from time to time and shall take up and clear them away as and when no longer required and make good all damage done to the site. The tenderer(s) before quoting his rate shall carefully inspect the site and shall be deemed to have satisfied himself about the nature and type of work including ancillary works necessary for satisfactory execution of work. Site accessibility and availability of required materials must be kept in view while quoting the rates. Many electrical works are dependent on Civil/S&T construction works. Contractor should properly

interface and co-ordinate accordingly for execution of work. No separate cost shall be paid for the same.

1.4 PRIORITY OF DOCUMENTS

Where there is any conflict between the various documents in the Contract, the following order of priority shall be followed i.e. a document appearing earlier shall override the document appearing subsequently:

- a. Letter of Acceptance (LOA)
- b. Schedule of items, Rates & Quantities.
- c. Special Conditions of Contract.
- d. Technical Specifications as given in tender documents.
- e. Drawings, if any.
- f. General Conditions of Contract.
- g. Relevant BIS Codes.

1.5 INDEMNITY BY THE CONTRACTOR

1.5.1 Indemnity against all actions of Contractor

The Contractor shall hold and save harmless and indemnify the Client/Employer/Engineer and their employees, from all actions, suits, proceedings, loss, costs, damages, charges, claims and demands of every nature and description brought against or recovered from the Client/Employer/Engineer and their employees by reason of any act or omission of the Contractor and/or his representative and/or his Employees and/or his sub-contractors in the execution of the works or in the guarding of the same. All the sums payable by Client/Employer/ Engineer by way of compensation under any of these conditions shall be recovered from the dues of the Contractor, without reference to the actual loss or damage sustained, and whether or not any damage shall have been sustained.

1.5.2 Indemnity against all Claims of Patent rights and Royalties

The Contractor shall hold and save harmless and indemnify the Client/Employer/Engineer, his officers and Employees from and against all claims and proceedings for or on account of infringement by the Contractor of copyright, any patent rights, design, trademark or name, secret process, patented or un-patented invention, articles or appliances manufactured or used for or in connection with the works and from and against all claims, proceedings, costs, damages, charges, and expenses whatsoever in respect thereof or in relation thereto. The Contractor shall pay all royalties, taxes, rent and other payments or compensation, if any, for getting the materials required for the works and due fulfillment of the contract and indemnify Client/Employer/Engineer against any claims in this regard.

1.5.3 Damage to Life and Property

The Contractor shall be responsible for all risks to works, nearby existing structures and life of his supervisors and workmen as also those of Employer/Client or any trespassers from whatever cause in connection with the works until these are taken over by Client/Employer/Engineer. The Contractor shall make good at his own expenses all loss or damages to life and property.

1.6 PRICES

- 1.6.1** Rates quoted in the financial offer (financial bid) shall be inclusive of all taxes and duties except GST. Rates shall also include transportation of material, transit insurance, e-way bill, loading, unloading, lifting/handling of material, insurance of material at site & workers, liaisoning with any other department, banker charges and other incidental charges. GST as applicable shall be paid extra on the accepted rates mentioned in Schedule-I & II.
- 1.6.2** If any cost implication to DFCCIL is occurred on GST account because of Contractor's default in filing of GST returns such as no GST number, wrong GST number, mismatch of GST number etc. , the same shall be recovered from the Contractor's bill or any other pending/future bill.

1.7 PRICE VARIATION CLAUSE

- 1.7.1** The Price Variation on Schedule-II (Civil works) shall be payable as per clause 46A of GCC. The percentage of various components shall be taken as for Building Contracts mentioned in clause 46A.6 of GCC.
- 1.7.2** The Price Variation on Schedule-I (Electrical works) shall be payable as per clause 46A of GCC except clause 46A.4 to 46A.9 which are replaced by following clauses:-
- 1.7.3** Adjustment for variation in prices of labour, cement, steel, fuel, electrical equipment etc. shall be determined in the manner prescribed.
- 1.7.4** Components of various items on which variation in prices be admissible, shall be Labour, Cement, Steel, Fuel & Power, Electrical wire & cables and Electrical Equipment. However, for fixed component, no price variation shall be admissible.
- 1.7.5** The percentages of various components to be considered for price variation shall be as under:

S. No	Component	%age
1	Labour Component	7
2	Cement & Lime	3
3	Steel Long	5
4	Fuel & Power	2
5	Electrial Accessories, Wires and Cables	3
6	Electrical Machienary/ Equipment	60
7	Fixed Component*	20

*It shall not be considered for any price variation.

1.7.6 Formulae: The Amount of variation in prices in several components (labour, material etc.) shall be worked out by the following formulae:

$$(i) \quad L = \frac{W \times (L_Q - L_B) \times L_C}{L_B \quad 100}$$

$$(ii) \quad C = \frac{W \times (C_Q - C_B) \times C_C}{C_B \quad 100}$$

$$(iii) \quad S = \frac{W \times (S_Q - S_B) \times S_C}{S_B \quad 100}$$

$$(iv) \quad F = \frac{W \times (F_Q - F_B) \times F_C}{F_B \quad 100}$$

$$(v) \quad EA = \frac{W \times (EA_Q - EA_B) \times EA_C}{EA_B \quad 100}$$

$$(vi) \quad EM = \frac{W \times (EM_Q - EM_B) \times EM_C}{EM_B \quad 100}$$

Where,

L Amount of price variation in Labour
C Amount of price variation in Cement
S Amount of price variation in Steel
F Amount of price variation in Fuel & Power
EA Amount of price variation in Electrical Accessories, Wires and Cables
EM Amount of price variation in Electrical Machinery/ Equipment

L_C % of Labour Component
C_C % of Cement Component
S_C % of Steel Component
F_C % of Fuel & Power Component
EA_C % of Electrical Accessories, Wires and Cables Component
EM_C % of Electrical Machinery/ Equipment

W Gross value of work done by Contractor as per on-account bill(s).

L_B Consumer Price Index for Industrial Workers - All India: Published in R.B.I. Bulletin for the base period
L_Q Consumer Price Index for Industrial Workers - All India: Published in R.B.I. Bulletin for the average price index of the 3 months of the quarter under consideration
C_B Index No. of Wholesale Price Index of sub-group Cement, Lime & Plaster as published in RBI Bulletin for the base period
C_Q No. of Wholesale Price Index of sub-group Cement, Lime & Plaster as published in RBI Bulletin for the average price index of the 3 months of the quarter under consideration

S_B	Index No. of Wholesale Price Index of sub-group item Mild Steel- Long Products as published in RBI Bulletin for the base period
S_Q	No. of Wholesale Price Index of sub-group item Mild Steel- Long Products as published in RBI Bulletin for the average price index of the 3 months of the quarter under consideration
F_B	Wholesale Price Index for the group Fuel & Power as published in the R.B.I. Bulletin for the base period
F_Q	Index Number of Wholesale Price Index – By Groups and Sub-Groups for the group Fuel & Power as published in the R.B.I. Bulletin for the average price index of the 3 months of the quarter under consideration
EA_B	Index No. of Wholesale Price Index of sub-group item Other Electronic and Electric Wires and Cables as published in RBI Bulletin for the base period
EA_Q	No. of Wholesale Price Index of sub-group item Other Electronic and Electric Wires and Cables as published in RBI Bulletin for the average price index of the 3 months of the quarter under consideration
EM_B	Index No. of Wholesale Price Index of sub-group Manufacture of Electrical Equipment as published in RBI Bulletin for the base period
EM_Q	No. of Wholesale Price Index of sub-group Manufacture of Electrical Equipment as published in RBI Bulletin for the average price index of the 3 months of the quarter under consideration

The demands for escalation of cost shall be allowed on the basis of provisional indices as mentioned above

Any adjustment needed to be done based on the finally published indices shall be made as and when they become available.

1.8 QUANTITY VARIATION:

The quantities of various items mentioned in the BOQ are tentative and may change as per requirement during execution of work. Due to this the contract value may also change. The variation in the contract shall be governed by Para 42 of GCC.

1.9 PERIOD OF COMPLETION OF WORK:

Period of completion for complete work shall be **09 months** from the date of issue of Letter of Acceptance. The period of completion of Civil works of substations shall be **4 months** from the date of issue of Letter of Acceptance.

1.10 MEASUREMENTS

The Contractor shall be paid for the works at rates in the accepted Schedule of Rate & Quantities. The measurement shall be taken by the Engineer or his representative in the presence of the Contractor or his authorized representative.

1.11 WARRANTY (Defect Liability Period):

Warranty (Defect Liability Period) of complete work including material shall be 12 months from the date of commissioning of each system and taken over by DFCCIL as certified by DFCCIL. During this period, any failure of system shall be attended free of cost by the

Contractor. Some items shall have OEM warranty of more than twelve months as specified in the technical specification of the concerned item.

1.12 TERMS OF PAYMENT

1.12.1 On Account Payment:

(A) On Account Payment for items involving Supply and Erection:-

- (i) 75% of accepted rates against receipt of materials.
- (ii) 15% on satisfactory erection of various items.
- (iii) Balance 10% on successful commissioning of the work.

(B) On Account Payment for items involving Supply only:-

- (i) 80% of quoted rates against receipt of materials.
- (ii) 10% on satisfactory erection of materials.
- (iii) Balance 10% on successful commissioning of the work.

(C) On Account Payment for items involving Erection only:-

- (i) 90% on successful erection of various items.
- (ii) Balance 10% on successful commissioning of the work.

1.12.2 Requirements for Payment against Supply of Material – Payment against receipt of material mentioned in clause 13.1 shall be made subject to complying the following:-

- (i) Supplier's delivery challan,
- (ii) Inspection Certificate issued by authorized representative of the Purchaser.
- (iii) Certificate of receipt of material in good condition at site/ Contractor's depot duly verified by the Purchaser's Engineer.
- (iv) Bank Guarantee in the prescribed form for an amount equal to total amount claimed against supply of material. The BG will be retained by DFCCIL till the erection of material. On completion of the erection of material, the BG may be returned to the Contractor or be adjusted against further on account payments for supply of material.

1.13 INSURANCE

Before commencing of works, it shall be obligatory for the contractor to obtain, *at his own cost, insurance cover* in the *joint name of the Contractor and Employer (DFCCIL)* from reputed companies for the following requirements:

- a. Contractor's All Risk (CAR) Policy.
- b. Liability for death of or injury to any person or loss or damage to any property (other than the work) arising out the performance of the contract.
- c. Construction Plant, Machinery and Equipment brought to site by the Contractor.

- d. Workmen Compensation Policy.
- e. Any other insurance cover as may be required by the law of the land.
- f. The Contractor, if required, will engage a suitable engineer to liaise with Insurer Company in the interest of reliazation of insurance claims at no cost to Employer.
- g. Contractor/Insurance Company shall have to indemnify DFCCIL for all losses. Claims if any given by insurance company to be given directly to DFCCIL. Decision of DFCCIL will be binding on Contractor to distribute claim in part or full.

All insurance covers referred to in the Contract shall be effected with an Indian Insurance Company incorporated and registered in India.

1.14 FIRE EXTINGUISHERS

The contractor shall at his own expenses provide at suitable, prominent and easily accessible places, requisite number of fire extinguishers and buckets, some filled with sand and some with water.

1.15 QUALITY CONTROL

The Contractor shall submit to the DFCCIL a comprehensive quality approval plan for all materials, equipments and things to be provided under the contract. No material or equipment shall be dispatched by the manufacture or vendor or brought to site by the Contractor until the quality of the material or equipment has been established through inspection and tests or through test certificates furnished by the manufacturer. In case the DFCCIL accepts such test certificates as sufficient proof that the material or equipment conforms to the contract document, he shall accord his approval for the dispatch of materials or equipment.

1.16 QUALITY OF MATERIALS AND WORKMANSHIP

- 1.16.1** All materials and workmanship shall be the best of the respective kinds described in the Contract and in accordance with the instructions and directions of the DFCCIL and shall be subjected from time to time, to such test as the DFCCIL may direct at the place of manufacture or fabrication or on the site or at such other places as may be directed. The Contractor shall execute the whole and every parts of the works in the substantial and workmen like manner, both as regards to materials and workmanship, and in every respect in strict accordance with the contract documents and in compliance with the applicable government laws, ordinance, statues, codes, rules and regulations. The Contractor shall also conform exactly and faithfully to the designs, drawings and instructions in writing of the DFCCIL.
- 1.16.2** The designs and drawings shall have the prior approval of the Engineer in Charge before commencement of the work.

Make, Specification and quantity shall be got approved from Engineer in Charge before procurement. Inspection of material shall be carried out at Factory/Site as provided in technical specifications/industry practice.

- 1.16.3** Any material rejected by DFCCIL shall be removed from site within 7 days by the contractor at his own cost.

1.17 CONTRACTOR'S SUPERVISION

- 1.17.1** The contractor shall provide all necessary supervision during the execution of the works and the guarantee period for the proper fulfilment of the Contractor's obligations under the contract documents.

- 1.17.2** The Contractor shall employ for the execution of the works such technical persons as are qualified and experienced and such representatives, foremen and supervisory staff as are competent to supervise on the works and in the course of any operations carried out by him for the purpose of completing any outstanding work or rectification of defects during the Guarantee Period.

- 1.17.3** The supervisors deployed can be demobilized on instructions of DFCCIL, if not found fit for the job.

1.18 Technical Staff:

The contractor shall submit the list of engineers / technical staff with charter of duties / responsibilities of each one related to execution of the work within 30 days of issue of Letter of Acceptance and deploy the same at work site according to progress of work as decided by Engineer/DFCCIL. The decision of DFCCIL in this regard would be final and binding. The minimum mandatory technical manpower for the Project is tabulated below:

Requirement of technical staff					
S.No.	Minimum Qualification of Technical Representative	Designation of Technical Staff	Minimum relevant experience	Number	Deduction per month on absence as per clause 26A of GCC
1.	Graduate Engineer/ Electrical	Project Manager	10 years	1 No.	Rs 75,000/-
2.	Graduate Engineer or Diploma Engineer/Electrical	Project/Site Engineer (Electrical)	5/10 Years respectively	2 Nos.	Rs 30,000/-
3.	Graduate Engineer or Diploma Engineer/Civil	Project/Site Engineer (Civil)	5/10 Years respectively	1 No.	Rs 30,000/-

1.19 Compliance with GRIHA Guidelines

The project is pre-certified GRIHA 5 star rating. To secure 5 star GRIHA rating, a high degree of responsibility and cooperation is necessary from the contractor. Agency is advised to note that entire work shall be carried out in such a manner so as to satisfy Green Building parameters/ GRIHA guidelines. Conditions of Contract specific to Green Building Practices have been narrated in Special Conditions for Green Building Practices (Part-I, Chapter-V, Section-5).

PART-I

CHAPTER-V

SECTION-2

SPECIAL CONDITIONS OF CONTRACT (CIVIL)

Note: *The Special Conditions of contract (SCC) should be read in conjunction with the General Conditions of Contract (GCC). However, if there is any provision in the GCC, which is at variance with the provisions in SCC, the provisions in the Special Conditions of Contract (SCC) shall take precedence.*

2.1 TEMPORARY WORKERS' HOUSING:

2.1.1 The bidder himself shall construct clean hygienic and well-ventilated labour housing with adequate water supply, electrical, sanitation facilities, etc as per "Model Rules for the Protection of Health and Sanitary Arrangement for the Workers Employed by the Contractors" of General Conditions of Contract, or applicable Labour Regulations.

2.1.2 The contractor has to arrange for the labour passes for entry and exit of labourers at the work site.

2.1.3 Adequate number of temporary housing units shall be constructed within one month of the date of start of work to the satisfaction of Engineer.

2.1.4 Toilet blocks having WC, wash basin and bathing area @ one set for approximately 15 labours with arrangement for sewage disposal through ready to install adequate capacity septic tank units shall be made available along with the labour huts.

2.1.5 These housing units can be inspected by Engineer and contractor will be allowed to take up main work only after satisfactory completion of these units.

2.1.6 *No extra payment shall be made by DFCCIL for construction of such temporary labour housing.*

2.2 Deleted

2.3 Procurement of fly ash, lime, AAC, gypsum bricks

2.3.1 The work involves RCC framed construction with filler walls. The brick work shall be

carried out with good quality AAC Block/ FPS/Fly Ash Lime Gypsum (FALG) bricks of class designation as per BOQ with cement, sand mortar of mix or adhesive as per BOQ & as per CPWD Specifications.

- 2.3.1** The contractor will have to plan in advance manufacturing / sourcing of AAC blocks/FPS bricks in sufficient quantity to have a stock of 15 days requirement at all the times during the masonry construction phase.

2.3.2 Deleted

2.4 Deleted

2.5 Tool and Plants

The required T&P shall be brought to site well in advance so as to ensure the progress of the work as per the contract / schedule.

2.6 Compliance with GRIHA Guidelines

Tenderer is advised to note that entire work shall be carried out in such a manner so as to satisfy Green building parameters / GRIHA guidelines. Conditions of Contract specific to Green Building Practices have been narrated in Special Conditions for Green Building Practices (*Part-I, Chapter-V, Section-5*).

2.7 Defects Liability Period (DLP)

- 2.7.1** Defects liability period shall be taken as **twelve months** from the date of completion of the work of ***“Supply, Erection, Testing and Commissioning of 33 kV Sub-stations, DG Set and related works including building as a whole”***, wherein all the defects shall be rectified by the contractor at his own cost.

For specialized works such as water proofing etc, the defect liability period shall be for a minimum period of 10 years, in which:

- a. The contractor shall be fully responsible for and shall guarantee proper performance of the entire waterproofing system for a period of 10 (Ten) years from the final completion of works. For this, a specific 10 years written guarantee (*to be furnished in a non-judicial stamp paper of value not less than Rs.100/-*) in the prescribed proforma (***Form No.24***) shall be submitted for the performance of the system before final payment and shall not in any way limit any other rights the Employer may have under the contract. All water-proofing work shall be carried out through specialized agency as per method of working approved by the Engineer. However, the contractors shall be solely responsible for waterproofing treatment until the expiry of the above guarantee period.

- b. In addition, **10% (ten percent) of the cost of these items of water proofing under this sub head shall be retained as guarantee to watch the performance of the work executed.** However, if the performance of the waterproofing works is found satisfactory, then, half of this amount (*withheld*) would be released after five years from the date of completion of the work & the remaining withheld amount, shall be released after completion of ten years from the date of completion of work (*if the performance of the waterproofing work is found satisfactory*).

However, if any defect is noticed during the guarantee period, it would need to be rectified by the contractor within seven days of issuing of notice by the Engineer / DFCCIL and, if not attended to, the same shall be got done through other agency at the risk and cost of the contractor and recovery shall be effected from the amount retained towards guarantee. In any case, the contractor and the specialized agency, during the guarantee period, shall inspect and examine the treatment once in every year and make good any defect observed and confirm the same in writing to DFCCIL. The security deposit can be released in full, if bank guarantee of equivalent amount, valid for the duration of guarantee period is produced and deposited with the Department.

- 2.7.2** Defects of serious nature causing inconvenience such as leakage, reverse floor slopes affecting the drainage (*ponding of water*), *warping and opening of joints in doors and window shutters, etc, shall be undertaken by the contractor immediately on receipt of the complaint but not exceeding one week time, failing which, the defects will be got removed at his risk and cost plus 25% as supervision and establishment charges.*
- 2.7.3** All other defects notified to the contractor during the DLP shall be rectified to the entire satisfaction of Engineer or item replaced as soon as possible but not beyond one month failing which, Engineer shall get it done at his cost plus 25% as supervision and establishment charges. **The decision of Engineer regarding a defect being of serious nature or otherwise shall be final and binding.**
- 2.7.4** The Contractor has to make arrangement/setup for timely rectification of defects during DLP period.

The scope of the defect liability will be as under (*as applicable*):

S. No	Description	Defect Liability
(i)	Concrete	(a) Rectification of structural /superficial/non-structural cracks. (b) Rectification of dampness/leakages/seepage in roof slab/junctions & sunken portion, depressed portion, through RCC slab, vertical ties, bands, walls, base slab, junction of RCC walls with base slab and construction joints of RCC water tanks. (c) Rectification of cracks in beam, slab, column, lintels, vertical ties, plinth bands, lintel bands etc.
(ii)	Brick work	(a) Rectification of cracks in confined masonry panel wall / partition wall in full length or in part portion. (b) Cracks / settlement of main wall, partition wall or dwarf walls. (c) Rectification of efflorescence, dampness.
(iii)	Woodwork & Joinery	(a) Replacement of warped / bent / weather affected joinery, termite & borer affected joinery of wooden door / window shutters and frames. (b) Cracks in panels, bars / rails / styles of wooden door / window shutters etc.
(iv)	Builders Hardware	(a) Repairs / Replacement of loosened / premature failure of fittings including lever mechanics in door locks, hydraulic door closers, handles, tower bolts, cupboard locks etc. (b) Tightening / Replacement of sag in mosquito proofing SS net.
(v)	Steel & iron work/u-PVC work	(a) Rectification / Replacement of defective part of gate, shutter, etc. (b) Redoing of defective portion in fabrication / welding including painting thereon. (c) Structural steel work and MS railing. (d) Windows, grills, gates etc.
(vi)	Roof treatment	(a) Rectification of leakage / seepage in roof slab, expansion/ seismic joints, floor junctions, inadequate/ faulty slope, drain outlets, including covering at junction till guarantee period.
(vii)	Finishing	(a) Rectification of structural / superficial cracks. (b) Rectification of protruding / peeling off plaster. (c) Rectification of efflorescence, dampness appeared. (d) Undulation / unevenness in plaster. (e) Paint & polishing.

(viii)	Flooring	(a) Rectification of sunken / deflected / depressed portion of plinth protection, flooring in rooms, toilets, entrance foyer, staircase and other locations. (b) Rectification / Replacement of settled floors. (c) Settlement of foundation & floors and resultant undulation of door finishes. (d) Rectification / Replacement of floor tiles which are sunken / uneven / undulating at joints / different in colour, texture, etc.
(ix)	Aluminium/u-PVC work	(a) Rectification / Replacement of defective part of Aluminium frame /shutters.

Note: The above list is illustrative for civil work and not exhaustive.

2.7.5 Deleted

2.8 Deleted

2.8.1 Deleted

2.8.2 Deleted

2.8.3 Deleted

2.8.4 Other Conditions

- (a) The execution of items shall be carried out in accordance to relevant CPWD specifications (*amended upto date of receipt of tenders*). For the items which are not covered under CPWD specifications, the Technical Specifications / B.I.S. Specifications shall have to be followed. The decision of Engineer shall be final in this regard.
- (b) Wherever any reference is made to any Indian Standard, it shall be taken as reference to the latest edition with all amendments / revision issued thereto upto the date of receipt of tenders.
- (c) Unless otherwise specified, the agreement rates for all items of work of the Schedule of Quantities are for all heights, depths, leads and lifts involved in the execution of work.
- (d) The contractor shall make his own arrangement of water required for the work.
- (e) The contractor shall make his own arrangements for obtaining electric connection for carrying out any maintenance activity and make necessary payment to the department concerned. In the absence of electric connection or failure of power supply, the contractor

shall make his own arrangements of generators.

- (f) Other agencies working at site will also simultaneously execute the work. The contractor shall offer necessary cooperation to other agencies wherever required.
- (g) On account of security consideration, there could be some restrictions on the working hours, movement of vehicles for transportation of materials, etc. The contractor shall be bound to follow all such restrictions and adjust the programmes for execution of works accordingly.
- (h) The work shall be carried out in a manner complying in all respects with the requirements of any prevalent statutory laws enacted either by Central Govt. as well as State Govt./Authority.
- (i) Any malba / building rubbish generated is to be removed from the site within 24 hours and to be stacked at a pre-designated place. The malba / building rubbish so stacked shall be disposed off as soon as one truck load is accumulated (*approx 5 cum*) from such designated place.
- (j) This malba / building rubbish has to be disposed off to the dumping ground as approved by the Engineer in consultation with DFCCIL. ***The rates quoted by the contractor are inclusive of all operations, labour, leads and lifts from site of work to the dumping ground.***
- (k) Maintenance Engineer/Supervisor shall carry mobile telephone (s) to enable the Engineer-in-Charge to have easy and quick communication. ***Nothing extra shall be paid to the contractor*** on this account and his ***quoted rates*** for various items under this contract will be ***inclusive of this obligation.***
- (l) The replaced materials used shall have same or richer specifications to the original materials and compatible to the work.
- (m) The staff employed by the contractor should be well behaved and any complaint of misbehaviour shall be taken very seriously and such staff will have to be removed by the contractor immediately from the site.
- (n) The dismantled materials shall be taken away and disposed off by the contractor at his cost. ***Nothing extra shall be paid*** / recovered on account of this.
- (o) The contractor shall make all safety arrangements required for the labour engaged by him at his cost. All consequences due to negligence on behalf of security / safety or otherwise

shall be on the contractor. The department shall not be responsible for any mishap, injury, accident or death of the contractor's staff. No claim in this regard shall be entertained / accepted by the department.

- (p) Contractor shall be fully responsible for any damages caused to government property or allottee's property by him or his labour in carrying out the work and shall be rectified by the contractor at his own cost.
- (q) Chases, holes, etc. shall be done using power operated tools.

2.9 Safety measures

2.9.1 The issue of construction safety & standards has gained utmost importance in recent times. This subject is to be dealt with, in an overall manner with an approach to developing and establishment a safety culture at work sites. Broadly, its components are:

2.9.1.1 Creating an awareness

2.9.1.2 Education

2.9.1.3 Training

2.9.1.4 Implementation

2.9.1.5 Enforcement measures

All workers of contractor and associate agencies, invariably and at all the times, must follow all safety norms, adopt safe construction practices and use all required safety gadgets in their working, throughout the project duration.

2.9.2 The *contractor will employ a Safety Engineer*. He shall be primarily responsible for developing safety programs, training, implementation and propagating safety culture.

2.9.3 The contractor shall issue *Photo Identity Cards* with unique numbers containing salient information of workers. Further the contractor shall establish a *Time Office* at the entry to demarcate area of site. The *Time Office* shall maintain a computerized record of all the workers allowed entry / working inside the demarcated area.

2.9.4 Formation of Safety Monitoring Committee: The contractor within 30 days of start of work shall submit the names of Safety Engineer to the Engineer/DFCCIL who shall notify a monitoring committee consisting of authorized representatives of the contractor, associate agencies (*if any*), DFCCIL. The mandate of this monitoring committee will be to monitor and achieve the objectives of construction safety continuously, progressively and through

affirmative action and to inculcate the safety culture among all stake holders. This committee will oversee implementation of safety program over the entire construction period.

2.9.5 Training and Awareness:

- a. Training: The training shall be in two phases- first initial training and then periodic training / refresher workshop.
- b. Initial training: All the workers shall have to undergo a training program of 16 hrs (*8 hrs for 2 days*) and to be declared satisfactorily trained by the Safety Manager before they are allowed to work on site.
- c. Orientation Program: An orientation program shall be arranged for all people (*other than workers*) who normally work at or visit the site.
- d. Workshops: Refresher workshops shall be arranged for one day in every three months for all the workers on site.
- e. Advance training: For workers involved in high risk activities (*to be identified by the Safety Monitoring Committee*) a refresher workshop / training shall be kept once a month.
- f. The training modules shall be designed by the Safety Manager and approved by the Safety monitoring committee.
- g. Training Methodology: The training methodology shall include both classroom and practical demonstration with audio visual techniques. For greater impact, demonstration with dummies will be done to highlight hazards of not following safe practices. The training shall be imparted in vernacular language and may include means such as songs, theatre, puppetry etc. for better appreciation and assimilation by workers.
- h. *Implementation:*
 - The basic responsibility of implementation of safe practices shall be that of the safety manager and safety supervisors of the contractor at the first level and Engineer and DFCCIL on second level. The basic approach of implementation should be towards voluntary acceptability of safe practices by all stake holders.
 - The safety arrangement made by the contractor shall be open to inspection by the

safety officer or any other representative appointed by Engineer/DFCCIL and the observation made by him shall be complied with by the contractor.

2.9.6 Enforcement: The safety team of the contractor and Engineer are entrusted with enforcement of safe practices. If safety program is not followed (*as assessed by Engineer/DFCCIL*) then suitable actions shall be taken as per GCC.

- a. No person shall be allowed to enter the demarcated area without adequate safety gadgets (*as per occupation / purpose of visit*).
- b. In case the contractor / subcontractor do not impart training, the same shall be provided by DFCCIL through an accredited agency. ***Twice the amount of fee for such training shall be deducted from the contractor.*** A display board shall be kept at site which would list the names of workers / teams and agencies following safety program in the best manner. This would be updated weekly.
- c. During training and workshops, the names of persons / teams / agencies that are best following safety program shall be announced and they shall be felicitated.
- d. On completion of the work, shields for best person / team / agencies safety program in different categories shall be awarded.

2.10 SECURITY

2.10.1 Contractor shall take all measures and precautions relating to security of the construction site. He shall ***barricade the construction site*** / designated area of construction through the barriers and as approved by the Engineer. No material shall be stored / dumped outside the designated area.

2.10.2 The movement of the construction vehicles and the labours shall be restricted to the designated routes which will be decided by the Engineer/DFCCIL.

2.10.3 All the vehicles carrying the material to the work site shall be subject to check and entries to be made at the gates. No material shall be taken out without proper gate pass.

2.10.4 Any labour engaged by the contractor shall be in possession of photo ID card failing which they are liable to be disengaged from the work and shall not be allowed to enter into the construction site.

2.10.5 In case of any nuisance caused by activities attributed to contractors' staff, workmen and

movement of vehicle, and reported to Engineer/DFCCIL, a suitable action will be taken by the Engineer/DFCCIL.

2.10.6 The movement of the labour shall be restricted to the barricaded work site area only.

2.11 3rd PARTY QUALITY ASSURANCE

2.11.1 In order to achieve high standards of materials, workmanship and overall quality of the execution, an agency engaged by DFCCIL will carry out Third Party Inspections as part of 'Third Party Quality Assurance'. This agency will carry out the checks of the quality assurance procedures followed at site, take samples of the materials for independent testing and check the workmanship of the works carried out. The contractor shall extend full co-operation to the TPQA agency in facilitating the inspections and collection of samples and regulate the execution stages with regards to the hold and witness points which shall be strictly adhered to by the contractor. The next stage work shall not be undertaken at the hold point stage and work shall be done in presence of the TPQA representative at the witness stage. The contractor shall be required to co-operate with agency in carrying out various activities including documentation at no extra time and cost to the owner. In case of any adverse findings by the TPQA agency, the contractor shall do the needful rectifications to the entire satisfaction of the TPQA agency and DFCCIL. If contractor fails to rectify the defects of the serious nature within a reasonable time frame, ***no further payment shall be made.***

If work is stopped due to non- rectification of defects and delay occurs on this account, no relief in completion of mile stone by way of grant of EOT or any other relaxation be given.

2.12 CONSTRUCTION VEHICLES TYRE WASHING FACILITIES

All the vehicles leaving the site shall be loaded in such a manner that the excavated materials, mud or debris will not be deposited on roads. All such loads shall be covered or protected to prevent dust being emitted. The wheels of all vehicles shall be washed properly before leaving the site to avoid the deposition of mud and debris on the roads. The contractor shall provide a wash pit and a wheel washing facility with high pressure water jets for this purpose. Also, the contractor shall make necessary arrangements for sweeping and removal of mud from roads if it is deposited even after washing of wheels of vehicles leaving site. ***Nothing extra shall be paid*** for providing and maintaining this facility.

2.13 BARRICADING OF SITE

The contractor shall make adequate arrangement for new barricading as directed by the Engineer to cover the entire construction site including all T&P and materials. The requirement of providing and fixing new barricading at site shall be decided as per the direction and approval of Engineer. The barricading shall be provided continuously during

the execution of the entire work till completion and shall not be removed at any stage without prior approval of the Engineer. The barricading shall be provided and shall be the property of the contractor after completion of the work.

2.14 WATER SUPPLY

Contractor shall be responsible for the arrangement to obtain supply of water necessary for the works at his own cost.

2.15 ELECTRIC SUPPLY

Contractor shall be responsible for the arrangement to obtain supply of electric power necessary for the works at his own cost.

2.16 COMPLIANCE TO ENVIRONMENTAL LAWS

The contractor shall comply the directives of Hon'ble National Green Tribunal dated 04.12.2014 & 10.04.2015 and EIA Guidance Manual issued in February 2010 and Construction & Demolition Waste Management Rules, 2016. The compliance of the contractor shall not be limited to the following:

1. The contractor shall not store/dump construction material or debris on metalled road.
2. The contractor shall get prior approval from Engineer for the area where the construction material or debris can be stored beyond the metalled road. This area shall not cause any obstruction to the free flow of traffic/inconvenience to the pedestrians. It should be ensured by the contractor that no accidents occur on account of such permissible storage.
3. The contractor shall take appropriate protection measures like raising wind breakers of appropriate height on all sides of the plot/area using CGI sheets or plastic and/or other similar material to ensure that no construction material dust fly outside the plot area.
4. The contractor shall ensure that all the trucks or vehicles of any kind which are used for construction purposes/or are carrying construction material like cement, sand and other allied material are fully covered. The contractor shall take every necessary precautions that the vehicle are properly cleaned and dust free to ensure that enroute their destination, the dust, sand or any other particles are not released in air/contaminate air.
5. The contractor shall provide mask to every worker working on the construction site and involved in loading, unloading and carriage of construction material and construction debris to prevent inhalation of dust particles.
6. The contractor shall provide all medical help, investigation and treatment to the workers

involved in the construction of building and carry of construction material and debris relatable to dust emission.

7. The contractor shall ensure that C&D waste is transported to the approved C&D waste site of local authority only as per Construction & Demolition Waste Management Rules, 2016 and due record shall be maintained by the contractor.
8. The contractor shall compulsorily use jet in grinding and stone cutting.
9. The contractor shall comply all the preventive and protective environmental steps as stated in the MoEF Guidelines, 2010.
10. The contractor shall carry out On-Road-Inspection for black smoke generating machinery. The contractor shall use cleaner fuel.
11. The contractor shall ensure that the DG sets comply emission norms notified by MoEF.
12. The contractor shall use vehicles having pollution under control certificate. The emissions can be reduced by a large extent by reducing the speed of a vehicle to 20 kmph. Speed bumps shall be used to ensure speed reduction. In cases where speed reduction cannot effectively reduce fugitive dust, the contractor shall divert traffic to nearby paved areas.
13. The contractor shall ensure that the construction material is covered by tarpaulin. The contractor shall take all other precaution to ensure that no dust particles are permitted to pollute air quality as a result of such storage.
14. ***No extra payment will be made*** for operation/activity mentioned at Sl. No. 1 to 13 above.

2.17 Deleted

2.18 NOTES

2.18.1 Deleted.

- 2.18.2** Tenderer is advised to visit the site before submitting their bid. The site may have ***bushes and vegetation***, etc. ***Nothing extra shall be payable on account of cleaning of site.*** The contractor must plan his activities accordingly so as to effectively utilize the cutting and filling of earth in nearest possible locations.

PART-I

CHAPTER-V

SECTION-3

ADDITIONAL SPECIAL CONDITIONS OF CONTRACT

3. GENERAL

- 3.1 Where there is any conflict between the various documents in the contract, the following order of priority shall be followed i.e. a document appearing earlier shall override the document appearing subsequently. However, the *decision of Engineer would be final & binding* in this regard.

Order of Priority of Documents:

- a. Letter of Acceptance (LOA)
- b. Schedule of items, Rates & Quantities.
- c. Special Conditions of Contract.
- d. Technical Specifications as given in tender documents.
- e. Drawings, if any.
- f. General Conditions of Contract.
- g. Relevant BIS Codes.

Note: Unless otherwise specified, CPWD Specifications 2009 Volume I & II with corrections slips till the last date of tender submission shall be followed in general. Any additional item of work, if taken up subsequently, shall also conform to the relevant CPWD Specifications mentioned above (*if available*).

- 3.1.1 The work shall be carried out in accordance with the Architectural drawings and structural drawings, to be issued from time to time, by the Engineer. Before commencement of any item of work, the contractor shall correlate all the relevant architectural and structural drawings issued for the work and satisfy himself that the information available from there is complete and unambiguous. The discrepancy, if any, shall be brought to the notice of the Engineer before execution of the work. The contractor alone shall be responsible for any loss or damage occurring by the commencement of work on the basis of any erroneous and or incomplete information.

- 3.1.2 The contractor shall be responsible for the watch and ward / guard of the buildings, till the building is physically handed over to the DFCCIL. **No extra payment** shall be made on this account.
- 3.1.3 For works below ground level, the contractor shall keep that area free from water. If, dewatering or bailing out of water is required, the contractor shall **do it at his cost** and **nothing extra shall be paid** except otherwise provided in the items of schedule of quantities.
- 3.1.4 Results of sub-surface investigations conducted at site are indicated in extracts of the soil investigation report (*available in DFCCIL Office*). This information about the soil and sub-soil water conditions is indicative and is being provided, in good faith, for guidance only and the tenderer is advised to obtain details directly as may be considered necessary by him before quoting rates in the tender. No claim whatsoever on account of any discrepancy between the sub- surface strata conditions that may be actually encountered at the time of execution of the work and those given in these tender documents, in-accuracy or interpretation thereof shall be entertained from the Contractor under any circumstances. The ground water table is a variable condition and the information given in the report is only indicative and it may vary from time to time.
- 3.1.5 Excavated earth shall be property of DFCCIL and shall not be disposed off without approval of Engineer. Any legal or financial implications resulting out of disposal of earth shall be sole responsibility of the contractor.
- 3.1.6 The Contractor shall make all necessary arrangements for protecting from rains, fog or likewise extreme weather conditions, the work already executed and for carrying out the further work, during monsoon including providing and fixing temporary shelters, protections etc. **Nothing extra shall be payable** on this account. Also, no claims for hindrance shall be entertained on this account.
- 3.1.7 In case of flooding of site on account of rain or any other cause and any consequent damage, whatsoever, **no claim financially or otherwise** shall be entertained notwithstanding any other provisions elsewhere in the contract agreement. Also, the Contractor shall make good, at his own cost, the damages caused, if any. Further, no claims for hindrance shall be entertained on this account.
- 3.1.8 The contractor will take reasonable precautions to prevent his workmen and employees from removing and damaging any flora (*plant/vegetation*) from the project area.
- 3.1.9 **Emergency Work:**

In the event of any action or failure occurring in on or about the work or arising out of or in connection with the construction, completion or maintenance of the work which in the Engineer opinion requires immediate attention, Engineer may by its own workmen or other

agency execute or partly execute the necessary work or carry out repairs if the Engineer considers that the contractor is not in a position to do in time and to charge the cost thereof to the contractor as determined by the Engineer.

3.1.10 Protection & Care of Works:

- a. The works are to be protected as asked by the Engineer. Protection is required for all hazardous works and during installation, testing & commissioning of work. The cost of safety measures & other gadgets etc. shall be deemed to be included in the quoted rates and ***nothing extra*** shall be paid for the same.
- b. ***Care of the building:***
 - (i) Care shall be taken by the contractor during execution of the work to avoid damage to the building and adjacent buildings.
 - (ii) They shall also be responsible for repairing all such damages and restoring the same to the original finish at their cost.
 - (iii) They shall also remove all unwanted and waste materials arising out of the execution of work from the site from time to time.

3.1.11 Handing Over

- a. On completion of all items of work as per contract, contractor shall hand over the works to joint taking over by client & Engineer. The handing over of the completed works to Engineer shall be the responsibility of the contractor. The handing over will be treated as final only when the same is taken over by the Engineer/Client officially in writing. The defect liability period will commence from the date of handing over to the Engineer. The process of handing over shall be as under:-

One month in advance of the stipulated date of completion, joint inspection shall be carried out with contractor and Engineer's representatives and all the defects, deficiencies shall be noted and a time bound programme to be made for rectifying/making good all the defects and deficiencies. The contractor shall remove at his own cost all surplus materials, debris, material waster, labour hutments before handing over. If it is felt that the contractor is not responding to rectify the defects urgently and the Engineer is suffering in using the assets created due to default of the contract, Engineer shall be entitled to get the defects rectified at the risk and cost of the contractor any time after expiry of 24 hours notice issued to the contractor.

3.2 TOOLS AND PLANTS

- 3.2.1 The bidder should arrange construction equipments required for the proper and timely execution of the work. ***Nothing extra shall be paid*** on this account.
- 3.2.2 No tools and plants including any special T&P etc. shall be supplied by the Department and the contractor shall have to make his ***own arrangements at his own cost***. No claim of hindrance (*or any other claim*) shall be entertained on this account.
- 3.2.3 The contractor shall do proper sequencing of the various activities by suitably staggering the activities within various pockets in the plot so as to achieve early completion. The agency may deploy adequate equipment, machinery and labour as required for the completion of the entire work within the stipulated period specified. Also ancillary facilities shall be provided by contractor commensurate with requirement to complete the entire work within the stipulated period. ***Nothing extra shall be payable*** on this account. Adequate number/sets of equipment in working condition, along with adequate stand-by arrangements, shall be deployed during entire construction period. It shall be ensured by the Contractor that all the equipment, Tools & Plants, machineries etc. provided by him are maintained in proper working conditions at all times during the progress of the work and till the completion of the work. Further, all the constructional tools, plants, equipment and machineries provided by the contractor, on site of work or his work shop for this work, shall be exclusively intended for use in the construction of this work and they shall not be shifted / removed from site without the permission of the Engineer.

3.3 ROYALTY

- 3.3.1 Royalty at the prevalent rates shall be paid by the contractor or the RMC supplier as per the terms of supply between them, on all materials such as boulders, metals, all sizes stone aggregates, brick aggregates, coarse and fine sand, moorum, river sand, gravels and bajri etc. collected by him for the execution of the work, directly to the revenue authority of the state government concerned. Further, contractor needs to submit proof of submission of full royalty to the state government or local authority. ***Nothing extra shall be payable*** on this account.

3.4 PRESERVATION AND CONSERVATION MEASURES

- 3.4.1 Existing drains, pipes, cables, over-head wires, sewer lines, water lines and similar services encountered in the course of the execution of work shall be protected against the damage by the contractor, ***at his own expense***, for which ***nothing is payable***. The contractor shall not

store materials or otherwise occupy any part of the site in a manner likely to hinder the operation of such services.

- 3.4.2 All fossils, coins, articles of value of antiquity, structures and other remains or things of geological or archaeological interest discovered on project location during excavation/ construction shall be the property of the Government, and shall be dealt with as per provisions of the relevant legislation. The contractor will take reasonable precaution to prevent his workmen or any other persons from removing and damaging any such article or thing. He will, immediately upon discovery thereof and before removal acquaint the Engineer of such discovery and carry out the official instructions of Engineer for dealing with the same, till then, all work shall be carried out in a way so as not to disturb/ damage such article or thing.

3.5 RESPONSIBILITY

- 3.5.1 The Contractor shall keep himself fully informed of all relevant acts and laws of the Central & State Governments, orders, decrees of statutory bodies, tribunals having any jurisdiction or authority, which in any manner may affect those engaged or employed and anything related to carrying out the work. All the rules & regulations and bye-laws laid down by District Collector /Noida Authority and any other statutory bodies shall be adhered to, by the contractor, during the execution of work. The Contractor shall also adhere to all traffic restrictions notified by the local authorities. ***The water charges (for municipal water connection as well as tanker water) shall be borne by the contractor.*** Also, if the contractor obtains water connection for the drinking purposes from the municipal authorities or any other statutory body, the consequent ***sewerage charges shall be borne by the contractor.*** All statutory taxes, levies, charges (*including water and sewerage charges, charges for temporary service connections and / or any other charges*) payable to such authorities for carrying out the work, ***shall be borne by the Contractor.*** The Contractor shall arrange to give all notices as required by any statutory / regulatory authority and shall pay to such authority all the fees that is required to be paid for the execution of work. He shall protect and indemnify the DFCCIL and its officials & employees against any claim and /or liability arising out of violations of any such laws, ordinances, orders, decrees, by himself or by his employees or his authorized representatives. ***Nothing extra shall be payable*** on these accounts.
- 3.5.2 The fee payable to statutory authorities for obtaining the ***various permanent service connections*** and Building Use Certificate for the building ***shall be borne by the DFCCIL.*** The contractor shall assume all liability, financial or otherwise in connection with this contract and shall protect and indemnify DFCCIL from any and all damages and claims

that may arise on any account. The Contractor shall indemnify against all claims in respect of patent rights, royalties, design, trademarks of name or other protected rights, damages to adjacent buildings, roads or members of public, in course of execution of work or any other reasons whatsoever, and shall himself defend all actions arising from such claims and shall indemnify the DFCCIL in all respect from such actions, costs and expenses. ***Nothing extra shall be payable*** on this account.

- 3.5.3 The contractor shall keep himself fully informed of all acts and laws of the Central Government and Government of U.P., all local bye laws, ordinances, rules and regulations and all orders and decree of bodies or, tribunals having any jurisdiction or authority which in any manner affect those engaged or employed on the work or which in any way affect the conduct of the works. Contractor shall at all times, observe and comply with all such laws, ordinances, rules, regulations, orders and decrees, and shall give all notices and ***pay out of his own money any fees or charges to which he may be liable***. He shall protect and indemnify the DFCCIL and its officers and employees against any claim or liability arising out of violations of any such law, ordinances, legislations, order or decree, whether by himself or by his employees & authorized representatives.

3.6 CO-OPERATION WITH OTHER CONTRACTORS/SPECIALIZED AGENCIES/SUB-CONTRACTORS

- 3.6.1 The contractor shall take all necessary precautions to prevent any nuisance or inconvenience to the owners, tenants or occupants of the adjacent properties and to the public in general .The Contractor shall take all care, as not to damage any other adjacent property or other services running adjacent to the plot. If any damage is done, the same shall be made good by the contractor ***at his own cost*** and to the entire satisfaction of the Engineer. The contractor shall use such methodology and equipment for execution of the work, so as to cause ***minimum environmental pollution*** of any kind during construction, to have minimum construction time and minimum inconvenience to road users and to the occupants of the buildings on the adjacent plot and public in general, etc. He shall make good ***at his own cost*** and to the entire satisfaction of the Engineer any damage to roads, paths, cross drainage works or public or private property whatsoever caused, due to the execution of the work or by traffic brought thereon, by the Contractor. Further, the contractor shall take all precautions to abide by the environmental related restrictions imposed by U.P. state Pollution control board, Govt. of U.P. as well as prevent any pollution of streams, ravines, river bed and waterways. All waste or superfluous materials shall be transported by the Contractor, entirely to the satisfaction of the Engineer. Utmost care shall be taken to keep the noise level to the barest minimum so that no disturbance as far as possible is caused to the occupants / users of adjoining buildings. No claim what so ever on account of site constraints mentioned above or any other site constraints, such as distance from Noida city as approximately 20 km, lack of public transport, inadequate availability of skilled, semi-skilled or unskilled workers in the near vicinity, non-availability of construction machinery spare parts and any other constraints not specifically stated here, shall be entertained from the contractor. Therefore, the

Tenderers are advised to visit site and get first-hand information of site constraints. Accordingly, they should quote their tenders. ***Nothing extra shall be payable*** on this account.

- 3.6.2 The contractor shall cooperate with and provide the facilities to the sub-contractors and other agencies working at site for smooth execution of the work. The contractor shall indemnify the DFCCIL against any claim(s) arising out of such disputes. The contractor shall :
- a. Allow use of scaffolding, toilets, sheds etc.
 - b. Properly co-ordinate their work with the work of other Contractors.
 - c. Provide control lines and benchmarks to his Sub-Contractors and the other Contractors.
 - d. Provide electricity and water at mutually agreed rates.
 - e. Provide hoist and crane facilities for lifting material at mutually agreed rates.
 - f. Co-ordinate with other contractors for leaving inserts, making chases, alignment of services etc. at site.
 - g. Adjust work schedule and site activities in consultation with the Engineer and other contractors to suit the overall schedule completion.
 - h. Resolve the disputes with other contractors / sub-contractors amicably and the Engineer shall not be made intermediary or arbitrator.
- 3.6.3 The work should be planned in a systematic manner so as to ensure proper co-ordination of various disciplines
- 3.6.4 The contractor shall leave recesses, holes, openings trenches etc. as may be required for the related works and ***nothing extra shall be payable*** on this account.
- 3.6.5 The contractor shall conduct his work, so as not to interfere with or hinder the progress or completion of the work being performed by other contractor(s) or by the Engineer and shall as far as possible arrange his work and shall place and dispose of the materials being used or removed so as not to interfere with the operations of other contractor or he shall arrange his work with that of the others in an acceptable and in a proper co-ordination manner and shall perform it in proper sequence to the complete satisfaction of others.

3.6.6 Specialized Agencies

The tenderer must associate with himself, agencies of the appropriate eligibility to tender for each of specialized nature of items / work. Such works shall be got executed only through associated agencies specialized in these fields.

It shall be the responsibility of main contractor to sort out any dispute / litigation with the Specialized Agencies without any time & cost overrun to the DFCCIL. The main contractor shall be solely responsible for settling any dispute / litigation arising out of his agreement with the Specialized Agencies. The contractor shall ensure that the work shall not suffer on account of litigation/ dispute between him and the specialized agencies / sub-contractor(s). No claim of hindrance in the work shall be entertained from the Contractor on this account. **No extension of time** shall be granted and **no claim** what so ever, of any kind, shall be entertained from the Contractor on account of delay attributable to the selection/rejection of the Specialized Agencies.

3.7 RATES

- 3.7.1 The rates quoted by the contractor are deemed to be inclusive of site clearance, setting out work, profile, setting lay out on ground, establishment of reference bench mark(s), installing various signage, taking spot levels, survey with total station, construction of all safety and protection devices, compulsory use of helmet and safety shoes, and other appropriate safety gadgets by workers, imparting continuous training for all the workers, barriers, preparatory works, construction of clean, hygienic and well ventilated workers housings in sufficient numbers working during monsoon or odd season, working beyond normal hours, working at all depths, height, lead, lift, levels and location etc. and any other unforeseen but essential incidental works required to complete this work. **Nothing extra shall be payable** on this account and **no extension of time** for completion of work shall be granted on these accounts.
- 3.7.2 ***The rates quoted by the tenderer shall be inclusive of all taxes and duties, except GST.*** GST as applicable shall be paid extra on the accepted rates mentioned in Schedule- II. If any cost implication to DFCCIL is occurred on GST account because of Contractor's default in filing of GST returns such as no GST number, wrong GST number, mismatch of GST number etc. , the same shall be recovered from the Contractor's bill or any other pending/ future bill. ***Price variation on Schedule-II (Civil works) will be applicable as per the clause mentioned in GCC.***
- 3.7.3 No foreign exchange shall be made available by the DFCCIL for importing (*purchase*) of equipment, plants, machinery, materials of any kind or any other items required to be carried out during execution of the work. ***No delay and no claim*** of any kind shall be entertained from the Contractor, on account of ***variation in the foreign exchange rate.***
- 3.7.4 All ancillary and incidental facilities required for execution of work like labour camp, stores, fabrication yard, offices for Contractor, watch and ward, temporary ramp required to be made for working at the basement level, temporary structure for plants and machineries, water storage tanks, installation and consumption charges of temporary electricity, telephone, water etc. required for execution of the work, liaison and pursuing

for obtaining various No Objection Certificates, completion certificates from local bodies etc., protection works, testing facilities / laboratory at site of work, facilities for all field tests and for taking samples etc. during execution or any other activity which is necessary (*for execution of work and as directed by Engineer*), ***shall be deemed to be included in rates quoted by the Contractor***, for various items in the schedule of quantities. ***Nothing extra shall be payable*** on these accounts. Before start of the work, the Contractor shall submit to the Engineer, a site / construction yard layout, specifying areas for construction, site office, positioning of machinery, material yard, cement and other storage, steel fabrication yard, site laboratory, water tank, etc. ***DFCCIL shall provide rent free piece of land*** for construction of these facilities at construction site for the duration of this work.

3.7.5 For completing the work in time, the contractor might be required to work in two or more shifts (*including night shifts*). ***No claim*** whatsoever shall be entertained on this account, not with-standing the fact that the contractor may have to pay extra amounts for any reason, to the labourers and other staff engaged directly or indirectly on the work according to the provisions of the labour and other statutory bodies regulations and the agreement entered upon by the contractor with them.

3.7.6 All material shall only be brought at site as per program finalized with the Engineer. ***Any pre-delivery of the material*** not required for immediate consumption shall not be accepted and ***thus not paid for***.

3.7.7 Deleted

3.8 SAFETY PRACTICES

3.8.1 **WARNING / CAUTION BOARDS:** All temporary warning / caution boards / glow signage display such as "Construction Work in Progress", "Keep Away", "No Parking", Diversions & protective Barricades etc. shall be provided and displayed during day time by the Contractor, wherever required and as directed by the Engineer. These glow signages and red lights shall be suitably illuminated during night also. The Contractor shall be solely responsible for damage and accident caused, if any, due to negligence on his part. Also he shall ensure that no hindrance, as far as possible, is caused to general traffic during execution of the work. This signage shall be dismantled & taken away by the Contractor after the completion of work, only after approval of the Engineer. ***Nothing extra shall be payable*** on this account.

3.8.2 **SIGN BOARDS:** The contractor shall provide and erect a display board of size and shape

as required and paint over it, in a legible and workman like manner, the details about the salient features of the project, as required by the Engineer. The Contractor shall fabricate and put up a sign board in an approved location and to an approved design indicating name of the project, client / owner, architects, structural consultants etc. besides providing space for names of other Contractors, Sub-Contractors and specialized agencies. ***Nothing extra shall be payable*** on this account.

- 3.8.3 Necessary protective and safety equipment shall be provided to the Site Engineer, Supervisory staff, labour and technical staff of the contractor by the contractor ***at his own cost*** and to be used at site.
- 3.8.4 No inflammable materials including P.O.L shall be allowed to be stored in huge quantity at site. Only limited quantity of P.O.L may be allowed to be stored at site subject to the compliance of all rules / instructions issued by the relevant authorities and as per the direction of Engineer in this regard. Also all precautions and safety measures shall be taken by the contractor for safe handling of the P.O.L products stored at site. All consequences on account of unsafe handling of P.O.L ***shall be borne by the Contractor***.

3.9 QUALITY ASSURANCE

- 3.9.1 Quality of work is of paramount importance. Contractor shall have to engage well-experienced skilled labour and deploy modern T&P and other equipment to execute the work. Many items like exposed finish form work, specialized flooring work, Polysulphide / P.U. sealant and backer rod fixing in expansion joints, factory made door- window shutters, proper slope maintaining in toilet units, sanitary- water supply installation, textured finishing, grit plastering with aluminium channel insertions, water proofing treatment, Extruded Polystyrene insulation boards, façade works and chemical treatment in toilet drops will specially require engagement of skilled workers having experience particularly in execution of such items.
- 3.9.2 The contractor shall ensure quality construction in a planned and time bound manner. Any sub-standard material / work beyond set out tolerance limit ***shall be summarily rejected*** by the Engineer & contractor shall be bound to replace / remove such sub-standard / defective work immediately. If any material, even though approved by Engineer is found defective or not conforming to specifications shall be replaced / removed by the contractor ***at his own risk & cost***.
- 3.9.3 **Deleted**
- 3.9.4 The contractor shall submit, a detailed and complete method statement for the execution, testing and Quality Assurance, of such items of works, as directed by the Engineer. All the materials to be used in the work, to give the finished work complete in all respects, shall comply with the requirements of the specifications and shall pass all the tests required as per specifications as applicable or such specifications / standards as directed by the Engineer. However, keeping the Quality Assurance in mind, the Contractor shall submit, on

request from the Engineer, his own Quality Assurance procedures for basic materials and such items, to be followed during the execution of the work, for approval of the Engineer.

- 3.9.5 All materials and fittings brought by the contractor to the site for use shall conform to the samples approved by the Engineer which shall be preserved till the completion of the work. If a particular brand of material is specified in the item of work in Schedule of Quantity, the same shall be used after getting the same approved from Engineer. Wherever brand / quality of material is not specified in the item of work, the contractor shall submit the samples as per suggested list of brand names given in the tender document / SCC for approval of Engineer. For all other items, materials and fittings of ISI Marked shall be used with the approval of Engineer. Wherever ISI Marked material / fittings are not available, the contractor shall submit samples of materials / fittings manufactured by firms of repute conforming to relevant specifications or IS codes and use the same only after getting the approval of Engineer.
- 3.9.6 The contractor shall procure and provide all the materials from the manufacturers / suppliers as per the list attached with the tender documents/SCC, as per the item description of the work. The equivalent brand for any item shall be permitted to be used in the work, only after approval of Engineer/Employer. **No claim**, whatsoever, of any kind **shall be entertained** from the contractor on this account and **Nothing extra shall be payable** on this account.
- 3.9.7 All materials whether obtained from Govt. stores or otherwise shall be got checked by the Engineer or his authorized supervisory staff on receipt of the same at site before use.
- 3.9.8 The tests, as necessary, shall be conducted in the laboratory approved by the Engineer. The samples shall be taken for carrying out all or any of the tests stipulated in the specifications and as directed by the Engineer or his authorized representative.
- 3.9.9 All the registers of tests carried out at Construction Site or in outside laboratories and all material at site (MAS) registers including cement register shall be maintained by the contractor which shall be issued to the contractor by Engineer. All the entries in the registers will be made by the designated Engineering Staff of the contractor and same should be regularly reviewed by Engineer/Employer. Contractor shall be responsible for safe custody of all the test registers.
- 3.9.10 The contractor shall at his own risk and cost make all arrangements and shall provide all such facilities including material and labour, the Engineer may require for collecting, preparing, forwarding the required number of samples for testing as per the frequency of test stipulated in the contract specifications or as considered necessary by the Engineer, at such time and to such places, as directed by the Engineer. **Nothing extra shall be payable** for the above.
- 3.9.11 The contractor or his authorized representative shall associate in collection, preparation, forwarding and testing of such samples. In case he or his authorized representative is not

present or does not associate him, the result of such tests and consequences thereon shall be binding on the contractor. The contractor or his authorized representative shall remain in contact with the Engineer or his authorized representative associated for all such operations. No claim of payment or claim of any other kind, whatsoever, shall be entertained from the contractor.

3.9.12 ***All the testing charges shall be borne by the contractor.***

3.9.13 All the hidden items such as water supply lines, drainage pipes, conduits, sewers etc. are to be properly tested as per the design conditions before covering and their measurements in computerized measurement book duly test checked shall be deposited with Engineer or his authorized representative, prior to hiding these items.

3.9.14 Water tanks, taps, sanitary, water supply and drainage pipes, fittings and accessories should conform to byelaws and municipal body / Corporation/Authority where CPWD Specifications are not available.

3.9.15 The contractor shall give performance test of the entire installation(s) as per the standing specifications before the work is finally accepted and ***nothing extra*** whatsoever ***shall be payable*** to the contractor for the test.

3.9.16 ***The contractor shall have to execute guarantee bonds in respect of water proofing / anti termite treatment works as per Proforma enclosed.***

3.9.17 The contractor shall depute Site Engineer & skilled workers as required for the work. He shall submit organization chart along with details of Engineers and supervisory staff. It shall be ensured that all decision making powers shall be available to the representatives of the contractor at site itself to avoid any likely delays on this account. The contractor shall also furnish list of persons for specialized works to be executed for various items of work. The contractor shall identify and deploy key persons having qualifications and experience in the similar and other major works, as per the field of their expertise. If during the course of execution of work, the Engineer is of the opinion that the deployed staff is not sufficient or not well experienced; the Contractor shall deploy more staff or better- experienced staff at site to complete the work with quality and in stipulated time limit.

3.9.18 The contractor shall maintain all the work in good condition till the completion of entire work. The contractor shall be responsible for and shall make good, all damages and repairs, rendered necessary due to fire, rain, traffic, floods or any other causes. The Engineer shall not be responsible for any claims for injuries to person/workmen or for structural damage to property happening from any neglect, default, want of proper care or misconduct on the part of the contractor or of any other of his representatives, in his employment during the execution of the work. The compensation, if any, shall be paid directly to the Department / authority / persons concerned, by the Contractor ***at his own cost.***

- 3.9.19 The contractor shall ***arrange electricity at his own cost*** for testing of the various electrical installations as directed by Engineer and for the consumption by the contractor for executing the work. Also, all the ***water required*** for testing various electrical installations, fire pumps, wet riser / fire-fighting equipment, fire sprinklers etc. and also testing water supply, sanitary and drainage lines, water proofing of underground sump, overhead tanks, water proofing treatment etc. shall be arranged ***by the contractor at his own cost. Nothing extra shall be payable*** on this account.

3.10 SUBMISSION AND DOCUMENTATION

- 3.10.1 The contractor shall display all permissions, licenses, registration certificates, bar charts, other statements etc. under various labour laws and other regulations applicable to the works, at his site office.

3.10.2 **Deleted**

3.10.3 **Deleted**

- 3.10.4 The contractor shall make available four (04) sets of computerized Standard Measurement Books (SMBs) having measurement of all the permanent standing in a building.

3.10.5 **Deleted**

- 3.10.6 The contractor will submit computerized measurement sheet for the work carried out by him for making payment. For casting of RCC members and other hidden items the corrected and duly test checked measurement sheets of reinforcement or that of other hidden items shall be deposited with Engineer or his authorized representative, before casting of RCC or other hidden items. The delay in submission of corrected and duly checked measurement sheet may, therefore, delay casting of RCC or execution of hidden item for which no hindrance shall be recorded.

- 3.10.7 To avoid delay, contractor should submit all samples well in advance so as to give timely orders for procurement.

3.10.8 **Program Chart:**

The contractor shall prepare an integrated program chart including civil activities for the execution of work, showing clearly all activities from the start of work to completion of civil work, with details of manpower, equipment and machinery required for the fulfillment of the program within the stipulated period and submit the same for approval of the Engineer. These shall be submitted by the contractor through electronic media besides forwarding hard copies of the same. The integrated program chart so submitted should not

have any discrepancy with the physical milestones attached in the contract agreement. The program chart should include the following: -

- a. Descriptive note explaining sequence of various activities.
 - b. Network (*PERT/CGM/BAR CHART*) prepared on MS project which will indicate resources in financial terms, manpower and specialized equipment for every important stage.
 - c. Program for procurement of materials by the contractor.
 - d. Program for arranging and deployment of manpower both skilled and unskilled so as to achieve targeted progress.
 - e. Program of procurement of machinery / equipment having adequate capacity, commensurate with the quantum of work to be done within the stipulated period, by the contractor.
 - f. Program for achieving fortnightly micro milestones and periodic milestones.
- 3.10.9 If at any time, it appears to the Engineer that the actual progress of work does not conform to the approved program referred above, the contractor shall produce a revised program showing the modifications to the approved program by additional inputs to ensure completion of the work within the stipulated time.
- 3.10.10 The submission for approval by the Engineer of such program or the furnishing of such particulars shall not relieve the contractor of any of his duties or responsibilities under the contract. This is without prejudice to the right of Engineer to take action against the contractor as per terms and conditions of the agreement.
- 3.10.11 Apart from the above integrated program chart, the contractor shall be required to submit fortnightly progress report of the work in a computerized form on 1st and 16th of every month. The progress report shall contain the following, apart from whatever else may be required as specified:
- i. Construction schedule of the various components of the work through a bar chart for the next two fortnights (or as may be specified), showing the micro- milestone/milestones, targeted tasks (*including material and labour requirement*) and up to date progress.
 - ii. Progress chart of the various components of the work that are planned and achieved, for the fortnight as well as cumulative up to the fortnight under reckoning, with reason for deviations, if any in a tabular format.
 - iii. Plant and machinery statement, indicating those deployed in the work.
 - iv. Man-power statement indicating:

- v. Individually the names of all the staff deployed on the work, along with their designations.
- vi. No. of skilled workers (*trade wise*) and total no. of unskilled workers deployed on the work and their location of deployment i.e. blocks.
- vii. Financial statement, indicating the broad details of all the running account payment received up to date, such as gross value of work done, advances taken, recoveries effected, amount withheld, net payments details of cheque payment received, extra/substituted/deviation items if any, etc.

3.11 TEMPORARY WATER/ ELECTRICITY/ TELEPHONE CONNECTION

- 3.11.1 Arrangement of temporary telephone connection, water and electricity required by contractor, shall be made by him ***at his own cost*** and also necessary permissions shall be obtained by him directly from concerned authorities, under intimation to the Department. Also, all initial cost and running charges, and security deposit, if any, in this regard shall be borne by him. The contractor shall abide by all the rules/ bye laws applicable in this regard and he shall be solely responsible for any penalty on account of violation of any of the rules / byelaws in this regard. ***Nothing extra shall be payable*** on this account.
- 3.11.2 The contractor shall be responsible for maintenance and watch and ward of the complete installation and water / electricity meter and shall also be responsible for any pilferage, theft, damage, penalty etc. in this regard. The contractor shall indemnify the DFCCIL against any claim arising out of pilferage, theft, damage, penalty etc. whatsoever on this account. ***Security deposit*** for the work shall be released only after No Dues Certificates are obtained from the local Authorities from whom temporary electric/ water / telephone connection have been obtained by the contractor. Nothing extra shall be payable on this account.
- 3.11.3 The DFCCIL shall in no way be responsible for either any delay in getting electric and/or water and/or telephone connections for carrying out the work or not getting connections at all. No claim of delay or any other kind, whatsoever, on this account shall be entertained from the contractor. Also contingency arrangement of stand-by water & electric supply shall be made by the contractor for commencement and smooth progress of the work so that work does not suffer on account of power failure or disconnection or not getting connection at all. No claim of any kind whatsoever shall be entertained on this account from the contractor. ***Nothing extra shall be payable*** on this account.

3.12 TRAFFIC ARRANGEMENTS

- 3.12.1 **Deleted**

3.12.2 Deleted

3.13 CLEANLINESS OF SITE

- 3.13.1 The contractor shall not stack building material / malba / muck on the land or road of the local development authority or on the land owned by the others, as the case may be. So the muck, rubbish etc. shall be removed periodically as directed by the Engineer, from the site of work to the approved dumping grounds as per the local byelaws and regulations of the concerned authorities and all necessary permissions in this regard from the local bodies shall be obtained by the contractor. ***Nothing extra shall be payable*** on this account. In case, the contractor is found stacking the building material / malba as stated above, the ***contractor shall be liable to pay*** the stacking charges / ***penalty*** as may be levied by the local body or any other authority and also to face penal action as per the rules, regulations and bye-laws of such body or authority. ***The Engineer shall be at liberty to recover***, such sums due but not paid to the concerned authorities on the above counts, from any sums due to the contractor including amount of the Security Deposit and performance guarantee in respect of this contract agreement.
- 3.13.2 The contractor shall take instructions from the Engineer regarding collection and stacking of materials at any place. No excavated earth or building rubbish shall be stacked on areas where other buildings, roads, services and compound walls are to be constructed.
- 3.13.3 The site of work shall be always kept clean due to constraints of space and to avoid any nuisance to the users of buildings in the adjacent plots. The contractor shall take all care to prevent any water- logging at site. The waste water, slush etc. shall not be allowed to be collected at site. It may be directly pumped into the creek with prior approval of the concerned authorities. For discharge into public drainage system, necessary permission shall be obtained from relevant authorities after paying the necessary charges, if any, directly to the authorities. The work shall be carried out in such a way that the area is kept clean and tidy. ***All the fees/charges in this regard shall be borne by the Contractor. Nothing extra shall be payable*** on this account.

3.14 INSPECTION OF WORK

- 3.14.1 In addition to the provisions of relevant clauses of the contract, the work shall also be open to inspection by the Chief General Manager, and other senior officers of DFCCIL in addition of the Engineer and his authorized representative. The contractor shall at times during the usual working hours and at all times at which reasonable notices of the intention of the Engineer or other officers as stated above to visit the works shall have been given to the contractor, either himself be present to receive the orders and instructions or have a responsible representative duly accredited in writing, to be present for that purpose.

3.14.2 Inspection of the work by Architects appointed by the DFCCIL

- a. The consulting architect appointed by DFCCIL shall be inspecting the works including workshops and fabrication factory to ensure that the works are in general being executed according to the design, drawings and specifications laid down in the contract. His observations shall be communicated by Engineer/DFCCIL engineering staff and compliance is to be reported to Engineer/DFCCIL.
- b. The consulting architect appointed by DFCCIL shall certify on completion of particular building that it has been constructed according to the approved drawings design and specifications.

3.14.3 Senior Officers of DFCCIL/Railway, Dignitaries from Central Ministry / Department, State Government may inspect the on-going work at site at any time with or without prior intimation. The contractor shall, therefore, keep updated the following requirements and detailing.

- a. Display Board showing detail of work, weekly progress achieved with respect to targets, reason of shortfall, status of manpower, wages being paid for different categories of workers.
- b. Entrance and area surrounding to be kept cleaned.
- c. Display layout plan key plan, Building drawings including plans, elevations and sections.
- d. Upto date displays of Bar chart, CGM and PERT etc.
- e. Keep details of quantities executed, balance quantities, deviations, possible Extra item, substituted Item etc.
- f. Keep plastic / cloth mounted one sets of building drawings.
- g. Set of Helmets and safety shoes for safety.

3.15 SETTING OUT

3.15.1 The contractor shall carry out *survey* of the work area, ***at his own cost, setting out*** the layout of building in consultation with the Engineer & proceed further. Any discrepancy between the architectural drawings and actual layout at site shall be brought to the notice of the Engineer. It shall be responsibility of the contractor to ensure correct setting out of alignment. Total station survey instruments only shall be used for layout, fixing boundaries, and center lines, etc., along with theodolites. ***Nothing extra shall be payable*** on this account.

3.15.2 The contractor shall establish, maintain and assume responsibility for grades, lines,

levels and benchmarks. He shall report any errors or inconsistencies regarding grades, lines, levels, dimensions etc. to the Engineer before commencing work. Commencement of work shall be regarded as the Contractor's acceptance of such grades, lines, levels, and dimensions and no claim shall be entertained at a later date for any errors found.

- 3.15.3 If at any time, any error appears due to grades, lines, levels and benchmarks during the progress of the work, the contractor shall, at his own expense rectify such error, if so required, to the satisfaction of the Engineer. ***Nothing extra shall be payable*** on this account.
- 3.15.4 Though the site levels are indicated in the drawings the contractor shall ascertain and confirm the site levels with respect to benchmark from the concerned authorities. The contractor shall protect and maintain temporary/permanent benchmarks at the site of work throughout the execution of work. These benchmarks shall be got checked by the Engineer or his authorized representatives. The work at different stages shall be checked with reference to bench marks maintained for the said purpose. ***Nothing extra shall be payable*** on this account.
- 3.15.5 The approval by the Engineer, of the setting out by the contractor, shall not relieve the contractor of any of his responsibilities and obligation to rectify the errors/ defects, if any, which may be found at any stage during the progress of the work or after the completion of the work.
- 3.15.6 The contractor shall be entirely and exclusively responsible for the horizontal, vertical and other alignments, the level and correctness of every part of the work and shall rectify effectively any errors or imperfections therein. Such rectifications shall be carried out by the contractor ***at his own cost*** to the entire satisfaction of the Engineer.
- 3.15.7 The ***rates quoted by the Contractor*** are deemed to be ***inclusive*** of site clearance, setting out work (*including marking of reference points, center lines of buildings*), construction and maintenance of reference bench mark(s), taking spot levels, construction of all safety and protection devices, barriers, barricading, signage, labour safety, labour welfare and labour training measures, preparatory works, working during monsoon, working at all depths, height and location etc. and any other incidental works required to complete this work. ***Nothing extra shall be payable*** on this account.

3.16 RECESS, HOLES, OPENINGS, ETC

The contractor shall leave such recesses, holes, openings, etc. as may be required for the electric, air-conditioning and other related works for which inserts, sleeves, brackets, conduits, base plates, clamps etc. and the contractor shall fix the same at the time of casting of concrete, stone work & brick work or at any similar location if required, and ***nothing extra shall be payable*** on this account.

3.17 JURISDICTION OF COURT

Courts at Delhi/Noida alone shall have the jurisdiction to decide any dispute arising out of or in respect of this contract.

3.18 Deleted

3.19 Deleted

3.20 PREVENTION OF NUISANCE AND POLLUTION CONTROL

The contractor shall take all necessary precautions to prevent any nuisance or inconvenience to the owners, tenants or occupiers of adjacent properties and to the public in general and to prevent any damage to such properties from pollutants like smoke, dust, noise. The contractor shall use such methodology and equipment so as to cause minimum environmental pollution of any kind during and minimum hindrance to road users and to occupants of the adjacent properties or other services running adjacent/near vicinity. The contractor shall make good at his cost and to the satisfaction of the Engineer, any damage to roads, paths, cross drainage works or public or private property whatsoever caused due to the execution of the work or by traffic brought thereon by the contractor. All waste or superfluous materials shall be carried away by the contractor, without any reservation, entirely to the satisfaction of the Engineer.

3.21 Deleted

3.22 SCAFFOLDING / SHUTTERING

Wherever required for the execution of work, all the scaffolding shall be provided and suitably fixed by the contractor. It shall be provided strictly with steel double scaffolding system, suitably braced for stability, with all the accessories, gangways, etc. with adjustable suitable working platforms to access the areas with ease for working and inspection. It shall be designed to take all incidental loads. It should cater to the safety features for workmen. ***Nothing extra shall be payable*** on this account. It shall be ensured that no damage is caused to any structure due to the scaffolding.

Only steel shuttering, unless otherwise specified, with suitably designed steel frame supporting system is to be used in the work. The contractor shall ensure that there shall be ***no leakage at formwork joints*** and there shall be no movement at joints or bending of the formwork under pressure of the concrete. ***Nothing extra shall be paid*** on this account.

3.23 PRODUCT DELIVERY, STORAGE AND HANDLING OF CHEMICALS

- (i) The contractor shall construct storage space for Chemicals materials to ensure that the storage conditions are as recommended by the manufactures.

- (ii) All the materials shall be procured and delivered in sealed containers with labels legible and intact.
- (iii) All the chemicals {polymers, epoxy, water proofing compound, plasticizer, Polysulphide, SBR based elastomeric, APP (Atactic Polypropylene Polymer), all exterior and interior paints, polish etc.} shall be procured in convenient packs say 20 litres/Kgs. capacity packing only or as approved by the Engineer, and not in bigger capacity containers, say 200 litre (Kgs.) drums unless otherwise specifically permitted by the Engineer. One sample from each lot of the chemical procured by the contractor shall be tested in a laboratory as approved by the Engineer.
- (iv) All material required for the execution of the work shall be got approved, procured and deposited with the Contractor's supervisory staff. The watch and ward of such material shall, however, remain to be the responsibility of the contractor and no claim, whatsoever, on this account shall be entertained. Different containers of each chemical shall be serially numbered on packing and also consumed in that order. Day- to-Day account of receipt, issue and balance shall be regulated by the Contractor and proper account shall be maintained at site of work in the prescribed form as per the standard practice.
- (v) All the chemicals shall be procured by the contractor directly from the manufacturer. In exceptional circumstances, the contractor may be allowed to procure the materials from the authorized dealers of the manufacturers.
- (vi) The original copies of challan/cash memos towards the quantity of various chemicals procured shall be made available by the contractor at the request from the Engineer-and a copy of the same shall be kept in record.
- (vii) The Name of manufacturers, manufacturer's product identification, manufacturer's mixing instructions, warning for handling and toxicity and date of manufacturing and shelf life shall be clearly and legibly mentioned on the labels of the each container.
- (viii) The contractor shall submit for the chemicals procured, manufacturer's and / or authorized dealer's certificate regarding supplying and verifying conformance to the material specifications, as specified.
- (ix) All filled containers shall be handled in safe manner and in a way to avoid breaking container seals.
- (x) All arrangements for measuring, dosing and mixing of material / chemicals at site have to be made by the contractor.
- (xi) Contractor shall suitably advise his site Engineer and all the workers as regards safe handling of chemicals. Necessary protective and safety equipment in form of hand gloves, goggles etc. shall be provided by the contractor and be also used at site.

- (xii) All incidental charges of any kind including cartage, storage and wastage and safe custody of material etc. shall be borne by the contractor and no claim, whatsoever, shall be entertained on this account.
- (xiii) The chemicals shall be tested in an independent laboratory as approved by the Engineer at the frequency as specified. If required, more samples may have to be tested as per the directions of the Engineer. ***Nothing extra shall be payable*** on this account.

3.24 De-watering:

- (i) De-watering required, if any, shall be done conforming to BIS Code IS: 9759 (*guide lines for de-watering during construction*) and / or as per the specifications approved by the Engineer. Design of an appropriate and suitable dewatering system shall be the Contractor's responsibility.
- (ii) Such scheme shall be modified / augmented as the work proceeds based on fresh information discovered during the progress of work, ***at no extra cost***. At all times during the construction work, efficient drainage of the site shall be carried out by the Contractor and especially during the laying of plain cement concrete, taking levels etc. The Contractor shall also ensure that there is no danger to the nearby properties and installations on account of such lowering of water table. If needed, suitable precautionary measures shall be taken by the Contractor. Also the scheme of dewatering adopted shall have adequate built in arrangement to serve as stand-by to attend to repair of pumps etc. and disruption of power / fuel supply. ***Nothing extra shall be payable*** on this account.
- (iii) In trenches where surface water is likely to get into cut / trench during monsoons, a ring bund of puddle clay or by any other means shall be formed outside, to the required height, and maintained by the Contractor. Also, suitable steps shall be taken by the Contractor to prevent back flow of pumped water into the trench. ***Nothing extra shall be payable*** on this account.
- (iv) For works below ground level the contractor shall keep that area free from water. If dewatering or bailing out of the water is required, the contractor shall do the same at ***his own cost and nothing extra shall be paid***. It is intimated that the foundation depth and water table below the ground level may be approximately at the same level. So most likely, the water table may be struck in the excavation of foundation. ***Nothing extra shall be paid*** for execution of work in or under water and / or liquid mud including pumping out of water as required.

PART-I

CHAPTER-V

SECTION-4

ADDITIONAL CONDITIONS FOR CEMENT AND STEEL

4. Procurement of materials

4.1 Bitumen: As per norms from reputed manufacturers.

4.2 Cement

4.2.1 The contractor shall procure Ordinary Portland Cement conforming to IS 12269 and Portland Pozzolana cement conforming to IS: 1489 [Part 1], as required in the work, from reputed manufacturers of cement **such as UltraTech, Ambuja cement and J.K. cement** or as approved by the Engineer/DFCCIL.

The supply of cement shall be taken in 50 kg bags bearing manufacturer's name and ISI marking or in Bulk.

Samples of cement arranged by the contractor shall be taken by the Engineer and got tested in accordance with provisions of relevant BIS codes. In case the test results indicate that the cement arranged by the contractor does not conform to the relevant BIS codes, the same shall stand rejected, and it shall be removed from the site by the contractor at his own cost within a week's time of written order from the Engineer to do so.

4.2.2 The ***cement godown*** of suitable capacity to store of cement shall be constructed by the contractor at site of work for which ***no extra payment shall be made.***

4.2.3 The contractor shall be responsible for the watch and ward and safety of the cement godown. The contractor shall facilitate the inspection of the cement godown by the Engineer at any time.

4.2.4 The cement shall be got tested by the Engineer and shall be used on the work only after satisfactory test results have been received. The contractor shall supply free of charge the cement required for testing including its transportation to testing laboratories. The ***cost of tests shall be borne by the contractor.***

- 4.2.5 The actual issue and consumption of cement on work site shall be regulated and proper accounts maintained.
- 4.2.6 The cement brought to the site and the cement remaining unused after completion of the work shall not be removed from site without the written permission of the Engineer.
- 4.2.7 The damaged cement shall be removed from the site immediately by the contractor on receipt of a notice in writing from the Engineer. If he does not do so within 3 days of receipt of such notice, the Engineer shall get it removed ***at the cost of the contractor.***
- 4.2.8 The day to day receipt and issue accounts of the cement bags shall be maintained in the register as per following proforma and daily signed by the contractor or his authorized representative and by the representative of Engineer.

Particular of receipt			Particulars of issue								Remarks
Date of receipt	Quantity received	Progressive total	Date of issue	Quantity issued	Items of work for which issued	Quantity returned at the end of the day	Total issued	Daily balance in hand	Contractor's initials	Engineer's initials	DFCCIL's initials
1	2	3	4	5	6	7	8	9	10	11	12

- 4.2.9 Where ready mix concrete is stipulated to be used from an approved source / manufacture, the computerized dispatch slips that are sent with each dispatch of RMC shall be kept on record.
- 4.2.10 The cement to be used for all works will be PPC / OPC unless otherwise specifically mentioned in the tender documents.

4.3 CONDITIONS FOR REINFORCEMENT STEEL: -

- 4.3.1 The contractor shall procure TMT bars of Fe 500D / Fe 550 / Fe 550D grade ***from primary producers*** such as **SAIL, Tata Steel Ltd., RINL, Jindal Steel & Power Ltd. and JSW Steel Ltd.** or any other producer as approved by **DFCCIL / RDSO.**
- The grade of the steel such as Fe 500D / Fe 550 / Fe 550D or other grade to be procured is to be specified as per BIS: 1786 - 2008.
 - The TMT bars procured from primary producers and ISPs shall conform to manufacturer's specifications.

- c. TMT bars procured shall meet the provisions of IS 1786: 2008 pertaining to Fe 500D / Fe 550 / Fe 550D or other grade of steel as specified in the tender.

4.3.2 Samples shall also be taken and got tested by the Engineer as per the provisions in this regard in relevant BIS codes. In case the test results indicate that the steel arranged by the contractor does not conform to the specifications as defined above, the same shall stand rejected, and it shall be removed from the site of work by the contractor at his cost within a week time of written orders from the Engineer to do so.

4.3.3 **Deleted**

4.3.4 The steel reinforcement bars shall be stored by the contractor at site of work in such a way as to ***prevent distortion and corrosion*** and ***nothing extra shall be paid*** on this account. Bars of different sizes and lengths shall be stored separately to facilitate easy counting and checking.

4.3.5 For checking nominal mass, tensile strength, bend test, re-bend test, etc. specimen of sufficient length shall be cut from each size of the bar at random at frequency not less than that specified below:

Dia of bar	For consignment below 100 tones	For consignment above 100 tones
Under 10 mm	One sample for each 25 tonnes or part thereof	One sample for each 40tonnes or part thereof
10 mm to 16mm	One sample for each 35 tonnes or part thereof	One sample for each 45tonnes or part thereof
Over 16mm	One sample for each 45 tonnes or part thereof	One sample for each 50tonnes or part thereof

4.3.6 The contractor shall supply free of charge the steel required for testing including its transportation to testing laboratories. ***The cost of tests shall be borne by the contractor.***

4.3.7. All ***other charges*** of sampling, packing and transportation of sample shall also be ***borne by the Contractor.***

4.3.8 The actual issue and consumption of steel on work shall be regulated and proper accounts maintained.

4.3.9 Steel brought to site and remaining unused shall not be removed from site without the written permission of Engineer.

4.3.9 (i) Reinforcement including authorized spacer bars and lappings shall be measured in length for different diameters as actually (*not more than as specified in the drawings*) used in the work nearest to a centimetre. Wastage and unauthorized overlaps shall not be measured.

(ii) The standard sectional weights referred to shall be as in Table 5.4 in para 5.3.4 in revised CPWD specifications 2009 Vol. I will be considered for conversion of length of various sizes of TMT bars in to standard weight.

(iii) Record of actual sectional weights shall also be kept dia wise and lot wise. The average sectional weight for each diameter shall be arrived at from samples from each lot of steel received at site. The decision of the Engineer shall be final for the procedure to be followed for determining the average sectional weight of each lot. Quantity of each diameter of steel received at site of work each day will constitute one single lot for the purpose. The weight of steel by conversion of length of various sizes of bars based on the actual weighted average sectional weight shall be termed as Derived Actual Weight.

a. If the derived weight as in sub-para (iii) above is less than the standard weight as in sub-para (ii) above, then the Derived Actual Weight shall be taken for payment.

b. If the derived actual weight is found more than the standard weight, than standard weight as worked out in sub para (ii) above shall be taken for payment. Nothing shall be paid extra for the difference in Derived/ Actual Weight and standard weight.

4.3.10 Every care should be taken to avoid mixing different types of grades of bars in the same structural members as main reinforcement to satisfy relevant clause of IS: 456. In case of buildings, wherever the situation necessitates, the changeover shall be permitted only from any one level onwards. In case of foundations, all foundation elements (*footings and grade beams*) shall have the same kind of steel. In the case of columns, all structural elements up to the level of change, where the changeover is taking place should have the same kind of steel as those in columns.

4.3.11 The reinforcing steel brought to site of work shall be stored on brick / timber platform of 30/40-cm height, ***nothing extra shall be paid*** on this account.

PART-I

CHAPTER-V

SECTION-5

METHODOLOGIES FOR GREEN BUILDINGS

- 5.1 To secure at least **5-Star GRIHA** ratings, a high degree of responsibility and cooperation is necessary from the contractor employed.
- 5.2 The following guideline provides the general concept of green, green building rating and the expectations from each one of those involved in this project:

5.3 GENERAL NOTE ON GREEN BUILDING PRACTICES

All materials and systems used in the project are intended to maximize energy efficiency for operation of Project throughout service life (*substantial completion to ultimate disposition – reuse, recycling, or demolition*) with an emphasis on top quality. Materials and systems are to maximize environmentally-benign construction techniques, including construction waste recycle, reusable delivery packaging, and reusability of selected materials. All vendors / contractors must adhere to best practices related to Green Buildings. Other than the particular specifications / methodologies for green buildings outlined here, all vendors / contractors will be furnished with a supplementary set of guidelines more specific to their nature of service/product.

5.4 GREEN BUILDING PRACTICES:

- 5.4.1 Ensure healthy indoor air quality in final Project.
- 5.4.2 Maximize use of products with low embodied energy (*harvesting, mining, manufacturing, transport, installation, use, operations, recycling and disposal*). Exceptions might include materials that result in net energy conservation during their useful life in building and building's life cycle.
- 5.4.3 Where possible, select materials harvested and manufactured regionally, within a 800-km radius of the project site.
- 5.4.4 Maximize use of durable products.
- 5.4.5 Maximize use of products easy to maintain, repair, and that can be cleaned using non-toxic substances.

- 5.4.6 Maximize recycled content in materials, products, and systems.
- 5.4.7 Maximize use of reusable and recyclable packaging.
- 5.4.8 Where possible and feasible, provide for non-destructive removal and re-use of materials after their service life in this building.
- 5.4.9 Re-use existing building materials to extent feasible within design concept expressed in Contract Documents. Provide materials that utilize recycled content to maximum degree possible without being detrimental to product performance or indoor air quality.
- 5.4.10 Use construction practices such as material waste reduction and dimensional planning that maximize efficient use of resources and materials.
- 5.4.11 Provide or contribute to O&M Manuals wherever applicable.
- 5.4.12 Be conversant with the Site Waste Management Program Manual and actively contribute to its compilation. Assist the Engineer by estimating the nature and volume of waste generated by the process/installation in question.
- 5.4.13 Minimize pollution: Select materials that generate least amount of pollution during mining, manufacturing, transport, installation, use, and disposal.
- 5.4.14 Avoid materials that emit greenhouse gases
- 5.4.15 Avoid materials that require energy intensive extraction, manufacturing, processing, transport, installation, maintenance, or removal.
- 5.4.16 Avoid materials that contain ozone-depleting chemicals (*e.g. CFCs or HCFCs*).
- 5.4.17 Avoid materials that emit potentially harmful volatile organic chemicals (VOCs).
- 5.4.18 Employ construction practices that minimize dust production and combustible by- products.
- 5.4.19 Avoid materials that can leach harmful chemicals into ground water; do not allow potentially harmful chemicals to enter sewers or storm drains.
- 5.4.20 Protect soil against erosion by wind or storm-water and topsoil depletion.
- 5.4.21 Minimize noise generation during construction; screen mechanical equipment to block noise.
- 5.4.22 Select materials that can be reused or recycled and materials with significant percentage of recycled content; conform with or exceed specified Project recycled content percentages for individual materials; avoid materials difficult to recycle. Protect natural habitats; restore natural habitats where feasible within scope of Project.

PART-I

CHAPTER-V

SECTION-6

MINIMUM QUALITY ASSURANCE PLAN (CIVIL WORK)

(MQAP)

6.1 OUTSIDE / INDEPENDENT TESTING

The Contractor shall engage outside / independent laboratories of any Government Institutes, Indian Institutes of Technology, National Institutes of Technology, Central and State Research Centres, Centrally and State funded laboratories or NABL accredited laboratories (*approved by Engineer/Employer*) for testing of materials in accordance with relevant CPWD Specifications / IS Codes / IRC Codes / Manufacturer's Specifications, etc., if testing facility is not available in the field laboratory. Where testing facilities are not available even in aforesaid laboratories, the name of the proposed lab shall be got approved by the Engineer.

6.2 QUALITY CONTROL TESTS

- 6.2.1 Field / lab tests shall be carried out to check, control and finally assure the quality of work at every level. Material and finished item shall be subjected to test to achieve the desired quality of work. Where ever necessary required number of test shall be carried out in outside laboratory approved by the Engineer. The mandatory test shall be carried out as per the provision of CPWD Specifications 2009 Volume-I & II and relevant IS codes or any other applicable codes.
- 6.2.2 The lot size, number of required tests and frequency of testing shall be as per CPWD Specifications. The number of tests indicated is minimum required test to be performed. However, actual numbers of test may be more depending upon the actual quantities executed and measured at site. ***Nothing extra shall be admissible on this account.*** Decision of the Engineer shall be final and binding in this respect.
- 6.2.3 The ***independent test equal to 10% tests*** or as desired by Engineer/Employer of the total number of tests performed in field laboratory shall be carried out in out-side laboratories mentioned in para 10.2 above.
- 6.2.4 Any other test in the opinion of the Engineer required for establishing quality of material or execution of work shall also got carried out by the contractor. Decision of Engineer shall be final and binding in this respect.

- 6.2.5** The contractor shall supply free of charge the materials required for testing including its transportation cost to testing laboratories. ***The cost of tests carried out shall be borne by the contractor.***
- 6.2.6** The contractor shall ensure quality construction in a planned and time bound manner. Any sub-standard material / work beyond set out tolerance limit shall be summarily rejected by the Engineer & contractor shall be bound to replace / remove such sub-standard / defective work immediately. If any material, even though approved by Engineer is found defective or not conforming to specifications shall be replaced / removed by the contractor at his own risk & cost.
- 6.2.7** The Contractor shall submit Manufacturer Test Certificate & carry out all required testing of material as per specifications & directions of Engineer in Charge. Testing of material shall be carried out at a laboratory approved by Engineer in Charge & testing charges shall be borne by the contractor.

Engineer in charge may also test portion of the finished works already done in order to prove soundness and efficiency of the material/work. The test results thus obtained shall be final and binding to the contractor. Cost of transportation of material for testing & testing charges shall be borne by Contractor.

If after any such tests, the material/work/portion of the works are found defective or unsound, the contractor shall remove/dismantle the rejected material/work and reconstruct the same at his own cost as per the directions of Engineer whose decision would be binding.

6.3 SHUTTERING SCHEDULE, MACHINERY AND OTHER TOOL & PLANTS

- 6.3.1** Minimum requirement of shuttering shall be drawn as per construction program. A proper shuttering schedule showing quantity of shuttering to be brought at site either in one lot or at different stages of work shall be submitted prior to start of work for the approval of Engineer.

Entire machinery and T&P may not be required at the start of work, therefore, a proper time schedule by which each machinery and T&P is to be brought at site shall be submitted prior to start of work for the approval of Engineer.

6.4 REMOVAL OF REJECTED/SUB-STANDARD MATERIALS

The following procedure shall be followed for the removal of rejected/sub-standard materials from the site of work:

- a Whenever any material brought by the contractor to the site of work is rejected, entry thereof should invariably be made in the Site Order Book under the signature of the

Engineer, giving the approximate quantity of such materials.

- b As soon as the material is removed, a certificate to that effect shall be recorded by the Engineer against the original entry, giving the date of removal and mode of removal, i.e., whether by truck, carts, or by manual labour. If the removal is by truck, the registration number of the truck should be recorded.
- c When it is not possible for the Engineer to be present at the site of work at the time of actual removal of the rejected/sub-standard materials from the site, the required certificate should be recorded by the person appointed by Engineer, and the Engineer should countersign the certificate recorded by the person so appointed.

6.5 Custody & Reporting of Records

- 6.5.1 All the records shall be maintained jointly by laboratory in-charge and the authorized representative of Engineer. Records shall be maintained in the shape of registers and shall be kept in the safe custody of Engineer of work. Status of mandatory test shall be reported at the time of presentation of each running account bill or monthly progress reports.

6.6 Maintenance of register of test:

- i. All samples of materials including cement concrete cubes shall be taken jointly with contractor by Engineer's representative. All the necessary assistance shall be provided by the contractor. Cost of sample materials is to be borne by the contractor and he shall be responsible for safe custody of samples to be tested at site.
- ii. All the tests in field lab setup at construction site shall be carried out by the engineering staff deployed by the contractor in presence of Engineer's representative where possible.
- iii. All the entries in the register will be made by the designated engineering staff of the contractor and same should be regularly reviewed by Engineer.

6.7 Maintenance of Site Records & Quality Records:

- a. The Contractor shall maintain records, plans and charts (*CGM/PERT*) showing the date and progress of all main operation and activities. The Engineer shall have access to the information at all times. All tests will be conducted in presence of Engineer's representative. Records of those shall be handed over to the Engineer's representative/officer carrying out tests.
- b. In addition to Quality Record the following registers shall be maintained at site by the Engineer and the Contractor shall furnish all the required details from time to time.

- c. The Contractor shall promptly sign the order given therein by the Engineer or his representative or his superior officers and comply with them. The compliance shall be reported by the contractor to the Engineer in reasonable time to enable Engineer/his representative to check the same.
- d. The register will be maintained to show the daily strength of labour in different categories employed by the contractor. The same shall be signed daily by representatives of contractor and Engineer for their correctness.
- e. The particulars of machineries with contractor in working condition and working at site to be recorded jointly on each day.
- f. All events are required to be chronologically logged in the register.
- g. All test results of materials used in works shall be maintained.
- h. All the drawings fit for construction issued to contractor, date wise will be maintained with latest revision.
- i. The register of Engineer & other staff at work site shall be maintained on daily basis.
- j. Other Register for cement, Steel or any other important items as directed by Engineer shall be maintained at site by Contractor.

6.8 Records to be produced by the Contractor for inspection

- a. The contractor shall whenever required by the Engineer or his authorized representatives produce or cause to be produced for examination any quotation, invoice cost or any copy of or extract from any accounts, books, vouchers, receipts, letter, memorandum or any copy of or extract from any such documents and also furnish information as may be required relating to the execution of this contract or relevant for verifying or ascertaining the materials supplied by the Contractor are in accordance with the specifications laid down in the contract etc. The Engineer decision on the question or relevancy of any document or information or returns will be final and binding on the contractor.
- b. The work may be inspected by the Engineer/Statutory Authority etc. and Vigilance and Technical Department of CVC etc. and the contractor is bound by their decisions in respect of quality, quantity and amount payable/recoverable under this contract.

PART – II
TECHNICAL SPECIFICATIONS

PART-II
CHAPTER-1

TECHNICAL SPECIFICATIONS FOR SUB STATION WORKS

1 TECHNICAL SPECIFICATIONS

1.1 GENERAL

Electrification works shall be carried out in conformity with Indian Electricity Act 1910 as amended and Indian Electricity Rules 1956 as amended up to date. Wherever applicable, relevant Indian Standard Code of Practice for external electrical installation (latest amendments/revisions) supplementary regulations or byelaws of Licenses and Electricity Undertaking Board shall be adopted.

1.2 STANDARDS

All equipment, material and components shall comply with the requirements of the latest editions of Indian Standards with updated amendments. Standards and Regulations applicable in the area where equipment is to be installed shall also be followed.

The equipment offered complying with other standards, these standards shall be equal to or superior to those specified and full details of the differences shall be furnished along with the tender.

IS 13947	:	A.C. Circuit Breakers (Relevant Parts/SCC).
IS 3427	:	Metal enclosed Switchgear & Control Gear.
BS 162	:	Safety Clearances.
IS 2705	:	Current Transformers (Parts 1 to 4).
IS 3156	:	Voltage Transformers (Parts 1 to 4).
IS 3202	:	Code of Practice for climate proofing of electrical equipment.
IS 375	:	Marking & Arrangement for Switchgear Bus Bars, main connections and auxiliary wiring.
IS 722	:	A.C. Electric Meters.
IS 1248	:	Direct acting Electrical Indicating Instruments.
IS 3231	:	Electrical Relays for Power System Protection.
IS 2544	:	Epoxy Cast Resin Insulators.
IS 5082	:	Electrolytic Copper and Aluminum.
IS 5792	:	High Voltage HRC fuses.

2 33 kV SWITCHGEARS

2.1 GENERAL

The technical specifications cover the equipment to be supplied for a 33 kV Switchboards suitable for 33 kV 3 phase earthed system. 50 HZ AC supply with a fault level of 1500 MVA at 33kV. The equipment shall be suitable for continuous operation at the stipulated ambient conditions.

2.2 STANDARDS AND CODES

The following Indian Standards Specifications and Codes of Practice shall apply to the equipment covered by this Contract. In addition, the relevant clauses of the Indian Electricity Act 1910 and Indian Electricity Rules 1956 as amended up to date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and/or IEC Standards shall be applicable.

BIS certified equipment shall be used as a part of the Contract in line with Government Regulations. Necessary Test Certificates in support of the certification shall be submitted prior to supply of the equipment.

It is to be noted that updated and current Standards shall be applicable irrespective of those listed below.

33000 volt Circuit Breaker	IS 13118; 1991
Metal Enclosed Switchgear and Control gear for voltages above 1000 volts	IS 3427 : 1969
Electrical Relays for Power System Protection	IS 3231 : 1986
Voltage Transformers	IS 3156 : 1978
Current Transformers	IS 2705 : 1981
Rubber Mats for Electrical Works	IS 5424 : 1983
Danger Notice Plate	IS 2551 : 1982

2.3 33 kV VACUUM CIRCUIT BREAKERS

2.3.1 Technical Parameters

The 33000 volt circuit breakers shall be triple pole Vacuum type suitable for indoor mounting and shall comply with the requirements of the relevant Indian Standards. The Circuit Breakers shall be suitable for operation at 11000 volts 3 phase 50 Hz supply

system and shall have a certified symmetrical breaking capacity of 1500 MVA at 33000 volts or as stipulated in schedule of quantities.

2.3.2 Technical Specifications

The Circuit Breakers shall be Vacuum type and shall consist of three identical single pole vacuum interrupter units which shall comprise of a pair of butt contacts enclosed within a sealed ceramic body with SS end plates. The moving contacts shall be sealed into the enclosure via a SS steel bellow which shall permit axial movement of the contact. The contact arrangement shall be surrounded by SS sputter shield to prevent condensation of metal on the inside of the insulating envelop and also to provide good voltage grading across the gap and the outer envelope. The contact material and the contact geometry shall be suitable for the purpose so as to attain current chopping at minimum current to prevent build-up of unduly high over voltages and to prevent the arc to cause localised high spots on the contact.

The Circuits Breaker shall be suitable for switching duty of Transformers

2.3.3 CIRCUIT BREAKER CONSTRUCTIONAL FEATURES

The 33000 volt circuit breaker shall be flush front, metal clad, truck mounted , drawout type and fully interlocked. The truck that carries the Circuit Breaker shall be of rigid fabricated construction. Each Circuit Breaker shall be housed in a separate compartment enclosed on all sides.

Each withdrawable truck shall have its own Circuit Breaker.

All electrical connections on the truck shall be brought to secondary plugs which engage similar sockets in the housing.

The Circuit Breakers shall be of the double break type. Interphase barriers and tank lining of insulating material shall be provided.

The drawout mechanism shall be so designed and constructed as to permit smooth withdrawal and insertion. The movement shall be free of jerks, easy to operate and positive.

All current carrying parts in the Circuit Breaker shall be silver plated and suitable arcing contacts shall be provided to protect the main contacts.

Isolating contacts of the spring loaded self aligning pattern shall be provided for the Circuit Breaker. Suitable arc control devices shall be mounted around the fixed contacts.

Terminal insulators of synthetic resin bonded paper shall be provided suitable for the specified short circuit level

Sheet steel barriers shall be provided between

Instrument Panel and Potential Transformer

Instrument Panel and Current Transformers

Busbar chamber and Circuit Breaker compartments

2.3.4 CIRCUIT BREAKER OPERATING MECHANISM

The Circuit Breaker shall be trip free and equipped with a motor power operated closing mechanism. The operating mechanism shall be such that the Circuit Breaker is at all times free to open immediately the trip coil is energised.

Mechanical ON/OFF position indication shall be provided on the front of the circuit breaker.

The operating mechanism shall be mounted on the front panel of the truck.

The operating handle and the mechanical trip push button shall be at the front of and integral with the Circuit Breaker.

The operating mechanism shall provide four distinct and separate positions of the Circuit Breaker on the cradle

Service

Test

Isolated

Maintenance

2.3.5 CIRCUIT BREAKER INTERLOCKING

Each Circuit Breaker shall be provided with the following mechanical safety interlocks to ensure protection to the equipment and the operator.

The Circuit Breaker cannot be closed unless it is in the 'PLUGGED IN' position.

The Circuit Breaker cannot be withdrawn from or pushed into the housing unless the main contacts are open.

The Circuit Breaker cannot be put into service without making the secondary connections between the truck and housing.

The cover of the drawout voltage transformer cannot be opened unless the transformer is isolated.

2.3.6 CIRCUIT BREAKER AUXILIARY CONTACTS

The Circuit Breaker shall have a minimum of 6 N.O. and 6 N.C. auxiliary contacts rated at 5 amps. These contacts shall close before the main contacts when the Circuit Breaker is plugged in and vice versa when the Circuit Breaker is lowered.

2.3.7 PROTECTIVE RELAYS

The Circuit Breaker shall have overcurrent, earth fault protection and auxiliary relay devices as specified in the Schedule of Quantities. These relays shall be mounted flush on a separate compartment with access from the rear for wiring and maintenance.

2.4 POTENTIAL AND INSTRUMENT TRANSFORMERS

A drawout type cast resin voltage transformer shall be mounted in the panel and connected to the line. The tank shall be arranged for horizontal isolation.

The Circuit Breaker shall have the required current transformers as specified in the Schedule of Quantities for metering and protection mounted outside the Circuit Breaker compartment but within the free standing cubicle. The transformers shall comply to the relevant Indian Standards. All current transformers for metering shall be Accuracy Class I and of capacity and ratio as required. Separate sets of current transformers shall be provided for metering and protection.

2.5 INSTRUMENTATION

Instruments and indicating lamps as required in the Schedule of Quantities shall not be mounted on the Circuit Breaker compartment door. A separate adequate compartment shall be provided. The instruments and relays shall be accessible for testing and maintenance without danger of accidental contact with live parts in the Switchgear Panel.

Square pattern flush mounting meters and selector switches of the three way and OFF pattern complying with the requirements of the relevant Indian Standards shall be used.

The current transformers for metering and protection shall be mounted on the solid copper busbars with proper supports.

LED type indicating lamps shall be provided for phase and other operational indications.

2.6 TYPE TEST CERTIFICATES

The Contractor shall submit type test certificates of the Circuit Breakers complying with the relevant Indian Standards from a recognized Test House.

33 KV SWITCHGEAR PANEL

3.1 General

The switchgear panels shall be suitable for operation at 33000 volt 3 phase 50 Hz supply system with a short circuit withstand of 1500 MVA at 33,000 volts and a corresponding short time rating for 1 second.

The Switchgear panels shall comply with the requirements of the latest edition with upto date amendments of the relevant Indian Standards Specifications, Indian Electricity Rules and Regulations.

3.2 Switchgear Configuration

The panel shall be configured with 33,000 volt Circuit Breakers, associated metering and protective devices and other equipment as called for in the Bill of Quantities.

Each 33,000 volt Circuit Breaker shall be housed in an individual panel in single tier formation.

3.3 Equipment Specifications

All equipment used to configure the Switchgear Panel shall comply to the relevant Standards and Codes of the Bureau of Indian Standards and the detailed technical specifications as included in this tender document.

3.4 Constructional Features

The 33000 volts Switchgear Panel shall be totally enclosed, metal clad, cubicle pattern, floor mounting, extensible on both sides and suitable for indoor use.

The Switchgear Panels shall be totally enclosed and completely dust and vermin proof. Synthetic rubber gaskets between all adjacent units and beneath all covers shall be provided to render the joints dust and vermin proof. All doors and covers shall also be fully gasketed with synthetic rubber and shall be lockable.

The Switchgear Panels shall be fabricated with CRCA Sheet Steel of thickness not less than 2.0 mm and shall be folded and braced as necessary to provide a rigid support for all components. The doors and covers shall be constructed from CRCA Sheet Steel of thickness not less than 1.6 mm. Joints of any kind in sheet steel shall be seam welded and all welding slag ground off and welding pits wiped smooth with plumber metal.

All panels and covers shall be properly fitted and square with the frame. The holes in the panel shall be correctly positioned.

Fixing screws shall enter holes tapped into an adequate thickness of metal or provided with hank nuts. Self threading screws shall not be used in the construction of the Switchgear Panels.

3.5 Switchgear Panel Limitations

A base channel of 75 mm x 5 mm thick shall be provided at the bottom.

The Switchgear Panel height shall normally be restricted to a maximum of 2300 mm.

3.6 Switchgear Panel Compartmentalization

The Switchgear Panels shall be divided into distinct separate compartments comprising

A completely enclosed ventilated dust and vermin proof bus bar compartment for the vertical and horizontal busbars.

Each Circuit Breaker shall be housed in a separate compartment enclosed on all sides.

Separate and adequate compartments shall be provided for accommodating instruments, indicating lamps, protective relays, control fuses etc as required. These shall be accessible for testing and maintenance without any danger of accidental contact with live parts.

A horizontal wireway with screwed covers shall be provided at the top to take interconnecting control wiring between vertical sections.

Cable compartment shall be of adequate size for easy termination of all incoming and outgoing cables. Adequate and proper supports shall be provided in the compartment for supporting the cables.

3.7 Switchgear Panel Busbars

The main horizontal and vertical interconnection busbars shall be of hard drawn high conductivity electrolytic copper and of rectangular cross sections suitable for full rated current. The current density for copper shall be 1.25 amps per sq. mm. and suitable to withstand the electromagnetic and thermal stresses of a 1500 MVA fault level at 33,000 volts for 3 second.

The busbars and interconnections shall be insulated with fibre glass sleeves.

The busbars shall be extensible on either side of the Panels.

The busbars shall be supported on non-breakable, non-hygroscopic insulated supports at regular intervals to withstand the stresses of a 1500 MVA fault level.

All busbars and interconnections shall be colour coded.

The main horizontal busbars shall run through the entire length of the Switchgear Panels.

3.8 Switchgear Panel Interconnections

All interconnections shall be with solid electrolytic copper of adequate size to carry the full rated current and fibre glass insulated.

3.9 Drawout Features

All Circuit Breakers shall be provided in fully drawout cubicles. These cubicles shall be such that drawout is possible without disconnection of the wires and the cables. The power and control circuits shall have self aligning and self isolating contacts which shall be easily accessible for maintenance. Mechanical interlocks shall be provided on the drawout cubicles to ensure safety and compliance to the relevant Standards.

3.10 Switchgear Panel Interlocks

Each group of busbars and feeder connections shall be fitted with automatically operated safety shutters with positive opening and closing when the Circuit Breaker is raised or lowered.

Facility shall be provided for hand operation of the shutters and latching in either open or closed position.

Padlocking provision of the shutter in the closed position shall be included for maintenance purposes.

3.11 Instruments And Protection Relays

Instruments, indicating lamps and all protection and control relays shall not be mounted on the Circuit Breaker compartment door. A separate adequate compartment shall be provided. The instruments and relays shall be accessible for testing and maintenance without danger of accidental contact with live parts in the Switchgear Panel.

LED type indicating lamps shall be provided for phase and other operational indications.

The current transformers for metering and protection shall be mounted on the solid copper busbars with proper supports.

3.12 Switchgear Panel Internal Wiring

All wiring for relays and metering shall be with PVC insulated copper conductor wires. The wiring shall be coded and labelled with approved ferrules for identification. The minimum size of copper conductor control wires shall be 2.5 sq.mm.

All control circuits shall be provided with 10 kA MCB's Instrument testing plugs shall be provided for testing the meters.

3.13 Cable Terminations

Knock out holes of appropriate size and number shall be provided in the Panels in conformity with the location of the incoming and outgoing cables.

The cable terminations of the Circuit Breakers shall be brought out to terminal cable sockets suitably located in the cable chamber at the rear of the panels.

3.14 Space Heaters

The Switchgear Panel shall have in each panel thermostatically controlled space heaters with a controlling 16 amp 230 volt socket outlet with MCB to eliminate condensation.

3.15 Earthing

Two main earth bars of copper as required shall be provided throughout the length of the Switchgear Panels with a provision to make connections on both sides to the sub-station earths.

3.16 Designation Labels

Suitably engraved white on black name plates and identification labels of metal for all Panels and circuits shall be provided. These shall indicate the feeder number and the designation

3.17 Sheet Steel Treatment And Painting

Sheet steel materials used in the construction of the Switchgear Panels should have undergone a rigorous rust proofing process comprising of alkaline degreasing, descaling in dilute sulphuric acid and a recognised phosphating process. The sheet steel work shall then receive two coats of oxide filler primer before final painting. Castings shall be scrupulously cleaned and fettled before receiving a similar oxide primer coat.

All sheet steel work shall after metal treatment be spray or powder painted with two coats of shade 692 to IS 5 on the outside and white on the inside. Each coat of paint shall be properly stoved and the paint thickness shall be not less than 50 microns.

The circuit breakers shall be provided with following accessories:

Auxiliary switch with 5NO + 5NC contacts.

Mechanical operation counter

Spring charging handle

Recharging in/out handle

Foundation bolts

Maintenance manual

Instruction manual

3.18 Auxiliary supply

The tipping shall be at 24 V DC through a battery bank unit.

Space heater, Indication and other auxiliary supply shall be through to 230 V AC

3.19 Site Test

Alignment panel, interconnection of bus bar and tightness of bolts and connection

Inter panel wiring

Free movement of circuit breaker trolley

Manual/electrical operation of the breaker

Megger test

CT/PT ratio/Polarity primary injection test.

Secondary injection test on relays

4.0 33 KV AND MEDIUM VOLTAGE CABLES

4.1 GENERAL

Technical specifications in this section covers supplying and laying of :

- 33 kV cables
- Medium voltage cables.

4.2 STANDARDS AND CODES

All equipments, components, materials and entire work shall be carried out in conformity with applicable and relevant Bureau of Indian Standards and Codes of Practice, as amended upto date and as below. In addition, relevant clauses of the Indian Electricity Act 1910 and Indian Electricity Rules 1956 as amended upto date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and /or IEC Standards shall be applicable.

Equipments certified by Bureau of Indian Standards shall be used in this contract in line with government regulations. Test certificates in support of this certification shall be submitted, as required.

It is to be noted that updated and current standards shall be applicable irrespective of dates mentioned along with ISS's in the tender documents.

PVC insulated heavy duty cables	IS 1554 - 1988
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Cross link polyethylene insulated PVC (sheathed XLPE cables)	IS 7098 - 1985
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Code of practice for installation and maintenance of power cables	IS 1255 - 1983
Conductors for insulated electrical cables	IS 8130 - 1984
Drums for electrical cable	IS10418- 1982
Methods of test for cables	IS10810- 1988
Recommended current rating	IS 3961 - 1987
Recommended short circuit rating of high voltage PVC cables	IS 5891 - 1970

4.3 CABLES

4.3.1 33 kV Cables

33 kV cable shall be aluminium conductor with cross linked polyethylene (XLPE) insulation, galvanized steel armouring and PVC sheathing conforming to IS 7098. Conductors shall be sector shaped, made from electrical purity aluminium of 3 x 4 H or H temper conforming to IS 8130 XLPE insulation of high purity shall be extruded on the conductors with screen a layer of semi-conducting material shall be applied over the XLPE insulation to prevent partial discharge at insulation surface. This shall be followed up by metallic aluminium tape screen the cores shall be discharged tested. Built up cores shall then be laid up and filler codes added. Combined core shall be provided with extruded PVC sheathing. Galvanized steel wire of strip armouring shall then be provided protected by an overall extruded black PVC sheet. The outer sheath shall bear the manufacturer's name and trade mark at every meter length.

4.3.2 Medium Voltage Cables

Medium voltage cables shall be aluminium conductor XLPE insulated, PVC sheathed armouring conforming to IS 7098. Cables shall be rated for a 1100 Volts. The conductor of cables from 16 Sq. mm. to 50 Sq. mm. shall be stranded. Circular shaped stranded conductors shall be used for cables of 50 sq. mm and above. Conductors shall be made of electrical purity aluminium 3/4 H or H temper. Conductors shall be insulated with high quality XLPE base compound. A common covering (bedding) shall be applied over the laid up cores by extruded sheath of unvulcanised compound. Armouring shall be applied over outer sheath of PVC sheathing. The outer sheath shall bear the manufacturer's name and trade mark at every meter length. Cores shall be provided with following colour scheme of XLPE insulation.

1 Core	:	Red/Black/Yellow/Blue
2 Core	:	Red and Black
3 Core	:	Red, Yellow and Blue
3 1/2 /4 Core	:	Red, Yellow, Blue and Black

Current ratings shall be based on the following conditions.

- | | |
|----------------------------------|-------------------|
| a) Maximum conductor temperature | 90 ⁰ C |
| b) Ambient air temperature | 45 ⁰ C |
| c) Ground temperature | 30 ⁰ C |
| d) Depth of laying | 1000 mm |

Short circuit rating of cables shall be as specified in IS 7098 Part-I.

Cables have been selected considering conditions of maximum connected loads, ambient temperature, grouping of cables and allowable voltage drop. However, the contractor shall recheck the sizes before cables are fixed and connected to service.

4.4 DELIVERY, STORAGE AND HANDLING

Cable drum shall be stored on a well drained, hard surface, preferably of concrete, so that the drums do not sink in ground causing rot and damage to the cable drum. The cable drum shall conform to IS 10418. During storage, periodical rolling of drums, in the direction of arrow marked on the drum, shall be done once in 3 month through 90⁰ C Both ends of cables shall be properly sealed to prevent moisture ingress Drums shall be stored in well ventilated area protected from sun and rain. Drums shall always be rested on the flanges and not on flat sides. Damaged battens of drums etc. shall be replaced. Movement of drums shall always be in direction of the arrow marked on the drum. For transportation over long distance, the drums shall either be mounted on drum wheels and pulled by ropes or they shall be mounted on trailers etc. drums shall be unloaded preferably by crane otherwise they shall be rolled down carefully on suitable ramps. While transferring cable form 1 drum to another, the barrel of the new drum shall have diameter not less than the original drum. Cables with kinks or similar visible defects like defective armouring etc shall be rejected. Cables shall be supplied at site in cut pieces as per actual requirements.

4.5 LAYING OF CABLES

Cables shall be so laid that the maximum bending radius is 12 times the overall diameter of the cable for medium voltage cables and 20 times the overall diameter for 33 kV cables. Cables shall be laid in masonry trenches, directly on walls/cable trays, directly buried in ground or in pipes/ducts as elaborated below. Cables of different voltages and also power and control cables shall be laid in different trenches with adequate separation. Wherever available space is restricted such that this requirement cannot be met, medium voltage cables shall be laid above HT cables.

4.6 In Masonry Trenches

Wherever so specified, cables shall be laid in indoor/outdoor masonry/RCC trenches to be provided by Owners. Cables shall be laid on MS supports fabricated from minimum 38mm x 38mm x 6mm painted / galvanized angle iron supports grouted in trench walls at intervals not exceeding 600 mm. If required, cables shall be arranged in tier formation inside the trench. Suitable clamps, hooks and saddles shall be used for securing the cables in position and dressing properly so that the clear spacing between the cables shall not be less than the diameter of the cable. Trenches shall be provided with chequered plate/RCC covers. Wherever so specified, trenches shall be filled with fine sand.

4.7 On Trays/Walls

Wherever so specified, cables shall be laid along walls/ceiling or on cable trays. Cable shall be secured in position and dressed properly by means of suitable clamps, hooks, saddles etc. such that the minimum clear spacing between cables is diameter of the cable. Clamping of cables shall be at minimum intervals as below.

Type of cables	Size	Clamping by	Fixing intervals
MV	Upto and including 25 sq mm	Saddles 1 mm thick	45 cm
MV & HV	35 sq mm to 120 sq mm	Clamps 3 mm thick 25 mm wide	60 cm
MV & HV	150 sq mm and above	Clamps 3 mm thick 40 mm wide	60 cm

Note : The fixing intervals specified apply to straight runs. In the case of bends, additional clamping shall be provided at 30 cm from the center of the bend on both sides.

Cable trays, of sizes as per schedule of quantities and drawings shall be of perforated doubled bend channel/ladder design unless otherwise stated. Cable trays shall be fabricated from minimum 2 mm thick sheet steel and shall be complete with tees, elbows, risers, and all necessary hardware. Cable trays shall comply with the following:

Trays shall have suitable strength and rigidity to provide proper support for all contained cables. Trays shall not have sharp edges, burrs or projections injurious to cable insulation. Trays shall include fittings for changes in direction and elevation. Cable trays and accessories shall be painted with one shop coated of red oxide zinc chromate primer and two side coats of aluminium alkyd paint or approved equivalent. Cable trays shall not have sharp edges, burrs or projection that may damage the

insulation jackets of the wiring. Cable trays shall have side rails or equivalent structural members.

Unless otherwise specifically noted on the relevant layout drawing, all cable tray mounting works to be carried out ensuring the following :

Cable tray mounting arrangement type to be as marked on layout drawing. Assembly of tray mounting structure shall be supplied fabricated, erected & painted by the electrical contractor. Tray mounting structures shall be welded to plate inserts or to structural beams as approved by the Clients. Wherever embedded plates & structural beams are not available for welding the tray mounting structure electrical contractor to supply the MS plates & fix them to floor slab by four anchor fasteners of minimum 16 mm dia having minimum holding power of 5000 Kg at no extra cost. Maximum loading on a horizontal support arm to be 120 Kg. metre of cable run. Width of the horizontal arms of the tray supporting structures to be same as the tray widths specified in tray layout drawings, plus length required, for welding to the vertical supports. The length of vertical supporting members for horizontal tray runs shall be to suit the number of tray tiers shown in tray layout drawings. Spacing between horizontal supports arms of vertical tray runs to be 300 mm. Cable trays will be welded to their mounting supports. Minimum clearance between the top most tray tier and structural member to be 300 mm. Cables in vertical race ways to be clamped by saddle type clamps to the horizontal slotted angels. Clamps to be fabricated from 3 mm thick aluminium strip at site by the electrical contractor to suit cable groups. The structural steel (standard quality) shall be according to latest revision of IS : 226 & 808. Welding shall be as per latest revisions of IS : 816. All structural steel to be painted with one shop coat of red oxide and oil primer followed by a finishing coat of aluminium alkyd paint where any cuts or holes are made on finished steel work these shall be sealed against oxidation by red oxide followed by the same finishing paint. Steel sheet covers wherever indicated to be similarly painted. Trays shall be erected properly to present a neat and clean appearance. Trays shall be installed as a complete system. Trays shall be supported adequately by means of painted MS structural members secured to the structure by dash fasteners or by grouting. The entire cable tray system shall be rigid. Each run of cable tray shall be completed before laying of cables. Cable trays shall be erected so as to be exposed and accessible.

4.8 Buried Directly In Ground

4.8.1 General

Cables shall be so laid that they will not interfere with under ground structures. All water pipes, sewage lines or other structures which become exposed by excavation shall be properly supported and protected from injury until the filling has been rammed solidly in places under and around them. Any telephone or other cables coming in the way are to be properly shielded as directed by Clients/Owners. Surface of the ground

shall be made good so as to conform in all respects to the surrounding ground to the satisfaction of Clients/ Owners.

4.8.2 Routing of cables

Before cable laying work is undertaken, the route of the cables shall be decided with the Clients/Owners. While shortest practicable route shall be preferred, cable runs shall follow fixed development such as roads, footpaths etc with proper off-sets so that future maintenance and identification are rendered easy. Whenever cables are laid along well demarcated or established roads, the LV/MV cables shall be laid further from the kerb line than HV cables. Cables of different voltages and also power and control cables shall be kept in different trenches with adequate separation. Where available space is restricted, LV/MV cables shall be laid above HV cables. Where cables cross one another, the cables of higher voltage shall be laid at a lower level than the cables of lower voltage. Power and communication cables shall as far as possible cross at right angles. Where power cables are laid in proximity to communications cables the horizontal and vertical clearances shall not normally be less than 60 cm.

4.8.3 Width of Trench

The width of trench shall be determined on the following basis. The minimum width of trench for laying single cables shall be 350 mm. Where more than one cable is to be laid in the same trench in horizontal formation, the width of trench shall be increased such that the inter-axial spacing between the cables except where otherwise specified shall be at least 200 mm. There shall be a clearance of at least 150 mm between axis of the end cables and the sides of the trench.

4.8.4 Depth Of Trench

The depth of trench shall be determined on the following basis:

- Where cables are laid in single tier formation, the total depth of the trench shall not be less than 750 mm for cables upto 1.1 kV and 1250 mm for cables above 1.1 kV.
- When more than one tier of cables is unavoidable and vertical formation of laying is adopted, the depth of trench shall be increased by 300 mm for each additional tier to be formed.

4.8.5 Excavation of Trenches

The trenches shall be excavated in reasonably straight lines. Wherever there is a change in direction, suitable curvature of 12 times the overall diameter of the largest cable shall be provided. Where gradients and changes in depths are unavoidable these shall be gradual. Excavation should be done by any suitable manual or mechanical means. Excavated soil shall be stacked firmly by the side of the trench such that it may not fall back into the trench. Adequate precautions shall be taken not to damage any existing cables, pipes or other such installations during excavation. Wherever bricks, tiles or protected covers or

bare cables are encountered, further excavation shall not be carried out without the approval of the Clients/ Owners. Existing property exposed during trenching shall be temporarily supported or propped adequately as directed by the Clients/ Owners. The trenching in such cases shall be done in short lengths, necessary pipes laid for passing cables therein and the trench refilled as required. If there is any danger of a trench collapsing or endangering adjacent structures the sides shall be well shored up with timbering and/or sheathing as the excavation proceeds. Where necessary these may even be left in place when back filling the trench. Excavation through lawns shall be done in consultation with the Clients/ Owners. Bottom of the trench shall be level and free from stone, brick, etc. The trench shall then be provided with a layer of clean dry sand cushion of not less than 150 mm in depth.

4.8.6 Laying Of Cable In Trench

The cable drum shall be properly mounted on jacks or on a cable wheel at a suitable location. It should be ensured that the spindle, jack etc are strong enough to carry the weight of the drum without failure and that the spindle is horizontal in the bearings so as to prevent the drum creeping to one side while rotating. The cable shall be pulled over rollers in the trench steadily and uniformly without jerks or strains. The entire cable length shall, as far as possible, be laid in one stretch. However when this is not possible the remainder of the cable shall be removed by flaking i.e. making one long loop in the reverse direction. After the cable is uncoiled and laid over the rollers, the cable shall be lifted slightly over the rollers beginning from one end by helpers standing about 10 metres apart and drawn straight. The cable should then be taken off the rollers by additional helpers lifting the cables and then laid in the trench in a reasonably straight line. For short runs and cable sizes upto 50 sq mm 1.1 kV grade the alternative method of direct handling can be adopted with the prior approval of the Clients/ Owners. If two or more cables are laid in the same trench care should be taken to preserve relative position. All the cables following the same routes shall be laid in the same trench. Cables shall not cross each other as far as possible. When the cable has been properly straightened the cores shall be tested for continuity and insulation resistance. The cable shall be measured thereafter. Suitable moisture sealing compound/tape shall be used for sealing of the ends. Cable laid in trenches in a single tier formation shall have a covering of clean dry sand of not less than 170 mm above the base cushion of sand before the protective cover is laid. In the case of vertical multi-tier formation after the first cable has been laid a sand cushion of 300 mm shall be provided over the initial bed before the second tier is laid. If additional tiers are formed each of the subsequent tiers also shall have a sand cushion of 300 mm. The top most cable shall have a final sand covering not less than 170 mm before the protective cover is laid. A final protection to cables shall be laid to provide warning to future excavators of the presence of the cable and also to protect the cables against accidental mechanical damage. Such protection shall be with second class bricks of not less than 200 mm x 100 mm x 100 mm (normal size) laid breadth wise for the full length of the cable to the satisfaction of the Owners /Clients. Where more than one cable is to be laid in the same trench this protective

covering shall cover all the cables and project at least 50 mm over the sides of the end cables. In addition bricks on edge shall be placed along the entire run on either side of the cable run. The trenches shall then be back filled with excavated earth free from stones or other sharp edged debris and shall be rammed and watered in successive layers not exceeding 300 mm. Unless otherwise specified a crown of earth not less than 50 mm in the centre and tapering towards the side of the trench shall be left to allow for subsidence. The crown of earth should however not exceed 100 mm so as not to be a hazard to vehicular traffic. Where road berms or lawns have been cut or kerb stones displaced the same shall be repaired and made good to the satisfaction of the Clients and all surplus earth and rocks removed to places as specified.

4.8.9 Laying In Pipes/Closed Ducts

In locations such as road crossings, entry to buildings/poles in paved areas etc., cables shall be laid in pipes or closed ducts. Spun reinforced concrete pipes shall be used for such purposes and the pipe shall not be less than 100 mm in diameter for a single cable and not less than 150 mm for more than one cable. These pipes shall be laid directly in ground without any special bed. Sand cushioning and/or brick tiles need not be used in such installations. Unless otherwise specified the top surface of pipes shall be at a minimum depth of 1000 mm from the ground level when laid under roads, pavements etc. The pipes for road crossings shall preferably be on the skew to reduce the angle of bend as the cable enters and leaves the crossing. Pipes shall be continuous and clear of debris or concrete before cable is drawn. Sharp edges at ends shall be smoothed to prevent injury to cable insulation or sheathing. No deduction shall be made for sand and bricks not used for cables passing through RCC Hume pipes or for parts of vertical cables at the lighting poles. Wherever so required, cables shall be laid at the bed of the lake through existing PVC pipe as itemized in bill of quantities.

4.8.10 Laying of Cables In Floors

Laying of cables directly in floors shall be avoided and GI pipes of adequate size shall be used wherever necessary. However if the cables have to be laid direct in the floor specific written approval of Client/ Owners shall be obtained and the Contractor shall cut chases, lay the cables and make good the chases to original finish.

4.8.11 Cable Entry Into Buildings

Cable entry into buildings shall be made through RCC pipes recessed in the floor. RCC Hume pipes shall be provided well in advance for service cable entries. The pipe shall be filled with sand and sealed at both ends with bitumen mastic to avoid entry of water. Suitable size manholes shall be provided wherever required to facilitate drawing of cables as per requirements.

4.9 TERMINATION/JOINTING OF CABLES

Soldered jointing/termination shall be totally avoided. Solderless terminations by using Dowel crimping tools and suitable legs shall be adopted for all cable terminations. Any terminations may without use of proper crimping tool is shall be liable to be rejected. In the case of aluminium conductors, it is to be ensured that the conductor oxidation is cleaned by means of emery paper and then a thin coat of tin is applied before pinching into any equipment. Heat shrinkable Raychem type or approved equivalent terminations shall be provided for High Voltage cables and Siemens make or approved equivalent make brass double compression glands shall be provided for Medium Voltage cable terminations. Straight through jointing of Medium Voltage or High Voltage cable shall normally be totally avoided. If absolutely unavoidable, such jointing shall be carried out as per procedure to be got specifically approved from Client/Owners.

4.10 MEASUREMENT OF CABLE RUNS

The cable runs shall be measured upto the outer end of the boxes without any allowances for over lap in joints. The actual run of the cables shall be measured and the rate shall include all the above mentioned material, labour etc for laying as required.

4.11 CABLE LOOPS

At the time of the installation approximately 3 meters of surplus cable shall be left

- at each end of the cable.
- on each side of underground straight through/tee/termination joints.
- at entries to buildings.
- and such other places as may be decided by the Clients/owners.

This cable shall be left in the form of a loop.

Wherever long runs of cable length are installed cable loops shall be left at suitable intervals as specified by the Client/owners.

4.12 BONDING OF CABLES.

Where a cable enters any piece of apparatus it shall be connected to the casting by means of an approved type of armoured clamp or gland. The clamps must grip the armouring firmly to the gland or casting, so that in the event of ground movement no undue stress is placed on to the cable conductors.

4.13 TESTING

4.13.1 Tests At Manufacturer's Work

The cables shall be subjected to shop test in accordance with relevant standards to prove the design and general qualities to the cables as below (as per IS 10810) :

- Routine test on each drum of cables.
- Acceptance tests on drums chosen at random for acceptance of the lot.
- Type test reports of cables to be submitted.

4.13.2 Site Testing

- All cables before laying shall be tested with a 500 V megger for 1.1 kV grade or with a 2,500/5,000 V megger for cables of higher voltages. The cables cores shall be tested for continuity, absence of cross phasing, insulation resistance to earth/sheath/armour and insulation resistance between conductors.
- All cables shall be subject to above mentioned test during laying, before covering the cables by protective covers and back filling and also before the jointing operations.
- After laying and jointing, the cable shall be subjected to a 1.5 minutes AC/DC pressure test.
- In the absence of facilities for pressure testing in accordance with clause___ above it is sufficient to test for one minute with 1000 V megger for cables of 1.1 kV grade and with 2,500/5,00 V megger for cables of higher voltages.

4.13.3 Test Witness

Tests shall be performed in presence of representative of Client. The Contractor shall give at least fifteen (15) days advance notice of the date when the tests are to be carried out.

5 DISTRIBUTION TRANSFORMERS

5.1 SCOPE

This specification covers design, manufacture, assembly, stage testing, inspection and testing before supply and delivery at site of oil immersed, naturally cooled 3 phase 33 kV/415 V distribution transformers with OLTC for outdoor use.

The transformer and accessories shall be manufactured in such a way to facilitate ease of operation, inspection, maintenance and repairs. The equipment shall incorporate every precaution and provision for the safety of equipment as well as staff engaged in operation and maintenance of equipment.

5.2 STANDARDS

The materials shall conform in all respects to the relevant Indian/International Standards, with latest amendments thereof unless otherwise specified herein. Some of them are listed below:

Indian Standard	Title
IS -2026	Specification for Power Transformers
IS - 1180	Outdoor distribution Transformer up to and including 100 kVA
IS 12444	Specification for Copper wire rod
IS-335	Specification for Transformer Oil
IS – 2099	Specification for high voltage porcelain bushing
IS - 649	Testing for steel sheets and strips and magnetic circuits
IS - 4257	Dimensions for clamping arrangements for bushings
IS - 7421	Specification for Low Voltage bushings
IS - 3347	Specification for Outdoor Bushings
IS - 9335	Specification for Insulating Kraft Paper
IS - 1576	Specification for Insulating Press Board
IS - 6600	Guide for loading of oil Immersed Transformers
IS - 6160	Rectangular Electrical conductor for electrical machines
IS - 5561	Electrical power connector
IS - 6103	Testing of specific resistance of electrical insulating liquids
IS - 6792	Determination of electrical strength of insulating oil
IS - 10028	Installation and maintenance of transformers.

Material conforming to other internationally accepted standards, which ensure equal or better quality than the standards mentioned above, would also be acceptable. In case the bidders who wish to offer material conforming to other standards, the bidder shall clearly bring out the salient points of difference between the standards adopted and the specific standards in relevant schedule.

5.3 SERVICE CONDITIONS

The Distribution Transformers to be supplied against this Specification shall be suitable for satisfactory continuous operation under the following climatic conditions as per IS 2026 (Part - I).

Location	:	At Sector 145, Noida
Maximum ambient air temperature ($^{\circ}\text{C}$)	:	50
Minimum ambient air temperature ($^{\circ}\text{C}$)	:	-5
Maximum average daily ambient air temperature ($^{\circ}\text{C}$)	:	40
Maximum yearly weighted average ambient temperature($^{\circ}\text{C}$):		32

Note:

1. The climatic conditions specified above are indicative and can be changed by the user as per requirements.
2. The equipment shall generally be for use in moderately hot and humid tropical climate, conducive to rust and fungus growth unless otherwise specified.

5.4 PRINCIPAL PARAMETERS:

The transformers shall be suitable for outdoor installation with three phase, 50 Hz, 33 kV system in which the neutral is effectively earthed and they should be suitable for service with fluctuations in supply voltage upto plus 12.5% to minus 12.5%.

The transformers shall conform to the following specific parameters:

Sl. No.	Item	33 kV Distribution Transformers
1	System voltage (max.)	36 kV
2	Rated voltage HV	33 kV
3	Rated voltage LV	415 V
4	Frequency	50 Hz +/- 5%
5	No. of Phases	Three
6	Connection HV	Delta
7	Connection LV	Star (Neutral brought out)

8	Vector group	Dyn-11
9	Type of cooling	ONAN
10	Audible sound levels (db)	As per NEMA Standards

5.5 CORE MATERIAL

The core shall be stack / wound type of high grade cold rolled grain oriented (CRGO) M4 prime grade or better annealed steel lamination having low loss and good grain properties, coated with ceramic insulation, lap jointed firmly to prevent vibration or noise. The transformer shall be boltless core design. The core shall be stress relieved by annealing under inert atmosphere, if required. The complete design of core must ensure permanency of the core loss with continuous working of the transformers. The value of the maximum flux density allowed in the design and grade of lamination used shall be clearly stated in the offer.

Transformer manufacturer shall have in-house core cutting facility for proper control and monitoring of quality & to avoid mixing of Prime core with second grade/defective core material.

Stage inspection of core shall be done at manufacturer premise with following documents:

- a. Invoice of Supplier
- b. Mill's test certificate
- c. Bill of Landing & Bill of Entry by Customs

The transformers core shall be suitable for over fluxing (due to combined effect of voltage and frequency) up to 10% without injurious heating at full load conditions and shall not get saturated. The bidder shall furnish necessary design data in support of this situation.

No-load current shall not exceed 3% of full load current and will be measured by energising the transformer at 415 volts, 50 Hz on the secondary. Increase of voltage of 415 volts by 12.5% shall not increase the no-load current by 6% (maximum) of full load current.

5.6 WINDINGS

- a. HV and LV windings shall be wound from Super Enamel covered / Double Paper covered 99.9% pure electrolytic grade copper conductor/foil winding.
- b. Windings shall be subjected to shrinking and seasoning process so that no further shrinkage occurs during service. Adjustable devices shall be provided for taking up possible shrinkages.

- c. Windings shall be transposed at sufficient intervals in order to minimize eddy current and equalize the distribution of currents and temperature along with winding.
- d. The winding construction of single HV coil wound over LV coil is preferable.
- e. Materials used in the insulation and assembly of windings shall be insoluble, non catalytic and chemical inactive in the hot transformer oil and shall not soften or be otherwise affected under the operating conditions.
- f. The completed core and coil assembly shall be dried in vacuum at not more than 0.5 mm of Hg absolute pressure and shall be immediately impregnated with oil to ensure elimination of air and moisture within insulation.
- g. Proper bonding of inter layer insulation with the conductor shall be ensured.
- h. Dimensions of winding coils are very critical. Dimensional tolerances for winding coils shall be within limits.
- i. The core/coil assembly shall be securely held in position to avoid any movement under short circuit conditions.
- j. Windings and connections shall be brazed to withstand shocks during transport or short circuit.
- k. Leads from the windings to the terminal board and bushing shall be rigidly supported to prevent injury from vibrations.

5.7 TAPS

Tapping shall be provided on the higher voltage winding for variation of HV voltage within range of (+) 5.0 % to (-) 15.0 % in steps of 1.25%.

5.8 ON LOAD TAP CHANGER

Required OLTC shall follow following:

- a) The OLTC gear shall be designed to complete successfully tap changes for the maximum current to which transformer can be loaded i.e. 150% of the rated current. Devices shall be incorporated to prevent tap change when the through current is in excess of the safe current that the tap changer can handle. The OLTC gear shall withstand through fault currents without injury.
- b) When a tap change has been commenced, it shall be completely independent of the operation of the control relays and switches. Necessary safeguard shall be provided to allow for failure of auxiliary power supply or any other contingency which may result in the tap changer movement not being completed once it is commenced.
- c) Oil in compartments which contain the making and breaking of contacts of the OLTC shall not mix with oil in other compartments of the OLTC or with transformer oil. Gases released from these compartments shall be conveyed by a pipe to a separate oil conservator or to a segregated compartment within the main transformer conservator. An Oil surge relay shall be installed in the above pipe. The conservator shall be provided with a prismatic oil level gauge.
- d) Oil, in compartments of OLTC which do not contain the make and break contacts, shall be maintained under conservator head by valve pipe connections. Any gas

- leaving these compartments shall pass through the Buchholz relay before entering the conservator.
- e) Oil filled compartments shall be provided with filling plug, drain valve with plug, air release vent, oil sampling device, inspection opening with gasketed and bolted cover with lifting handles.
 - f) OLTC driving mechanism and its associated control equipment (local) shall be mounted in an outdoor, weatherproof cabinet with IP 55 protection which shall Include:
 - Driving motor (415V, 3-phase, 50 Hz. AC squirrel cage).
 - Motor starting contactor with Motor Protection Circuit Breaker, isolating switch and HRC fuses.
 - Control switch: Raise/off/lower (spring return to normal type).
 - Remote/local selector switch (maintained contact type).
 - Mechanical tap position indicator showing rated tap voltage against each position and resettable maximum and minimum indicators.
 - Limit switches to prevent motor over-travel in either direction and final mechanical stops.
 - Brake or clutch to permit only one tap change at a time on manual operation.
 - Emergency manual operating device (hand crank or hand wheel).
 - A five digit operation counter.
 - Electrically interlocked reversing contactors (preferably also mechanically interlocked).
 - 240V, 50 Hz. AC space heater with switch and HRC fuses.
 - Interior lighting fixture with lamp door switch and HRC fuses.
 - Gasketed and hinged door with locking arrangement.
 - Terminal blocks, internal wiring, earthing terminals and cable glands for power and control cables.
 - Necessary relays, contactors, current transformers etc.
 - g) The following electrical control features shall be provided:
 - Positive completion of load current transfer, once a tap change has been initiated, without stopping on any intermediate position, even in case of failure of external power supply.
 - Only one tap change from each tap change impulse even if the control switches or push button is maintained in the operated position.
 - Cut-off of electrical control when manual control is resorted to. Cut-off of a counter impulse for a reverse tap change until the mechanism comes to rest and resets the circuits for a fresh operation.
 - Cut-off of electrical control when it tends to operate the tap beyond its extreme position.
 - h) Automatic OLTC control shall include the following items:
 - Voltage setting device.
 - Voltage sensing and voltage regulating devices.
 - Line drop compensator with adjustable R and X elements.
 - Line drop compensator with adjustable R and X elements.

- Timer 5-25 seconds for delaying the operation of the tap changer in the first step for every tap change operation.
- Adjustable dead band for voltage variation.

i) **OLTC Panel**

The OLTC remote control equipment shall be suitable for 30V DC supply and shall be housed in an indoor sheet cubicle to be located in a remote control room. The OLTC control panel shall comprise of rigid welded structural frames made of structural steel section or of pressed and formed cold rolled steel (CRCA) and frame enclosures, doors and partitions shall be of cold rolled steel of thickness 2 mm. Stiffeners shall be provided wherever necessary. All doors, removable covers and plate shall be gasketed all around with neoprene/EDPM gaskets. Panel shall be dust, weather and vermin proof providing degree of protection of IP42, colour of finish shade for interior and exterior shall be Powder Coated RAL7032/7035. Earthing bus shall be of 25 x 6 mm copper.

- Control switch: Raise/Off/Lower (spring return to normal type)
- Auto/manual selector switch: (Maintained contact type)
- Tap position indicator:

a. Facia type alarm annunciator with “accept” and “lamp test” facilities:

- A.C. supply failure
- Drive motor auto tripped
- Tap change delayed

b. Necessary auxiliary relays

c. Lamp indications for:

- 1) Tap change in progress
- 2) Lower limit reached
- 3) Upper Limit reached
- 4) Cable glands for power and control cables
- 5) 240 V rated panel space heater with ON-OFF switch
- 6) Fluorescent type interior lighting fixture with lamp and door switch
- 7) HRC fuses
- 8) Terminal blocks
- 9) Internal wiring

- 10) Earthing terminal
- 11) Supply ON Indication Lamp.
- 12) Labels for Accessories.
- 13) Automatic Voltage Regulating Relay.
- 14) Heater Switch (Rotary Type)
- 15) Control Supply Switch (Rotary Type)
- 16) Hooter for Facia annunciator (230V AC)
- 17) Time Delay Relay for 'Tap Change Delayed' (110V AC)
- 18) H.V. Voltmeter (Digital Type)
- 19) H.V. Voltmeter Selector Switch (Rotary Type)
- 20) L.V. Voltmeter (Digital Type)
- 21) L.V. Voltmeter Selector Switch (Rotary Type)
- 22) PT for AVR.
- 23) Tap changer Counter for registering number of times the Tap is changed
for voltage correction

5.9 INSULATING OIL

- a. The insulating oil shall comply with the requirements of IS 335. It shall be "PCB free and Polycyclic Aromatic Hydrocarbon free Mineral oil". Use of recycled oil is not acceptable. The specific resistance of the oil shall not be less than 1500×10^{12} ohm-cm at 27°C when tested as per IS 6103 and 35×10^{12} ohm-cm at 90°C .
- b. Oil shall be filtered and tested for break down voltage (BDV) and moisture content before filling.
- c. The oil shall be filled under vacuum.

5.10 INSULATION LEVELS

Sl. No.	Voltage (kV)	Impulse Voltage (kV Peak)	Power Frequency Voltage (kV)
1	0.433	-	3
2	11	95	28
3	33	170	70

5.11 LOSSES

The bidder shall guarantee individually the no-load loss and load loss without any positive tolerance. The bidder shall also guarantee the total losses at 50% and 100% load condition (at rated voltage and frequency and at 75 °C).

The maximum allowable losses at rated voltage and rated frequency permitted at 75 °C for 33/0.415 kV transformers shall be as per energy efficiency level-II specified in IS:1180 (Part-1) 2014 and tabulated below for reference:

Voltage Ratio	Rating (kVA)	Max. Losses at 50% Loading (Watts)	Max. Losses at 100% Loading (Watts)
33000/415 V	1250	3547.5	9890.0
33000/415 V	1600	4515.0	12685.0

Where actual losses during testing are found in excess of maximum guaranteed figures, the transformer shall be rejected.

Measurement of losses shall form part of the routine acceptance test. The losses of first and subsequent transformers supplied shall also be guaranteed at the time of pre commissioning test and losses exceeding guaranteed figures shall stand rejected.

5.12 PERCENTAGE IMPEDANCE

The value of impedance of transformers at 75 °C shall be in accordance with IS 2026.

5.13 TEMPERATURE RISE

The temperatures rise over ambient shall not exceed the limits given below:

Top oil temperature rise measured by thermometer : 35 °C

Winding temperature rise measured by resistance method : 40 °C

The transformer shall be capable of giving continuous rated output without exceeding the specified temperature rise. Bidder shall submit the calculation sheet in this regard.

5.14 TANK

The internal clearance of tank shall be such, that it shall facilitate easy lifting of core with coils from the tank without dismantling LV bushings.

All joints of tank and fittings shall be oil tight and no bulging should occur during service.

Inside of tank shall be painted with varnish/hot oil resistant paint.

The top cover of the tank shall be slightly sloping to drain rain water.

The tank plate and the lifting lugs shall be of such strength that the complete transformer filled with oil may be lifted by means of lifting shackle.

Manufacturer should carry out all welding operations as per the relevant ASME standards and submit a copy of the welding procedure to the customer.

The transformer tank shall be of robust construction rectangular/octagonal/round/elliptical in shape and shall be built up of electrically tested welded mild steel plates of thickness of 6 mm for the bottom and top and not less than 4 mm for the sides for distribution transformers above 100 kVA. Tolerances as per IS:1852 shall be applicable.

Tank shall be designed to permit lifting by crane or jacks.

In case of rectangular tanks above 100 kVA the corners shall be fully welded at the corners from inside and outside of the tank to withstand a pressure of 0.8 kg/cm² for 30 minutes.

Under operating conditions the pressure generated inside the tank should not exceed 0.4 kg/ sq. cm positive or negative. There must be sufficient space from the core to the top cover to take care of oil expansion. The space above oil level in the tank shall be filled with dry air or nitrogen conforming to commercial grade of IS:1747.

The tank shall be reinforced by welded flats on all the outside walls on the edge of the tank.

The tank shall be capable of withstanding a pressure of 0.8 kg/ sq.cm (g) and a vacuum of 0.7 kg/sq.cm (g) without any deformation.

The radiators can be tube type or fin type or pressed steel type to achieve the desired cooling to limit the specified temperature rise.

5.15 CONSERVATOR

The conservator shall be provided on transformers.

When a conservator is provided, oil gauge and the plain or dehydrating breathing device shall be fitted to the conservator which shall also be provided with a drain plug and a filling hole normal size thread with cover. In addition, the cover of the main tank shall be provided with an air release plug.

The dehydrating agent shall be silica gel. The moisture absorption shall be indicated by a change in the colour of the silica gel crystals which should be easily visible from a distance. Volume of breather shall be suitable for 1 Kg of silicagel conforming to IS:3401 for transformers above 200 kVA.

The capacity of a conservator tank shall be designed keeping in view the total quantity of oil and its contraction and expansion due to temperature variations. The total volume of conservator shall be such as to contain 10% quantity of the oil. Normally 3% quantity the oil shall be contained in the conservator.

The cover of main tank shall be provided with an air release plug to enable air trapped within to be released, unless the conservator is so located as to eliminate the possibility of air being trapped within the main tank.

The inside diameter of the pipe connecting the conservator to the main tank should be within 20 to 50 mm and it should be projected into the conservator so that its end is approximately 20 mm above the bottom of the conservator so as to create a sump for collection of impurities. The minimum oil level (corresponding to -5 °C) should be above the sump level.

5.16 SURFACE PREPARATION AND PAINTING

- a. All paints, when applied in a normal full coat, shall be free from runs, sags, wrinkles, patchiness, brush marks or other defects.
- b. All primers shall be well marked into the surface, particularly in areas where painting is evident and the first priming coat shall be applied as soon as possible after cleaning. The paint shall be applied by airless spray according to manufacturer's recommendations.

5.16.1 CLEANING AND SURFACE PREPARATION:

- a. After all machining, forming and welding has been completed, all steel work surfaces shall be thoroughly cleaned of rust, scale, welding slag or spatter and other contamination prior to any painting.
- b. Steel surfaces shall be prepared by shot blast cleaning (IS9954) to grade Sq. 2.5 of ISO 8501-1 or chemical cleaning including phosphating of the appropriate quality (IS 3618).
- c. Chipping, scraping and steel wire brushing using manual or power driven tools cannot remove firmly adherent mill-scale. These methods shall only be used where blast cleaning is impractical. Manufacturer to clearly explain such areas in his technical offer.

5.16.2 PROTECTIVE COATING

As soon as all items have been cleaned and within four hours of the subsequent drying, they shall be given suitable anti-corrosion protection.

5.16.3 PAINT MATERIAL

- a. Following are the types of paint which may be suitably used for the items to be painted at shop and supply of matching paint to site:
 - i. Heat resistant paint (Hot oil proof) for inside surface

- b. For external surfaces one coat of thermo setting powder paint or one coat of epoxy primer followed by two coats of synthetic enamel/polyurethane base paint. These paints can be either air drying or stoving.

5.16.4 PAINTING PROCEDURE

- a. All prepared steel surfaces should be primed before visible re-rusting occurs or within 4 hours, whichever is sooner. Chemical treated steel surfaces shall be primed as soon as the surface is dry and while the surface is still warm.
- b. Where the quality of film is impaired by excess film thickness (wrinkling, mud cracking or general softness) the supplier shall remove the unsatisfactory paint coating and apply another coating. As a general rule, dry film thickness should not exceed the specified minimum dry film thickness by more than 25%.

5.16.5 DRY FILM THICKNESS

- a. To the maximum extent practicable, the coats shall be applied as a continuous film of uniform thickness and free of pores. Overspray, skips, runs, sags and drips should be avoided. The different coats may be of the same colour.
- b. Each coat of paint shall be allowed to harden before the next is applied as per manufacturer's recommendation.
- c. Particular attention must be paid to full film thickness at the edges.
- d. The requirements for the dry film thickness (DFT) of paint and the materials to be used shall be as given below:

Sl. No.	Paint Type	Area to be painted	No. of coats	Total dry film thickness (DFT) (Min.) (Micron)
1	Thermo setting powder paint	Inside	01	30
		Outside	01	60
2	Liquid paint			
	a. Epoxy primer	Outside	01	30
	b. PU paint (Finish coat)	Outside	02	25 each
	c. Hot oil paint/varnish	Inside	01	35/10

5.16.6 TESTS FOR PAINTED SURFACE

- a. The painted surface shall be tested for paint thickness.
- b. The painted surface shall pass the cross hatch adhesion test and impact test as acceptance tests and Salt spray test and Hardness test as type test as per the relevant ASTM standards.

Note: Supplier shall guarantee the painting performance requirement for a period of not less than 5 years.

5.17 BUSHINGS

- a. The bushings shall conform to the relevant standards specified and shall be of outdoor type. The bushing rods and nuts shall be made of brass material 12 diameter for both HT and LT bushings. The bushings shall be fixed to the transformers on side with straight pockets and in the same plane or the top cover for transformers above 100 kVA. The tests as per latest IS 2099 and IS 7421 shall be conducted on the transformer bushings.
- b. For 33 kV, 52 kV class bushings shall be used for transformers of ratings above 500 kVA.
- c. Bushing can be of porcelain/epoxy material. Polymer insulator bushings conforming to relevant IEC can also be used.
- d. Dimensions of the bushings of the voltage class shall conform to the Standards specified and dimension of clamping arrangement shall be as per IS 4257
- e. Minimum external phase to phase and phase to earth clearances of bushing terminals shall be as follows:

Voltage	Clearance	
	Phase to phase (mm)	Phase to earth (mm)
33 kV	350	320
11 kV	255	140
LV	75	40

The clearances in case of cable box shall be as below:

Voltage	Clearance	
	Phase to phase (mm)	Phase to earth (mm)
33 kV	351	222
11 kV	127	76
LV	45	20

- f. Arcing horns shall be provided on HV bushings.
- g. Brazing of all inter connections, jumpers from winding to bushing shall have cross section larger than the winding conductor. All the Brazes shall be qualified as per ASME, section – IX.
- h. The bushings shall be of reputed make supplied by those manufacturers who are having manufacturing and testing facilities for insulators.

5.18 CABLE BOXES

- a. In case HV/LV terminations are to be made through cables the transformer shall be fitted with suitable cable box on 33 kV side to terminate one 33kV/ 3 core aluminium conductor cable up to 240 sq. mm.(Size as per requirement). The bidder shall ensure the arrangement of HT Cable box so as to prevent the ingress of moisture into the box due to rain water directly falling on the box. The cable box on HT side shall be of the split type with faces plain and machined and fitted with Neo-k-Tex or similar quality gasket and complete with brass wiping gland to be mounted on separate split type gland plate with nut-bolt arrangement and MS earthing clamp. The bushings of the cable box shall be fitted with nuts and stem to take the cable cores without bending them. The stem shall be of copper with copper nuts. HT Cable support clamp should be provided to avoid tension due to cable weight.
- b. When bus duct connection is specified, a flanged bushing connection shall be provided to suit the client bus duct. The winding termination shall be brought out on outdoor type bushing.

5.19 TERMINAL MARKINGS

High voltage phase windings shall be marked both in the terminal boards inside the tank and on the outside with capital letter 1U, 1V, 1W and low voltage winding for the same phase marked by corresponding small letter 2u, 2v, 2w. The neutral point terminal shall be indicated by the letter 2n. Neutral terminal is to be brought out and connected to local grounding terminal by an earthing strip.

5.20 FITTINGS

The following standard fittings shall be provided:

- I. Diagram, Rating and terminal marking plates, non-detachable.
- II. Earthing terminals with lugs - 2 Nos.
- III. Lifting lugs for main tank and top cover
- IV. Terminal connectors on the HV/LV bushings (For bare terminations only).
- V. Thermometer pockets with cap
- VI. 150 mm dial type winding temperature indicator with maximum reading pointer and alarm & trip contacts
- VII. 150 mm dial type oil temperature indicator with maximum reading pointer and alarm & trip contacts

- VIII. 150 mm dial type magnetic oil level indicator with low level alarm and trip contacts and minimum & maximum filling level markings
- IX. Double float Buckholz relay with alarm and trip contacts
- X. W.P. thermo junction box
- XI. Oil surge relay for OLTC
- XII. Shut off valve for OLTC connection
- XIII. Air release device
- XIV. HV bushings - 3 Nos.
- XV. LV bushings - 4 Nos.
- XVI. Pulling lugs
- XVII. Stiffener
- XVIII. Detachable radiator with top and bottom stop valves and drain & air release plugs
- XIX. Radiators - No. and length may be mentioned (as per heat dissipation calculations)/ corrugations.
- XX. Arcing horns or 9 kV, 5 kA lightning arrestors on HT side - 3 No.
- XXI. Prismatic oil level gauge.
- XXII. Drain cum sampling valve.
- XXIII. Top filter valve
- XXIV. Oil filling hole having p. 1- ¼ ‘’ thread with plug and drain plug on the conservator.
- XXV. Silica gel breather
- XXVI. 4 No. rollers for transformers of 200 kVA and above.
- XXVII. Pressure relief device or double diaphragm explosion vent.
- XXVIII. Extra neutral bushing for solid earthling
- XXIX. Neutral CT with terminals brought out for connection

5.21 FASTENERS

- a. All bolts, studs, screw threads, pipe threads, bolt heads and nuts shall comply with the appropriate Indian Standards for metric threads, or the technical equivalent.
- b. Bolts or studs shall not be less than 6 mm in diameter except when used for small wiring terminals.
- c. All nuts and pins shall be adequately locked.
- d. Wherever possible bolts shall be fitted in such a manner that in the event of failure of locking, resulting in the nuts working loose and falling off, the bolt will remain in position.
- e. All ferrous bolts, nuts and washers placed in outdoor positions shall be treated to prevent corrosion, by hot dip galvanising, except for high tensile steel bolts and spring washers which shall be electro-galvanised/plated. Appropriate precautions shall be taken to prevent electrolytic action between dissimilar metals.
- f. Taper washers shall be provided where necessary.

- g. Protective washers of suitable material shall be provided in front and back of the securing screws.

5.22 OVERLOAD CAPACITY

The transformers shall be suitable for loading as per IS 6600.

5.23 PROTECTION FEATURES

Expulsion/any other suitable type of fuse shall be placed in series with the primary winding. This fuse is mounted normally inside of the primary bushing for the three phases and is connected to the high voltage winding through a terminal block. This has to protect that part of the electrical distribution system which is ahead of the distribution transformers from faults which occur inside the distribution transformer i.e., either in the windings or some other part of the transformer. It shall be ensured that this fuse does not blow for faults on the secondary side (LT side) of the transformer i.e., the blowing characteristics of the fuse and LT breaker shall be so coordinated such that the fuse shall not blow for any faults on the secondary side of the transformer beyond LT breakers and those faults shall be cleared by the LT breaker only.

5.24 TESTS

- a. Transformers shall be subjected to routine and type tests as specified in IS:2026, IS: 11171 and IEC: 726 as given below.
- b. All the equipment offered shall be fully type tested by the bidder or his collaborator as per the relevant standards including the additional type tests. The type test must have been conducted on a transformer of same design **during the last five years** at the time of bidding.
- c. Before dispatch, each of the completely assembled transformers shall be subjected to the routine tests at the manufacturer's works.

5.24.1 ROUTINE TESTS

- a. Ratio, polarity, phase sequence and vector group.
- b. No Load current and losses at service voltage and normal frequency.
- c. Load losses at rated current and normal frequency.
- d. Impedance voltage test.
- e. HV & LV winding resistance
- f. Measurement of load losses at 50%, 75% and 100%
- g. Insulation resistance test
- h. Induced over voltage withstand test.
- i. Separate source voltage withstand test.
- j. Neutral current measurement-The value of zero sequence current in the neutral of the star winding shall not be more than 2% of the full load current.
- k. Oil samples to comply with IS 1866.

5.24.2 TYPE TESTS

In addition to the tests mentioned in clause 5.24.1, following tests shall be conducted:

- a. Temperature rise test to be conducted for each rating for determining the maximum temperature rise after continuous full load run. The ambient temperature and time of test should be stated in the test certificate.
- b. Impulse voltage withstand test
- c. Short circuit withstand test, Thermal and dynamic ability.
- d. Noise-level measurement.
- e. Leakage test (Tank)
- f. Pressure relief device test: The pressure relief device shall be subject to increasing fluid pressure. It shall operate before reaching the test pressure as specified in the above class. The operating pressure shall be recorded. The device shall seal-off after the excess pressure has been released.

5.25 TESTS AT SITE

The purchaser reserves the right to conduct all tests on transformer after arrival at site and the manufacturer shall guarantee test certificate figures under actual service conditions.

5.26 INSPECTION AND TESTING

- a. The Contractor shall draw up and carry out comprehensive Inspection and Testing Program during manufacturing and commissioning of the transformer. The program shall be duly approved by client.
- b. To ascertain the quality of the transformer oil, the original manufacturer's tests report should be submitted at the time of inspection. Arrangements should also be made for testing of transformer oil, after taking out the sample from the manufactured transformers and tested in the presence of client's representative.
- c. To ensure about the quality of transformers, the inspection shall be carried out by the client's representative at following two stages:-
 - i. Online anytime during receipt of raw material and manufacture/ assembly whenever the client desires.
 - ii. At finished stage i.e. transformers are fully assembled and are ready for dispatch.
- d. In case of any defect/defective workmanship observed at any stage by the pclient's Inspecting Officer, the same shall be pointed out to the firm in writing for taking remedial measures. Further processing should only be done after clearance from the Inspecting Officer/ purchaser.
- e. All tests and inspection shall be carried out at the place of manufacture unless otherwise specifically agreed upon by the manufacturer and purchaser at the time of purchase. The manufacturer shall offer the Inspector representing the client all reasonable facilities, without charges, to satisfy him that the material is being supplied in accordance with this specification. This will include Stage

Inspection during manufacturing stage as well as Active Part Inspection during Acceptance Tests.

- f. The manufacturer shall provide all services to establish and maintain quality of workman ship in his works and that of his sub-contractors to ensure the mechanical /electrical performance of components, compliance with drawings, identification and acceptability of all materials, parts and equipment as per latest quality standards of ISO 9000.
- g. The client has the right to have the test carried out at his own cost by an independent agency wherever there is a dispute regarding the quality supplied. Purchaser has right to test the supply selected either from the stores or field to check the quality of the product. In case of any deviation, purchaser has every right to reject the entire lot or penalize the manufacturer, which may lead to blacklisting, among other things.

5.27 DRAWING AND INFORMATION

The vendor shall furnish following drawings/documents in accordance with enclosed requirements:

- a. General arrangement of transformer
- b. General arrangement of HV cable box with connection diagram
- c. General arrangement of LV bus duct and connection diagram
- d. General arrangement of marshaling box and wiring diagram
- e. Rating and diagram plate indicating % impedance etc.
- f. Guaranteed technical parameters
- g. Reactance, resistance and capacitance
- h. Initial charging current (in-rush current)

5.28 PACKING AND FORWARDING

- i. The packing shall be done as per the manufacturer's standard practice. However, it should be ensured that the packing is such that, the material would not get damaged during transit by Rail / Road / Sea.
- ii. The marking on each package shall be as per the relevant IS.

5.29 GUARANTEE

The manufacturers of the transformer shall provide a guarantee of 24 months from the date of receipt at site or 18 months from the date of commissioning, whichever is earlier. In case the distribution transformer fails within the guarantee period, the client will immediately inform the supplier who shall take back the failed DT within **7 (Seven) days** from the date of the intimation at his own cost and replace/repair the transformer within **30 (Thirty) days** of date of intimation with a roll over guarantee.

The outage period i.e. period from the date of failure till unit is repaired/ replaced shall not be counted for arriving at the guarantee period.

In the event of the supplier's inability to adhere to the aforesaid provisions, suitable penal action will be taken against the supplier which may inter alia include blacklisting of the firm for future business with the client for a certain period.

5.30 DEVIATION

Deviation from specifications must be stated in writing at the tendering stage. In the absence of such statement, it will be assumed that the requirements of the specifications are met without exception.

6 LOW VOLTAGE PANEL & SWITCHGEAR

This section covers specification of Medium Voltage Switchboards incorporating items of switchgear like Circuit Breakers, MCCBs, metering and protection

6.1 GENERAL

6.1.1 STANDARDS AND CODES

The following Indian Standard Specifications and Codes of Practice will apply to the equipment and the work covered by the scope of this contract. In addition the relevant clauses of the Indian Electricity Act 1910 and Indian Electricity Rules 2003 as amended upto date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and/or IEC Standards shall be applicable.

BIS certified equipment shall be used as a part of the Contract in line with Government regulations. Necessary test certificates in support of the certification shall be submitted prior to supply of the equipment.

It is to be noted that updated and current Standards shall be applicable irrespective of those listed below.

IEC 61439-1&2	: Low Voltage Switchgear Assemblies
IEC 60947/IS 13947:1993	: Low Voltage Switchgear & Control Gear
IEC 60529/IS 2147:1962	: Degree of Protection of Enclosures for LV Switchgear
IEC 61641	: Internal Arc
IS 11353 : 1985	: Marking of Switchgear Busbars
IS 3231:1986	: Electrical Relays for Power System Protection

6.1.2 TYPE OF PANEL

The medium voltage switch board panel shall comprise of the following type of switchgears:

- a. Air Circuit breakers draw out type.
- b. Plug-in type MCCBs of suitable Ics ratings. MCCBs shall invariably be Current Limiting type. Features like Double Break, Positive Isolation functions shall be preferred.

The Panel shall be indoor type having incoming sectionalization and outgoing switchgears as specified. The design shall be cubical type. The degree of enclosure protection shall be IP 42.

6.1.3 SITE CONDITIONS

For general climatic conditions, refer and comply the specified project site conditions. The main distribution boards shall comply and perform satisfactorily at the below listed special design conditions as minimum:

Ambient temperature	:	45°C
Relative humidity	:	95% (at 55°C)

6.2 LT PANEL

The main LT panel shall be total type tested assembly as per standards IEC: 61439-1&2. Main LT Panel shall be supplied as per BOQ, specifications & drawings (SLD). LT Panel shall be indoor type, IP 42, metal clad, floor mounted, free standing, totally enclosed, extensible type, air insulated, cubicle type for use on 415 Volts, 3 phase, 50 cycles system with a fault level of 50 kA RMS symmetrical, with bus coupler switching & interlocking of incomer & bus coupler breakers of Main LT Panel.

- All medium voltage switchboards shall be suitable for operation at three phase/three phase 4 wire, neutral grounded at transformer system as per schedule of quantities and insulation voltage of 1000 V.
- The switchboards and the associated equipment including switchgear, control gear, Busbar supports, Busbar orientation, Busbar links etc shall be identical in construction to the assembly which has undergone the type test. The drawings of the type-tested assemblies shall be made available for inspection. The drawings shall be signed and stamped by OEM for verification of GA and bus bar sizing.
- The enclosures shall be designed to take care of normal stress as well as abnormal electro-mechanical stress due to short circuit conditions. All covers and doors provided shall offer adequate safety to operating persons and provide ingress protection of IP 42 unless otherwise stated. Ventilating openings and vent outlets, if provided, shall be arranged such that same ingress protection of

IP 42 is retained. Suitable pressure relief devices shall be provided to minimize danger to operator during internal fault conditions.

- The switchboard along with ACBs and connections should have been be total type tested design at **CPRI/ERDA** for short circuit, temperature rise, protective earth short circuit test and dielectric tests of the ratings required .
- For operator safety IP2X (touch proof) protection to be available even after opening the feeder compartment door. The compartmentalization to be achieved by using metal separators, use of PVC sheet / Hylem sheets shall not be allowed.
- All equipment and components of the main distribution boards shall be capable of continuous operation at their full current and voltage ratings and without detriment or malfunction at system continuous deviation of up to and including the following percentages of the normal values.
 - Voltages $\pm 10\%$
 - Frequency $\pm 5\%$
- All components shall be capable of withstanding the dynamic, thermal and dielectric stresses resulting from prospective short circuit currents without damage or injury to personnel.
- Main distribution boards shall be assembled only by a franchisee (Licence Partner) of the original manufacturer and approved by the consultant. The certificate copy issued by original manufacturer shall be attached with quotation document for review & acceptance. All major components like enclosures, switchgear components and bus bar supports shall be supplied by OEM manufacturer to franchisee assembler (Licence Partner). In case of licensed manufacture, enclosure parts may be manufactured as per drawings issued by original manufacture with quality check. The QA documents, if required shall be furnished for review during inspection. The QA shall be of OEM and during inspection, OEM inspection personal shall be available along with along with customer and consultant inspection.
- Vendors shall ensure components like ACBs, MCCBs selected shall have both current and time discrimination. Coordination study done using switchgear manufacturer's software shall be furnished.

6.2.1 PANEL CONFIGURATION

- The Switch Board shall be configured with Air Circuit Breakers, MCCB's, and other equipment as called for in the Schedule of Quantities.
- The MCCB's shall be arranged in multi-tier formation whereas the Air Circuit Breakers shall be arranged in Single or Double tier formation only to facilitate operation and maintenance.
- The Switch Boards shall be of adequate size with a provision of 25% spare space to accommodate possible future additional switch gear.

6.2.2 CONSTRUCTIONAL FEATURES

- The Switch Boards shall be metal enclosed, sheet steel cubicle pattern, extensible, floor mounting type and suitable for indoor mounting.
- The Switch Boards shall be totally enclosed, completely dust and vermin proof. Gaskets between all adjacent units and beneath all covers shall be provided to render the joints dust and vermin proof to provide a degree of protection of IP 42. All doors and covers shall also be fully gasketed with PU foam/Neoprene/EPDM rubber and shall be lockable.
- The Switch Board shall be fabricated with CRCA Sheet Steel of thickness not less than 2.0 mm and shall be folded and braced as necessary to provide a rigid support for all components. The doors and covers shall be from CRCA sheet steel of thickness not less than 1.5 mm. Joints of any kind in sheet metal shall be seam welded and all welding slag ground off and welding pits wiped smooth with plumber metal.
- All panels and covers shall be properly fitted and square with the frame. The holes in the panel shall be correctly positioned.
- Switchboards construction shall employ the principle of compartmentalized and segregation for each circuit.
- Incomer and bus section panels or sections shall be separate and independent and shall not be wired with sections required for feeder. The incomer panel shall be suitable for receiving bus trunking or MV cable of size specified.
- Switchboard shall be readily extensible on both sides by addition of vertical sections after removal of the end covers.
- The switchboards shall be designed for use in high ambient temperature and humid tropical conditions as specified. Ease of inspections, cleaning and repairs while maintaining continuity of operation shall be provided in the design.
- Special care to be taken to ensure effective earthing of the frame and doors of the switchboards
- Each vertical section shall be provided with a rear or side cable chamber housing the cable end connections and power/control cable terminations. There should be generous availability of space for ease of installation and maintenance with adequate safety for working in one vertical section without coming into contact with any live parts. The design of the switchboard shall allow standard extension chambers if required to accommodate cables.
- Switchboard shall be provided with “Danger Notice Plate” conforming to relevant Indian Standards.
- The main LV Panel shall be able to connect to Ethernet and communicate all related data of ACBs, MCCB, Meters etc to EMS software.
- Internal arc withstand of 50kA for 0.3-0.5 sec.

6.2.3 SWITCHBOARD COMPARTMENTALIZATION

- For compartmentalized switchboards, separate totally enclosed compartments shall be provided for horizontal busbars, vertical busbars, ACBs, MCCBs, and cable alloys.
- The main board shall be with Form 4b Construction.
- Earthed metal or insulated shutters shall be provided between drawout and fixed portion of the switchgear such that no live parts are accessible with equipment drawn out. Degree of protection within compartments shall be **atleast IP 2X**.
- Sheet steel hinged lockable doors for each separate compartment shall be provided and duly interlocked with the breaker in "ON" and "OFF" position.
- For all Circuit Breakers separate and adequate compartments shall be provided for accommodating instruments, indicating lamps, control contactors and control MCB etc. These shall be accessible for testing and maintenance without any danger of accidental contact with live parts of the circuit breaker, busbars and connections.
- For Some MCCB feeders for critical loads like UPS it may be required to have operation only after opening the door, all other facilities like padlockable rotary handle to be provided for such feeder. It shall be possible to do this change during execution of order
- Each switchgear cubicles shall be fitted with label in front and back identifying the circuit, switchgear type, rating and duty. All operating device shall be located in front of switchgear only.
- Cable compartments shall be of adequate size for easy termination of all incoming and outgoing cables entering from bottom or top. The construction shall include necessary and adequate and proper support shall be provided in cable compartments to support and clamping the cable in the cable alley / cable chamber.

6.2.4 PANEL DIMENSIONAL LIMITATIONS

- A base channel 75 mm x 5 mm thick shall be provided at the bottom.
- A minimum of 200 mm blank space between the floor of switch board and bottom most unit shall be provided.
- The overall height of the Switch Board shall be limited to 2400 mm
- The height of the operating handle, push buttons etc shall be restricted between 300 mm and 1800 mm from finished floor level.

6.2.5 DRAW OUT FEATURES

- Air Circuit Breakers shall be provided in fully drawout cubicles. These cubicles shall be such that drawout is possible without disconnection of the wires and cables. The power and control circuits shall have self aligning and self isolating contacts. The fixed and moving contacts shall be easily accessible for operation and maintenance. Mechanical interlocks shall be provided on the drawout cubicles to ensure safety and compliance to relevant Standards.

- The MCCB's shall be plug-in type MCCB in order to replace the MCCBs in live condition.

6.2.6 BUS BARS

- The Bus Bar and interconnections shall be of electrolytic Copper and of rectangular cross sections suitable for full load current for phase bus bars. The maximum current density for copper shall be 1.25 amps per sq. mm. suitable to withstand the stresses of a 50 kA fault level at 415 volts for 1 second or as per schedule of quantities. .
- The bus bars and interconnections shall be insulated with insulation tape/ fiber glass.
- The bus bars shall be extensible on either side of the Switch Board.
- The bus bars shall be supported on non-breakable, non-hygroscopic insulated supports at regular intervals, to withstand the forces arising from a fault level of 50 kA at 415 volts for 1 second and operating temperature of 110 °C. The material and spacing of the Busbar supports shall be same as per the type tested assembly.
- Auxiliary buses for control power supply, space heater or any other specified services shall be provided.
- Clearances between phases shall be in line with IEC.
- All bus bars shall be colour coded.
- All bus bar connections in Switch Boards shall be bolted with brass bolts and nuts. Additional cross section of bus bars shall be provided wherever holes are drilled in the bus bars.

6.2.7 PANEL INTERCONNECTIONS

- All connections between the bus bars/Breakers/cable terminations shall be through solid copper strips of adequate size to carry full rated current and PVC/fibre glass insulated.
- For unit ratings upto 100 amps FRLS insulated copper conductor wires of adequate size to carry full load current shall be used. The terminations of all such interconnections shall be crimped.

6.2.8 WIRING

All wiring for relays and meters shall be with FRLS insulated copper conductor wires. The wiring shall be coded and labeled with approved ferrules for identification. The minimum size of copper conductor control wires shall be 2.5 sq. mm. Runs of wires shall be neatly bunched and suitably supported and clamped. Means shall be provided for easy identification of wires. Identification ferrules shall used at both end of wires.

All control wires meant for external connections are to be brought out on a terminal board. **The cables and control wires shall be suitable for withstanding 105 deg C.**

6.2.9 INSTRUMENT ACCOMMODATION

- All voltmeter and ammeter and other instruments shall be flushed mounted type conforming to accuracy class 1 to IS 1248 for accuracy. All voltmeter shall be protected with control MCBs.
- Instruments and indicating lamps shall not be mounted on the Circuit Breaker Compartment door for which a separate and adequate compartment shall be provided and the instrumentation shall be accessible for testing and maintenance without danger of accidental contact with live parts of the Switchboard.
- For MCCBs, instruments and indicating lamps can be provided on the compartment doors.
- The current transformers for metering and for protection shall be mounted on the solid copper busbars with proper supports.
- On all the incomers of switch boards ON/OFF indicators lamps shall be provided suitable for operation on AC 230 volts supply. All lamps shall be protected by control MCBs.
- For Incomer and important outgoing feeders comprehensive power meters shall be provided which shall display A, V, PF, Hz, Kw, KVA, KVA_r, Kwh, Kvarh, average and maximum values, demand values, individual harmonics on current and Voltages. Also add on modules for RS485 port to link to BMS/EMS/SCADA system.

6.2.10 CABLE TERMINATIONS

- Knockout holes of appropriate size and number shall be provided in the Switch Board in conformity with the location of incoming and outgoing conduits/cables.
- The cable terminations of the Circuit Breakers shall be brought out to terminal cable sockets suitably located at the rear of the panel.
- The cable terminations for the MCCB's shall be brought out to the rear in the case of rear access switchboards or in the cable compartment in the case of front access Switch Boards.
- The Switch Boards shall be complete with tinned brass cable sockets, tinned brass compression glands, gland plates, supporting clamps and brackets etc for termination of 1100 volt grade aluminium conductor PVC/PVCA cables.

6.2.11 SPACE HEATERS

Anti- condensation heaters shall be fitted in each cubicle together with an ON/OFF isolating switch suitable for electrical operation at 230 volts A.C 50 Hz single phase of sufficient capacity to raise the internal ambient temperature by 5^o C. The electrical apparatus so protected shall be designed so that the maximum permitted rise in

temperature is not exceeded if the heaters are energized while the switchboard is in operation. As a general rule, the heaters shall be placed at the bottom of the cubicle.

6.2.12 EARTHING

A main earth bar of G.I./copper as required shall be provided throughout the full length of the Switch Board with a provision to make connections to the sub-station earths on both sides.

6.2.13 SHEET STEEL TREATMENT AND PAINTING

- Sheet Steel materials used in the construction of these units should have undergone a rigorous rust proofing process comprising of alkaline degreasing, descaling in dilute sulphuric acid and a recognised phosphating process. The steel work shall then receive two coats of oxide filler primer before final painting. Castings shall be scrupulously cleaned and fettled before receiving a similar oxide primer coat.
- All sheet steel shall after metal treatment be spray or powder painted with two coats of shade 692 to IS 5 on the outside and white on the inside. Each coat of paint shall be properly stoved and the paint thickness shall not be less than 50 microns.

6.2.14 NAME PLATES AND LABELS

Suitable engraved white on black name plates and identification labels of metal for all Switch Boards and Circuits shall be provided. These shall indicate the feeder number and feeder designation.

6.2.15 INSTALLATION

The foundations prepared as per the manufacturers drawings shall be leveled, checked for accuracy and the Panel installed. All bus bar connections shall be checked with a feeler gauge after installation. The cable end boxes shall be sealed to prevent entry of moisture. The main earth bar shall be connected to the sub-station earths.

A 15 mm thick rubber matting of approved make on a 100 mm high timber shall be provided in front of and along the full length of the Switch Board. The width of the matting shall be 1000 mm. The rubber mat shall withstand 15 KV for 1 minute and leakage current shall not exceed 160 mA/sq. metre.

After installation the Switch Board shall be tested as required prior to commissioning.

6.2.16 TESTING

6.2.16.1 TYPE TEST

The main distribution board and the components as applicable shall be type tested in accordance with the IEC standards to verify the specified fault level withstand capacity from a reputed and approved type testing laboratory and certified by an competent authority.

The following type tests as specified in IEC 61439-1 standards shall be carried out on assembly at recognized test laboratories and certificates shall be provided for each type test:

- i. Verification of temperature-rise limits (IEC Cl. 10.10);
- ii. Verification of the dielectric properties (IEC Cl. 10.9);
- iii. Verification of short-circuit withstand strength (IEC Cl. 10.11);
- iv. Verification of the effectiveness of the protective circuit (IEC Cl.10.5)
- v. Verification of clearances and creep age distances (IEC C. 10.4)
- vi. Verification of mechanical operation (IEC Cl.10.13)
- vii. Verification of the degree of protection (IEC Clause 10.3)
- viii. Verification of mechanical impact (IEC Clause 10.2)

The panel should be tested for internal arc as per IEC 61641 which guarantee safety to operating personnel in terms of arc containment and readiness of panel for normal operation after the clearance of fault.

Type test certificates shall be submitted to the consultant engineer for verification.

6.2.16.2 ROUTINE TEST

The panel assembler shall perform the routine test and provide the test certificates as defined in IEC standards. The routine test shall include but not limited to the following:

1. Inspection of the assembly including inspection of wiring and electrical operational test
2. Dielectric test & Insulation resistance test
3. Checking of protective measures and of the electrical continuity of the protective circuits
4. Functional test as per the approved test procedure.

Routine test certificates and test readings shall be submitted to the consultant engineer for verification.

6.2.17 TESTING & COMMISSIONING AT SITE

Commissioning checks and tests shall include all wiring checks and checking up of connections. Relay adjustment/setting shall be done before commissioning, in addition to routine Megger tests. Checks and tests shall include the following:

- a. Operation checks and lubrication of all moving parts.
- b. Interlock function checks.
- c. Continuity checks of wiring, fuses etc. as required.
- d. Insulation test: When measured with 500 V Megger the insulation resistance shall not be less than 100 mega ohms.
- e. Alignment of panel, interconnection of Bus bars and tightness of bolts and connection.
- f. Inter panel wiring
- g. Free movement of ACB/MCCB
- h. Operation of breakers

6.3 LOW VOLTAGE AIR CIRCUIT BREAKERS

6.3.1 TECHNICAL PARAMETERS

- The circuit breaker shall be of the air break type, robust and compact design suitable for indoor mounting and shall comply with the requirement of IEC: 60947-1&2. Rupturing capacity shall be 50 kA at 415 Volts or as per schedule of quantities.
- The breakers shall be type tested & certified at ERDA/CPRI.
- ACB shall have a rated operational voltage of 415V AC, rated insulation voltage of 1000 volts AC, rated impulse voltage of 12kV.
- The breaker shall comply with the isolation function requirement of IEC 60947-2 section 7.12 to be marked as suitable for isolation / disconnection to facilitate safety of operating personnel while the breaker is in use.
- The breaker shall provide class II insulation between the front panel and internal power circuits to avoid any accidental contact with the live main current carrying path with the front cover open.
- Protective devices, metering, CTs, PTs, push buttons and indicating lamps shall be provided as per schedule of quantities.
- The ACBs shall be capable for LOTO (Lock Out Tag Out) protection.
- ACB shall comply with the environmental directives like RoHS.
- All ACBs irrespective of Incomer or Outgoing shall have neutral protection. In case of 3P ACBs are offered based on application, it shall still be possible to protect neutral by providing external CT.
- ACB shall have the breaking performance $I_{cs} = I_{cu} = I_{cw} (1\text{sec}) = 50\text{kA}$

6.3.2 CONSTRUCTIONAL FEATURES

- The Circuit Breaker shall be flush front, metal clad, horizontal draw-out pattern, three/four pole as required and fully interlocked. Each Circuit Breaker shall be housed in a separate compartment enclosed on all sides.
- The Circuit Breaker cradle shall be designed and constructed to permit smooth withdrawal and insertion. The movement shall be free of jerks, easy to operate and positive.
- All current carrying parts in the breaker shall be silver plated and suitable arcing contacts shall be provided to protect the main contacts which shall be separate from the main contacts and easily replaceable. In addition, Arc chutes shall be provided for each pole, and these shall be suitable for being lifted out for the inspection of the main and the arcing contacts.
- Self-aligning cluster type isolating contacts shall be provided for the Circuit Breaker, with automatically operated shutters to screen live cluster contacts when the Breaker is withdrawn from the cubicle. Sliding connections including those for the auxiliary contacts and control wiring shall also be of the self-aligning type. The fixed portion of the sliding connections shall have easy access for maintenance purposes.
- ACBs shall be capable for LOTO (Lock Out Tag Out) protection.
- The cubicle for housing the Breaker shall be free standing pattern, fabricated from the best quality sheet steel.
- All ACBs shall have OEM make terminal adopters for both incoming/outgoing side.

6.3.3 OPERATING MECHANISM

- The Circuit Breaker shall be trip free with independent manual spring operated or motor wound spring operated mechanism as specified and with mechanical ON/OFF indication. The operating mechanism shall be such that the circuit breaker is at all times free to open immediately the trip coil is energised.
- The closing time shall be less than or equal to 70 ms to ensure faster closing of the breaker. And tripping time should be less than 40 ms to reduce the let through energy in the event of fault.
- The operating handle and mechanical trip push button shall be at the front of and integral with the Circuit Breaker.
- There shall be electrical indicator on the front panel for 'Ready to close' situation for the breaker by checking all interlockings.
- The Circuit Breaker shall have the following four distinct and separate positions which shall be indicated on the face of the panel.

- "Service" -- Both main and secondary isolating contacts closed
- "Test" -- Main isolating contacts open and secondary isolating contacts closed
- "Isolated" -- Both main and secondary isolating contacts open
- "Maintenance" -- Circuit Breaker fully outside the panel ready for maintenance

6.3.4 CIRCUIT BREAKER INTERLOCKING

Sequence type strain free interlocks shall be provided to ensure the following:

- It shall not be possible for the Breaker to be withdrawn from the cubicle when in the "ON" position. To achieve this, suitable mechanism shall be provided to lock the Breaker in the tripped position before the Breaker is isolated.
- It shall not be possible for the Breaker to be switched "ON" until it is either in the fully inserted position or, for testing purposes, it is in the fully isolated position.
- It shall not be possible for the Circuit Breaker to be plugged in unless it is in the OFF position.
- A safety catch shall be provided to ensure that the movement of the Breaker, as it is withdrawn, is checked before it is completely out of the cubicle, thus preventing its accidental fall due to its weight.

6.3.5 CIRCUIT BREAKER AUXILIARY CONTACTS

The Circuit Breaker shall have minimum 6 N.O. and 6 N.C. auxiliary contacts rated at 16 amps 415 volts 50 Hz. These contacts shall be approachable from the front. They shall close before the main contacts when the Circuit Breaker is plugged in and vice versa when the Circuit Breaker is Drawn Out of the cubicle.

6.3.6 ELECTRICAL AUXILIARIES

- All electrical auxiliaries, including the spring charging gear motor shall be installable on site without requiring adjustment or any tools other than a screw driver
- The auxiliaries shall be placed in a compartment which under normal operating conditions, shall not contain any conducting parts capable of entering into electrical contact with the circuit breaker poles. It shall be possible to connect all auxiliary wiring from the front of the circuit breaker.

6.3.7 CIRCUIT BREAKER RELEASES

- The Air Circuit Breakers should have microprocessor release. The protection release shall have LSIG protection as standard.
- The Incoming & Outgoing circuit breakers to be equipped with the microprocessor based release with adjustable short circuit protection with

adjustable time delay, Overcurrent protection, and adjustable earth fault protection with adjustable time delay. The release should have display to show all electrical parameters like V, A, W, VAR, VA, Wh, VARh, Vah. It should be possible to store tripping history of last ten faults with time and date of fault and the type of fault with values.

- On line setting of the parameters should be possible.
- ACB's should have thermal memory feature for safer & reliable operations of panels.
- The setting of the ACB should be possible digitally as well as with dial settings with the help of screwdriver.
- Communication port on all types of the releases shall be available and all parameters of the ACB be communicable to EMS with on-board Ethernet port.
- The micro-processor release should be self-powered type without any auxiliary power supply during normal operation of the breaker.
- I^2t ON / I^2t OFF options shall be available for short-circuit & earth fault protections to enhance discrimination with downstream devices.
- The trip unit shall have integral test facility to verify the healthiness and to avoid external calibration.
- Protection Release shall have rating plug whereby over load setting range can be adopted based on load conditions without modifying any internal components of the Circuit breakers.
 - a. Adjustable over load current settings from 40% to 100% of rating of ACB (In).
 - b. Over load time setting from 3 sec-24 sec as field selectable curves.
 - c. Short circuit setting from 1.5 to 10 times of I_n setting
 - d. Short circuit time delay adjustable from 0.1 to 0.4 sec.
 - e. Instantaneous protection with an adjustable pick-up and an OFF position.
 - f. Earth fault setting adjustable in absolute Ampere 0.2-1 In with time delay settings from 0.1 to 1 sec.
- ACB protection release shall be able to provide following maintenance related data at any time:
 - a. Last 10 trips history with date & time stamping
 - b. % Contact wear
 - c. Data logger
 - d. Total number of operations
 - e. Thermal memory
 - f. LCD display to see all currents at single screen without scrolling down to new screen
- The protection release shall have capability of recording and transferring data on real time stamping basis. Releases without capabilities of real time stamping is not acceptable.
- The protection release shall be suitable to achieve both current and Time discrimination with downstream protection devices.

- The protection releases of Air circuit breakers shall have built in data log function. It shall be possible for operating personnel to collect data and transfer it to personal computer for further analysis.
- The communication protocol shall be modbus/Ethernet protocol to interface with upstream BMS/SCADA systems without using PLC.
- **All incomer Circuit Breakers shall have following additional features and measurement functions as standard:**
- **Protections (via separate relays):**
 - i. Under and Over Voltage Protection.
 - ii. Under and Over Frequency Protection.
 - iii. Reverse Power Protection(On standby Generator ACB).
 - iv. Residual current protection.
- **All outgoing ACB shall have additional features as below:**
 - i. Protection against phase unbalance.
 - ii. All outgoing ACB shall have LSIG protection and current metering.
 - iii. Chronological event storage.
 - iv. Counting the number of operations & contact wear.
 - v. Password protection with “READ” & “EDIT” mode.

6.3.8 PROTECTIVE DEVICES

The Circuit Breaker shall have protective devices as specified in the Schedule of Quantities. These will in general be:

- C.T. operated thermal overload releases with magnetic instantaneous short circuit release. The overload releases shall be such that each phase can be individually set depending on the phase unbalanced currents. The releases shall have inverse time current characteristics and the magnetic release shall be time delayed with a minimum setting of 25 ms varying upto 300 ms for discrimination without effecting the breaking current capacity of the ACB.
- Over voltage relay.
- Under/no voltage trip coil or Relay as required.
- Over current and earth fault IDMT relays with shunt/series trip coil operation as specified.

The Circuit Breakers shall be suitable to accommodate one or more types of protection as specified.

6.3.9 INSTRUMENT TRANSFORMERS

The Circuit Breaker shall have the required Current Transformers as specified for metering and protection mounted outside the Circuit Breaker compartment but within the free standing cubicle. The transformers shall comply to the relevant Indian Standards and the Class of Accuracy required for metering and protection. Separate sets of Current transformers shall be provided.

6.3.10 METERING

The metering required to be provided for each Circuit Breaker shall be as per the Schedule of Quantities. Such metering shall not be provided on the front panel of the Circuit Breaker compartment. A separate compartment shall be provided for the metering and Protective relays as required.

Square pattern flush mounting meters complying with the requirements of the relevant Indian Standards shall only be used.

Selector switches of the three way and OFF pattern complying to the relevant Indian Standards shall be used.

6.3.11 INDICATING LAMPS

LED type indicating lamps shall be provided for indication of phases and Breaker position as required in the Schedule of Quantities.

6.3.12 CONTROL WIRING

All wiring for relays and meters shall be of copper conductor FRLS insulated and shall be colour coded and labelled with appropriate plastic ferrules for identification. The minimum size of control wires to be used shall be 1.5 sq mm.

All control circuits shall be provided with protective control MCBs. Instrument testing plugs shall be provided for testing the meters.

6.3.13 EARTHING

The frame of the Circuit Breaker shall be positively earthed when the Circuit Breaker is racked into the cubicle.

6.3.14 TYPE TEST CERTIFICATES

The Contractor shall submit type test certificates from a recognized test house for the Circuit Breakers offered.

6.4 MOULDED CASE CIRCUIT BREAKERS

Moulded case circuit breakers (MCCB), incorporated in switchboards wherever required, shall conform to IEC 60947-1&2 in all respects. MCCBs shall be suitable either for single phase 240 Volts or 3 Phase 415 Volts AC 50 Hz supply with ultimate short circuit breaking capacity of **50KA at 415 volts**.

All MCCBs whether Thermal or Microprocessor shall be **plug-in type** to facilitate ease of maintenance and repair. In plug in design of MCCB's, rack in and rack out shall be prevented when the circuit breaker is in on condition.

The moulded circuit breakers offered shall strictly comply with environmental protection. The circuit breakers shall be free from hazardous substances like Lead, Mercury, Cadmium, Chrome etc. The materials shall be suitable for recyclability.

Manufacturer shall furnish discrimination chart for coordination between upstream and downstream devices. The MCCB's shall be from one manufacturer and shall be from one range from 100A up to 1600A. Mix of multiple ranges of MCCB's from one manufacturer is not acceptable.

The MCCB's shall be Line/Load Interchangeable. The MCCB's shall have adjustable over load settings & adjustable short circuit settings for discrimination. The rated impulse withstand capability shall be minimum of 8kV.

MCCB's up to 250A shall be of Thermo-magnetic release. MCCB above 250A shall be Microprocessor based release. Thermo-magnetic trip unit should have adjustable thermal protection from 70–100% times the current rating I_n . The ground fault protection shall be inbuilt or external module for ground fault with 3 phase 4 wire protection shall (Lock Out Tag Out) provided.

All microprocessor based MCCB shall have fault LED indication for O/L (L), S/C (S&I) and E/F (G) protection.

Electronic trip units should have:

- a. Adjustable over load protection from 50-100% times the current rating.
- b. Variable short circuit protection setting from 2 to 10 I_n and time setting.
- c. Instantaneous protection setting from 1 to 10 I_n and time setting will be instantaneous trip take place.
- d. Earth Fault protection setting from 0.2 to 1 I_n and time setting is 0.1-0.8 sec.
- e. In case of 4 pole MCCB, neutral shall be 100% protected.

The protection release of microprocessor based MCCB's shall be communication capable and shall communicate on Modbus/Ethernet protocol. The protection shall transmit following data via communication network.

- Current
- Voltage
- Power
- Power Factor
- Frequency
- Power quality indicator
- Individual Harmonics of Current & Voltage

The protection release of microprocessor based MCCB's shall be capable to store the following data for maintenance purpose:-

- No. of operations.
- Number of protection trip.
- Last trip history.

MCCB release shall have display unit to display measurement/protection/maintenance related data locally.

MCCBs shall have double break mechanism.

MCCB's shall be designed based low watt loss technology which reduces energy consumption and limits green house gases.

The moulded-case circuit breakers shall be designed for both vertical and horizontal mounting, without any adverse effect on electrical performance. For maximum safety, the construction of circuit breakers shall have double insulation and live part is separated from other functions such as the operating mechanism and auxiliaries.

MCCB cover and case shall be made of high strength heat resisting and flame retardant thermosetting insulating material. Operating handle shall be quick make/break, trip - free type. Operating handle shall have suitable ON, OFF and TRIPPED indicators. Three phase MCCBs shall have a common handle for simultaneous operation and tripping of all the three phases. Suitable arc extinguishing device shall be provided for each contact.

Contact trips shall be made of suitable arc resistant sintered alloy. Terminals shall be of liberal design with adequate clearances.

MCCBs shall be provided with following interlocking devices for interlocking the door a switch board.

- Handle interlock to prevent unnecessary manipulations of the breaker.
- Door interlock to prevent door being opened when the breaker is in ON position
- Deinterlocking device to open the door even if the breaker is in ON position.

MCCBs shall have rupturing capacity as specified in drawings/schedule of quantities.

6.5 METERING & INSTRUMENTATION

Ratings, type and quantity of meters, instruments and protective devices shall be as per drawings and schedule of quantities.

6.5.1 CURRENT TRANSFORMERS

CTs shall conform to IS 2705 (Part-I, II and III) in all respects. All CTs used for low voltage application shall be rated for 1 kV. CTs shall have rated primary current, rated

burden and class of accuracy as specified in schedule of quantities/drawings. Rated secondary current shall be 5A unless otherwise stated. Minimum acceptable class for measurement shall be class 0.5 to 1 and for protection class 5P10. CTs shall be capable of withstanding magnetic and thermal stresses due to short circuit faults of 50 kA at 415V.

CTs shall be mounded such that they are easily accessible for inspection, maintenance and replacement. Wiring for CT shall be with copper conductor FRLS insulated wires with proper termination works and wiring shall be bunched with cable straps and fixed to the panel structure in a neat manner.

6.5.2 POTENTIAL TRANSFORMER

PTs shall conform to IS 3156 (Part-I, II and III) in all respects.

6.5.3 MEASURING INSTRUMENTS

Direct reading electrical instruments shall conform to IS 1248 in all respects. Accuracy of direct reading shall be 1.0 of voltmeter and 1.5 for ammeters. Other instruments shall have accuracy of 1.5. Meters shall be suitable for continuous operation between -10°C and $+50^{\circ}\text{C}$. Meters shall be flush mounting and shall be enclosed in dust tight housing. The housing shall be of steel or phenolic mould. Design and manufacture of meters shall ensure prevention of fogging of instrument glass. Selector switches shall be provided for ammeters and volt meters used in three phase system.

MFM shall be employed wherever required. The MFM for Incomer shall provide following data:

1. Accuracy - Class 0.5S as per IEC Specifications.
2. Individual current & Voltage Harmonics up-to 31st THD, TDD as per IEC specifications on meter display.
3. Peak demand with time stamping D/T for current and powers.
4. Communication on RS485.
5. Meters should have 2 DI/DO's, data logging & 64 samples per cycle.
6. Per-phase, avg/total of volts, Amps, PF, THD, Hz, W, Wh, VA, VAh, VAR, VARh, max demand & import/export.

MFM provided for Outgoing shall provide following data:

1. Energy Standard – Class 1 as per IEC 62053-22 / 21
2. Power quality analysis with THD
3. Volts, Amps, PF, THD, F, W, Wh, VA, VAh, Var, Varh, Runhrs, Onhrs, Interrupts,
4. Min/Max Monitoring with Date/Time stamping
5. Communication on RS485 port

7 BUSWAY TRUNKING SYSTEM

7.1 GENERAL

Bus bar Trunking shall be sandwich type construction. It shall be 3 Phase with 100% Neutral and 50%PE conductor enclosed in all aluminum alloy housing. Complete bus duct assembly shall be total type tested as per IEC-61439-6. All relevant type test certificates pertaining to the rating shall be submitted by Contractor. Bus duct shall be suitable for operation at ambient temperature of 40 deg C. The temperature rise over ambient shall not exceed more than 55 deg C in case of full load. Necessary certificates for temperature rise shall be furnished.

Bus bar Trunking shall be rated for operational voltage of 690V with insulation voltage of 1000V and shall be suitable for 50Hz frequency.

Sandwich type bus bar shall be suitable for distribution application from 100A to 4000A copper conductor in a single run.

Range shall be suitable for horizontal and riser application and should be complete with feeder/plug in and all accessories like expansion joints, reducers, end terminal covers etc. as recommended by the manufacturers. Standard length of bus bar shall not be less than 3000 mm & plug in opening (if required) shall be provided at regular interval of 610mm with safety shutters. Special length shall be designed to connect the end piece and some special requirements.

Plug in length shall have a feasibility of having plug outlets on both sides.

The Plug in Busway shall be suitable for vertical and/or horizontal installation.

All indoor application shall use IP54 and for outdoor application IP65 should be used. Manufacturer / manufacturer's representative shall liaise with contractor in verifying outdoor conditions w.r.t. proposal/offering being made.

7.2 SHORT CIRCUIT AND TYPE TEST

Bus way system shall comply to following standards:

IEC 61439-6:2012

All type test certificates according to above standards shall be from International Lab of repute such as KEMA or equivalent.

Bus duct shall have short circuit withstand capacity of minimum 50 kA for 1 sec.

Type test certificate shall be produced for validation before ordering for Rated Short Circuit breaking capacity for 1sec .

Type Test certificate confirming, Short Circuit Rating, Mechanical Operation and Temp. Rise of Tap Off Box of similar design in accordance with IEC-61439-6 are must.

Busway manufacturer shall produce a Type Test Report determining Rating of Busway at 35 Deg Ambient with no deration. Failure to submit such reports will disqualify the manufacturer.

A Type Test report confirming Degree of Protection in accordance with IEC 60529 is must.

Salt fog test report for 1000 Hrs from Manufacturer shall be provided.

7.3 HOUSING

The bus bar trunking housing shall be constructed of extruded aluminum on all the sides to reduce hysteresis, eddy current losses and better heat dissipation. It shall be provided with a suitable protective finish of epoxy powder coating.

Housing shall be light in weight for ease of installation and maintenance.

Housing shall be non-corrosive and shall be able to withstand 1000 hours of salt spray test.

Color indication (RYBN) shall be there on the housing for phase sequence identification.

The bus bar trunking housing shall be totally enclosed non-ventilated, extruded aluminum for protection against mechanical damage and dust accumulation.

Also, manufacturer to confirm their proposed Aluminum Housing and construction of housing can provide a low impedance ground path with almost 50% Grounding Capacity of Rated Current.

Totally enclosed housing for busways shall be manufactured by the busway/busbar trunking system manufacturer. Modifications of bus bar trunking at site to make it totally enclosed by third party / other than the bus bar trunking manufacturer shall not be acceptable.

For outdoor/Higher IP protection, the housing made by the manufacturer shall be considered based on adequate type test reports ratifying their use in desired conditions/locations alongside a confirmation meeting the requirement of basic IP Protection sought above. External enclosure on the housing shall not be accepted to increase IP protection unless agreed/approved by client reckoning the site condition and manufacturer's recommendation to do so with documents substantiating such recommendations.

In plug in unit bus ways, the plug in outlet should be available on both the sides for the entire current range.

7.4 BUS BARS

Bus bar conductors shall be 99.9% purity high conductivity copper.

Each bus bar shall be insulated with two layers of halogen free polyester film with thermic class of B/F, providing significant insulation level and resistance to impact and should meet the requirement of ROHS & UL94.

Test Report confirming Busway operation at rated current and rated ambient is a must alongside Test Report confirming Temperature rise at housing/connecting terminals in the bus bar trunking in accordance temp. rise limits specified in IEC-60439-1&2. Based on these reports, manufacturer shall substantiate suitability of insulation material being proposed.

Both feeder and plug-in bus bar trunking for all ratings shall be of sandwich construction, with no air gap between bus bars except at plug-in openings.

7.5 NEUTRAL BUS BAR

Internal neutral conductor shall be 100%, which can meet with the requirements of various power systems in the installations.

7.6 JOINT

The bus bar trunking joint shall be of one bolt type, which utilizes a high strength steel bolt and washer to maintain proper pressure over a large contact surface area.

The bolt shall have two-headed design to indicate when proper torque has been applied and should require only a standard long handle wrench for tightening.

Access shall be required to only one side of the bus bar trunking for tightening joint bolts.

On bus bar trunking, it shall be possible to remove any joint connection assembly to allow electrical isolation or physical removal of a bus bar trunking length without disturbing adjacent bus bar trunking lengths.

Each joint shall also have a colour coded thermal indicator for indicating the rise in temperature over and above ambient by changing colour at 60/70/80 degree centigrade to BLACK/GREEN/RED of that particular length, enabling clear visual inspection, without use of any tools.

Insulation materials used for joints shall have type test reports confirming resistance to fire.

Test Report verifying mechanical strength of insulation materials being used and construction of joint is must.

7.7 SUPPORT OF BUS BAR TRUNKING

Hanger spacing shall be noted on layout drawings and shall not exceed manufacturer's recommendations.

Indoor Feeder and plug-in bus bar trunking shall be approved for hanger spacing of up to two meters' for horizontally mounted runs and four meters' for vertically mounted runs.

Outdoor feeder bus bar trunking shall be approved for spacing of up to 1.2 meters' for horizontally or vertically mounted runs.

7.8 VOLTAGE DROP

The voltage drop (input voltage minus output voltage) specified shall be based on rated current at operational ambient temperature.

The line-to-line voltage drop shall not exceed 3.1 volts per hundred feet at the load power factor which produces maximum voltage drop in the bus bar trunking.

7.9 INSTALLATION

The bus bar trunking construction should be such that no two consecutive pieces be installed as successive TOP and BOTTOM, i.e., there should be a clear mechanical preventer to prevent installation of (TOP) RYBN and (BOTTOM) NBYR.

Proper installation manual shall be provided by the manufacturer.

8.0 APFC PANEL WITH CAPACITOR BANK

8.1.1 GENERAL

This specification covers the general requirement of Design, Manufacture, Factory testing, site testing and Installation of Automatic Power Factor Correction equipment along with capacitor bank intended to be used with low voltage networks.

Power Correction equipment should be able to improve the power factor as per regulations and shall be suitably rated to improve the system power factor from 0.8 to 0.99 based on the actual load. The Equipment shall be manufactured by OEM as per approved make list, and installed in full compliance to this specification, International standards & in accordance to the Rules and regulations of Electrical authorities.

The power factor correction equipment shall normally be connected to the main LV Distribution Boards through dedicated feeders. This equipment shall be stand alone with LV Distribution Board.

8.1.2 APPLICABLE STANDARDS

Unless specified otherwise the capacitor banks shall conform in design, material, construction and performance to the latest editions of the IEC standards, their corresponding British/European (BS/EN) standards and in particular to the following publications :

IEC 61921/IS 16636-2017	Power capacitors – Low voltage power factor correction banks
IEC 60831-1 & 2	Shunt power capacitors of the self-healing type for A.C. systems having a rated voltage up to and including 1000 V
IEC 60076-6	Power transformers - Part 6: Reactors
IEC 61439	Low-Voltage Switchgear and Control gear Assemblies
IEC 60947	Low-voltage Switchgear and Control gear
IEC 62208	Empty enclosures for low-voltage switchgear and control gear assemblies – General requirements
IEC 60529	Degree of protection provided enclosures (IP code)
IEC 61000	Electromagnetic compatibility
IEEE 519-2014	IEEE Recommended Practices and Requirements for Harmonic Control in Electric Power Systems
IS: 13340-1993	Power Capacitor of self-healing type for AC power
IEC 61010	Safety requirements for electrical equipment for measurement, control, and laboratory use
IEC 61326	Electrical equipment for measurement, control and laboratory use - EMC requirements

In addition to the above listed standards, the Rules and Regulations for electrical installations issued by CEA regulation shall also be adhered to.

8.2 MARKING

The following minimum information shall be given by the manufacturer in an instruction sheet and on a rating plate to be fixed on the assembly.

- 1) Manufacturer's name or trademark.
- 2) Serial number.
- 3) Date of manufacture
- 4) Rated reactive power, Q_N in kilovars (kVar).
- 5) Rated voltage, U_N in volts (V).
- 6) Rated frequency, f_N in hertz (Hz).
- 7) Minimum and maximum ambient temperatures in degrees Celsius (°C).
- 8) Degree of protection.
- 9) Short-circuit withstand strength, in amperes (A)
- 10) Number of stages
- 11) Step Size

8.3 CONSTRUCTION OF APFC PANEL

The enclosure housing the capacitor units shall be of minimum 1.5 mm thick electro galvanized sheet steel folded and welded construction, floor mounted, free standing or wall mounted type with a minimum degree of protection of IP42 complete with a hinged lockable door.

The enclosure system for capacitor bank shall be of certified design as per IEC 62208.

The enclosure system should have a minimum of IK 10 certification (external mechanical impacts) in accordance with IEC 62262.

All enclosures or partitions including locking means and hinges for doors shall be of a Mechanical strength sufficient to withstand the stresses to which they may be subjected in normal service, and during short-circuit conditions

The enclosure will be factory wired and comprise mainly of the following:

1. Power factor improvement 3 phase capacitors, arranged in a suitable number of stages.
2. Detuned three phase iron cored series reactors for harmonic current suppression.
3. Microprocessor based power factor regulator for automatic power factor correction.
4. pole contactors for capacitor switching.
5. MCCB for each capacitor stage.
6. Main incomer MCCB.

The automatic capacitor bank should be ready for field connection with all the components clearly labeled for identification.

To ensure safety, reliability and accountability of component coordination, all the major capacitor bank components such as capacitor Units, de tuning reactors, PF controllers, Contactors called for in this specification should be preferably from a single manufacturer.

The Power Correction Equipment shall be installed in cool ventilated locations away from other heat radiating elements

The Power Correction Equipment shall be of type tested design at an ambient temperature of 50 degree Centigrade.

The Capacitor bank shall be designed for trouble free service under the arduous temperature conditions as defined in Regulations and typical of Indian Continental. The capacitor banks shall be operable on 50 Hz and shall meet or comply with IEC 61921 and IEC 61439-1.

The Design and component selection shall consider continuous operation at a maximum system voltage of 415V and ensure reliable performance in consideration of room ambient temperature of 50 degree Centigrade.

All Components shall can withstand the dynamic, thermal and dielectric stresses resulting from prospective short circuit currents without damage or injury to personnel. Due to the presence of harmonic currents and to manufacturing tolerances, components (MCCB/ isolator, bus bar & power cables) shall be designed for 1.5 times nominal current.

Ventilation fan and air inlet filter unit shall be provided for the capacitor banks to facilitate better heat dissipation. The ventilation fan shall be operated by two numbers of thermostat set at 35 and 55 degree Centigrade respectively.

8.4 BUS BARS

- The bus bar section of power factor assemblies shall withstand, as a minimum, the fault current of the system at the point where it is intended to be connected. Usually, these assemblies are connected onto a section of the main installation where the fault current are quite high. Bus bars shall be tin plated copper, rectangular and rigid construction.
- The phase bus bar shall be arranged systematically and assembled using insulators.
- The bus bars shall be protected by poly carbonate shrouds from all sides. The bus bar assembly shall be fully shrouded (at least IP20) so that no live parts are accessible.
- Phase identification shall be done systematically.
- The rating of the main bus bar assembly shall be to suit the incoming switching device rating. The main bus bars of the capacitor banks are preferred and recommended to be in separate bus bar chamber, wherever applicable.

8.5 TECHNICAL REQUIREMENTS

8.5.1 CAPACITOR UNITS

Capacitor shall be suitable for operation at 415V three phases. The type of the capacitor banks shall be self-healing MPP type Heavy Duty as per IS: 13340-1993. Capacitors shall be housed in sheet steel container to ensure explosion free design. The built-in discharge resistors shall not be accessible (factory fitted) and tamper proof. The discharge resistors shall ensure reduction in capacitor voltage to less than 50 volts in 1 minute after switch off. Capacitor banks shall be suitable for overloading as 115% for over current and 110% for over voltage. The watt loss shall be less than 0.5 W/kVAr. A 3 phase pressure switch disconnecter for protection against internal faults, over pressure, etc. should be available. The pressure switch disconnecter must isolate all the three phases simultaneously in the event of fault.

8.5.2 DE-TUNING REACTORS

Capacitors with detuned filtering technique shall be employed to correct power factor while avoiding the risk of resonance condition. This shall be performed by shifting the resonance frequency to lower values where no harmonic currents are present, by introducing a filter reactor in series with the capacitors, such that the capacitor / reactor combination is inductive at the dangerous frequencies but capacitive at fundamental frequency. The circuit should be tuned such that the series resonant frequency should be below the lowest harmonic order expected to be present in the electrical network. The de-tuning reactors shall be connected in series with each capacitor stage and shall be of iron cored type. The Detuned Reactor Should be equipped with Thermal Switch inside the Winding which should cut-off the respective contactor in case of Over-temperature. The capacitors used in conjunction with reactors shall be suitably de-rated to deliver the

designed output at 415V. The reactor insulation shall be Class “F” or above. The maximum temperature of the reactor at maximum continuous RMS amperage shall be no higher than 145 °C at a 50 °C ambient. The capacitor and reactors shall be tuned for 135 Hz and 14% relative impedance (2.7 tuning order) for 3rd Harmonics present in the network. Tolerance of reactors shall not exceed +/-3% of rated value.

8.5.3 POWER FACTOR CONTROLLERS

The power factor controller shall be able to:

1. Microprocessor based and shall be able to sense the reactive current requirement of the network and shall switch ON / OFF the required stages of a capacitor bank.
2. Insensitive to wirings such as reversed CT connection, PT on a wrong phase etc.
3. Detect any stage size by automatic recognition and the switching sequences should be user defined. Detect the capacitor bank size if in case the present capacitor is replaced by a new capacitor of different rating
4. Is equipped with LCD display which shows at any time power factor, internal capacitor bank temperature and monitors the line frequency.
5. The capacitor Bank and controller shall ensure that after the loss by fault of any one stage, it shall continue to operate automatically and shall follow rotational switching.
6. Recognize the connection of CT and Voltage and be able to automatically adjust itself to the phase angle difference. Regulator shall have capability to automatically search and set the C/K setting, it shall be also possible to program the C/K setting manually.
7. Have a minimum time delay of 120 seconds for switching on a capacitor into circuit, from its last disconnection from the circuit.
8. The ingress protection of the regulator shall be minimum IP 42.
9. The regulator must be panel mounted, shall be easily programmable and shall conform to safety guidelines as per IEC 61010-1:2001
10. The regulator must be suitable for 1 A or 5 A current input and shall be sensitive to a minimum current input of 40 mA.
11. The threshold value for the operating temperature and system harmonics shall be programmable and the regulator shall be able to switch off the connected capacitor stages if the actual values exceed these thresholds.
12. Be equipped with RS 485 communication port.
13. Dual Cos Phi – The Controller should have programmable dual cos phi to differentiate the need in compensation (Cos Phi) when the operating condition changes. Like Peak Hour (2:30-3:30PM when the target PF could be increased to 0.98) or Power factor correction needs with a utility supply changes when the input power is from an in-house Generator.
14. The Power factor controller/regulator should allow the following readings.

- Automatic initialization and stage rating detection
- Any step sequence detection (User definable step sequence)
- Measurement of capacitance per stage
- No.of switching cycles per step
- Cap bank over load current ratio
- THD Voltage
- Operating time
- 4 Quadrant operation
- Active , reactive and apparent power
- Record of the Max temp internal of the capacitor bank since reset
- System Voltage (V AC)
- Frequency
- Apparent Power (kVA)
- Apparent current (A)
- Temperature (°C)
- Real time Cos phi
- kVAr value to target Cos phi

15. The controller shall initiate alarms and warnings in the following events.

- Temperature limit is exceeded
- Insufficient capacitor output
- Overload current ratio limit is exceeded
- Under voltage, Over voltage
- THDU limit is exceeded
- Low power factor/ under compensation.
- Over compensation
- Over current
- Capacitor step defective

NOTES: The automatic power factor controller shall be manufactured in full compliance with and tested to the requirements of IEC 61326-1.

8.5.4 SHORT CIRCUIT AND OVER LOAD PROTECTION

The capacitor bank shall be protected by a suitably rated MCCB at the incomer. It shall have a rotary front operating door mounted handle and should be interlocked with the door to ensure that the capacitor bank is de-energized when door is open.

The MCCB shall be a three pole and shall fully comply with the requirements of the IEC 60947-1 & 2. The MCCB shall be rated for a minimum insulation voltage of 660 V and designed for an ambient temperature of 50 degrees C. The current rating shall be at least 1.5 times the full load current of the capacitor bank and shall have a mechanical endurance of a minimum 1000 operations. Each stage of the capacitor bank shall also

have a suitably rated MCCB with an electronic over-current relay for overload protection. The electronic over-current relay shall be adjusted to trip if the RMS current of the stage exceeds the overload setting.

The combination of bus bars and stage breakers shall be designed and type tested for a short circuit withstand of 50kA for 1 sec minimum.

8.5 CONTACTORS (STAGE SWITCHING)

The contactors shall be of three pole type, specially designed for switching capacitors and shall be able to make against large transient current peaks at a high frequency of several kHz that can occur on capacitor switching. The contactors shall isolate all the three supply phases to the capacitor on switch off. The contactors shall have an electrical lifetime of 200,000 operations under capacitive switching conditions. Contactors along with damping resistors (AC6b) shall be used where there is a possibility of high inrush peak current to reduce it. The capacitor contactors shall be weld resistant up to a possible peak inrush current of $200 * I_R$.

In case capacitor banks are supplied with Harmonic Blocking Reactors, contactors for capacitor switching shall be without damping resistors (AC3), because the peak current limitation is provided by Reactor impedance.

8.6 TESTING AND INSPECTION

8.6.1. ROUTINE TESTS

All tests shall be carried out in the presence of engineer in charge, at such times as he may reasonably require.

All samples used for testing shall be to the contractor's expense and shall not affect the quantities to be supplied under this contract.

All instrument used for testing purposes, shall be calibrated by an approved authority. The cost of all tests shall be included in the contract price and shall not be quoted for separately.

a. Routine Tests on APFC Panel

All routine tests on the assembled Capacitor Bank shall be carried out in accordance with IEC 61921 and IEC 61439-1 as per the relevant clauses mentioned against each test.

Routine tests shall be carried out by the manufacturer on every Low voltage power factor correction banks before delivery.

- Inspection of the assembly including inspection of wiring and, if necessary, an electrical operation test
- Dielectric test
- Checking of protective measures and of the electrical continuity of the protective circuit
- Verification of insulation resistance

b. Routine Tests on Capacitor Units

All routine tests shall be carried out in accordance with IEC 60831 as per the relevant clauses mentioned against each test. Routine tests shall be carried out by the manufacturer on every capacitor unit before delivery.

Capacitor Banks should accompany the test reports of the Capacitor Units used issued by the manufacturer.

- Capacitance measurement and output calculation
- Measurement of the tangent of the loss angle ($\tan \delta$) of the capacitor
- Voltage test between terminals
- Voltage test between terminals and container
- Test of the internal discharge device
- Sealing test

8.6.2. TYPE TESTS

Type tests certificates and reports shall be submitted from independent certification bodies and must include the following:

a) Type Tests on Capacitor Bank

All type tests shall be carried out in accordance with the International Electro-technical Commission (IEC) Publication No. IEC 61921 and IEC 61439-1 on complete Capacitor banks equipped with detuned reactors. The following type tests shall include:

b) MCCB's, Reactors & Current Transformers

Complete type test certificates for all major components, like MCCB's, Reactors, Current Transformers, etc. shall be submitted as per the relevant IEC/BS standards along with the tender.

8.6.3. SITE TESTS

The contractor is responsible for submitting all contract works for site inspection by the Engineer, before site tests are commenced. Before commissioning, the contractor shall depute an experienced and qualified testing Engineer from the manufacturer's works to carry out the following tests on the equipment and such other tests that may be considered necessary by the Client.

The Site Acceptance Test (SAT) format for the capacitor bank shall be forwarded to the client prior to the SAT.

The contractor's test engineer shall complete all pre-commissioning tests, commission all plant and equipment supplied by him and hand over the entire contract works to the Client in good shape. All the charges connected with the pre-commissioning tests of the equipment shall be included in the tender price.

The contractor's testing engineer shall carry out all commissioning tests in co-operation with and to the satisfaction of the Client's engineer who will take part in all these tests.

The manufacturer shall provide all test equipment required for different test purposes at site. The following test / inspections at site shall be carried out:

a. Mechanical Tests

Visual inspection to verify degree of protection creepage and clearance distances. All conductors and cables are checked for proper routing and all devices for proper mounting. Check effectiveness of all mechanical devices, e.g. handles, locks, interlocks, operating devices, etc. Check panel conformity to drawing and Engineer's requirements.

- a) Checking of all mounting plates/fasteners.
- b) Checking of dimensions and components as per drawings.
- c) Electrical circuits fasteners tightness/ surface area contacts.
- d) Crimping and ferrules as per drawing.
- e) Labels / Identification/ Nameplate.
- f) All doors checking, safety and accessibility.
- g) APFC cabinet surface finish / smoothness.

b. Electrical Tests

Insulation resistance test shall be carried out at all main circuits through to final terminals. Insulation resistance shall exceed 10 mega ohms. Record all measurements.

Function test of all circuit breakers switches, contacts, etc. and every circuit to verify correct operation.

- a) Insulations resistance tests between phases and earth and between neutral and earth.
- b) Operational test on components.
- c) Switching ON / Off of capacitor bank on various KVAR requirement.
- d) Checking of Display parameters.
- e) Switching On / off logic verification.
- f) Data communication through Serial / optical port
- g) Verification of data/reports/functions in base computer software.

c. Final Inspection

Prior to energizing the capacitor bank, the following checks shall be carried out at site:

1. Operate the equipment through all design functions, including remote operation, actuation of alarm and indicating devices, mechanical and electrical tripping and closing and operation of the protective devices.
2. Insulation resistance measurements on the buses, phase to phase and phase to ground, with all breakers in the fully connected position and contacts open.
3. Control circuit insulation resistance to ground
4. Inspect all relays and protective devices, and verify settings in accordance with the manufacturer's instructions. Inspect current transformers and relays for correct polarity of connections and the installation of jumpers on unused current transformer circuits.
5. Manually close and trip each breaker checking and adjusting the main contact alignment and wiring action in accordance with the manufacturer's instructions.
6. Test protective relay operation for incomer air circuit breakers.

With the capacitor bank in operation, measurement of the power factor and system harmonics shall be carried out after commissioning of equipment.

8.7 DRAWINGS AND INFORMATION

The Manufacturer shall furnish the following drawings and documents placed inside the drawing pocket of the equipment supplied.

- Dimensioned drawing showing outline of the capacitor bank
- Single line diagram showing all the major electrical components.
- Protection and control schematics of the capacitor bank
- Details of cable terminations and fittings.
- Technical Manual giving installation, operation and maintenance instructions

8.8. WARRANTY/DISCLAIMERS

The APFC panel along with capacitor bank shall be warranted by the manufacturer to be free from defects for a period of 12 months from date of commissioning or 18 months from date of supply.

9. CABLE TRAYS

Cable trays, of sizes as per schedule of quantities and drawings shall be of perforated doubled bend channel/ladder design unless otherwise stated. Cable trays shall be fabricated from minimum 2 mm thick sheet steel and shall be complete with tees, elbows, risers, and all necessary hardware. Cable trays shall comply with the following:

- 9.1 Trays shall have suitable strength and rigidity to provide proper support for all contained cables. Trays shall not have sharp edges, burrs or projections injurious to cable insulation. Trays shall include fittings for changes in direction and elevation. Cable trays and accessories shall be painted with one shop coat of red oxide zinc chromate primer and two side coats of aluminium alkyd paint or approved equivalent. Cable trays shall have side rails or equivalent structural members.
- 9.2 Unless otherwise specifically noted on the relevant layout drawing, all cable tray mounting works to be carried out ensuring the following:
- 9.2 Cable tray mounting arrangement type to be as marked on layout drawing.
- 9.3 Assembly of tray mounting structure shall be supplied fabricated, erected & painted by the electrical contractor. Tray mounting structures shall be welded to plate inserts or to structural beams as approved by the Clients. Wherever embedded plates & structural beams are not available for welding the tray mounting structure electrical contractor to supply the MS plates & fix them to floor slab by four anchor fasteners of minimum 16 mm dia having minimum holding power of 5000 Kg at no extra cost. Maximum loading on a horizontal support arm to be 120 Kg. metre of cable run. Width of the horizontal arms of the tray supporting structures to be same as the tray widths specified in tray layout drawings, plus length required, for welding to the vertical supports. The length of vertical supporting members for horizontal tray runs shall be to suit the number of tray tiers shown in tray layout drawings. Spacing between horizontal supports arms of vertical tray runs to be 300 mm. Cable trays will be welded to their mounting supports. Minimum clearance between the top most tray tier and structural member to be 300 mm.
- 9.3.14 Cables in vertical race ways to be clamped by saddle type clamps to the horizontal slotted angels. Clamps to be fabricated from 3 mm thick aluminium strip at site by the electrical contractor to suit cable groups
- 9.3.15 The structural steel (standard quality) shall be according to latest revision of IS : 226 & 808.
- 9.3.16 Welding shall be as per latest revisions of IS : 816.
- 9.3.17 All structural steel to be painted with one shop coat of red oxide and oil primer followed by a finishing coat of aluminium alkyd paint where any cuts or holes are made on finished steel work these shall be sealed against oxidation by red oxide followed by the same finishing paint. Steel sheet covers wherever indicated to be similarly painted.
- 9.3.18 Trays shall be erected properly to present a neat and clean appearance. Trays shall be installed as a complete system. Trays shall be supported adequately by means of painted MS structural members secured to the structure by dash fasteners or by grouting. The entire cable tray system shall be rigid. Each run of cable tray shall be completed before laying of cables. Cable trays shall be erected so as to be exposed and accessible

10 EARTHING

10.1 GENERAL

All the non-current carrying metal parts of electrical installation shall be earthed properly. All metal conduits, trunking, cable sheaths, switchgear, distribution fuse boards, light fittings and all other parts made of metal shall be bonded together and connected by means of specified earthing conductors to an efficient earthing system. All earthing shall be in conformity with Indian Electricity Rules.

The Earthing System shall in totally comprise the following:-

- a) Earth Electrodes
- b) Earthing Leads
- c) Earth Conductors

All three phase equipment shall have two separate and distinct body and single phase equipment shall have a single body earth.

10.2 STANDARDS

All equipments, components, materials and entire work shall be carried out in conformity with applicable and relevant Bureau of Indian Standards and Codes of Practice, as amended upto date and as below. In addition, relevant clauses of the Indian Electricity Act 1910 and Indian Electricity Rules 2003 as amended upto date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and /or IEC Standards shall be applicable.

Equipments certified by Bureau of Indian Standards shall be used in this contract in line with government regulations. Test certificates in support of this certification shall be submitted, as required.

It is to be noted that updated and current standards shall be applicable irrespective of dates mentioned along with IS's in the tender documents.

10.3 EARTHING MATERIAL

Materials of which the protective system is composed shall be resistant to corrosion or be adequately protected against corrosion. The material shall be as specified in the schedule of quantities and shall comply with the following requirements:

- Copper - When solid or stranded copper wire is used, it shall be of the grade ordinarily required for commercial electrical work generally designated as being of 98% conductivity when annealed, conforming to Indian standard specifications.

- Galvanised Steel - Galvanised steel used shall be thoroughly protected against corrosion by hot dipping Zinc coating. The material coating shall withstand the test specified in IS 2309:1969.
- The strips to be used shall be in maximum lengths available as manufactured normally avoiding unnecessary joints.

10.4 EARTH ELECTRODES

10.4.1 Plate Earth Electrode

The plate electrodes shall be of copper/ GI as called for in the schedule of quantities. The minimum dimensions of the electrodes shall be 600 mm x 600 mm. Thickness of copper electrodes shall not be less than 3 mm and of GI electrodes not less than 6 mm.

The electrode shall be buried in ground with its face vertical and top not less than 4 meters below ground level.

10.5 EARTHING LEADS

The strip earthing leads shall be connected to the Earth Electrode at one end and to the metallic body of the main equipment at the other end. The earthing lead shall connect to the earthing network in the installation.

10.5.1 Earthing Lead Sizes

Strip earthing leads shall be of copper/GI and as per specifications.

10.5.2 Earthing Lead Installation

The length of buried strip earthing lead shall be not less than 15 metres and shall be buried in trench not less than 0.5 m deep.

If conditions necessitates use of more than one earthing lead they shall be laid as widely distributed as possible preferably in a single straight trench or in a number of trenches radiating from one point.

10.6 Method of Connecting Earthing Lead To Earth Electrode

In the case of plate earth electrode, the earthing lead shall be securely bolted to the plate with two bolts, nuts, checknuts and washers as required by IS 3043 : 1987.

All materials used for connecting the earth lead with electrode shall be GI in case of GI Pipe and GI plate earth electrodes or tinned brass in case of Copper plate electrode.

10.7 Protection of Earthing Lead

The earthing lead from electrode onwards shall be suitably protected from mechanical injury and corrosion by a 15 mm dia GI pipe in case of wire and 100/40 mm dia medium class GI Pipe

The portion of the G.I. pipe within ground shall be buried at least 30 cm deep (to be increased to 60 cm in case of road crossing or pavements). The portion within the building shall be recessed in walls and floors to adequate depth.

10.8 EARTHING CONDUCTORS

Earthing conductors shall form the earthing network throughout the installation for earthing of all non- carrying metal parts.

10.9 Connection Of Earthing Conductors

- Main earthing conductors shall be taken from the earth connections at the main switch boards to all other switchboards in the network.
- Sub-mains earthing conductors shall run from the main switch board to the sub distribution boards and to the final distribution boards.
- Loop earthing conductors shall run from the distribution boards and shall be connected to any point on the main/sub-main earthing conductor, or its distribution board or to an earth leakage circuit breaker.
- Metal conduits, cable sheathing and armouring shall be earthed at the ends adjacent to switch boards at which they originate, or otherwise at the commencement of the run by an earthing conductor in effective electrical contact with cable sheathing, Switches, accessories, lighting fitting etc shall be effectively connected to the Loop Earthing Conductors. These though rigidly secured in effective electrical contact with a run of metallic conduit shall not be considered earthed, even though the run of metallic conduit is earthed.

10.10 Earthing Conductor Installation

The earthing conductors inside the building wherever exposed shall be properly protected from mechanical injury by running the same in GI pipe of adequate size.

Joints shall be revetted and brazed in approved manner.

Sweated lugs of adequate capacity and size shall be used for termination. Lugs shall be bolted to the equipment body to be earthed after the metal body is cleaned of paint and other oily substances and properly tinned.

10.11 Sizing Of Earthing Conductors

All fixtures, outlet boxes and junction boxes shall be earthed with bare copper wires as specified.

All 3 phase switches and distribution boards upto 60 amps rating shall be earthed with 2 Nos. distinct and independent 4 mm dia copper/6 mm dia GI wires. All 3 phase switches and distribution boards upto 100 amps rating shall be earthed with 2 Nos. distinct and independent 6 mm dia copper/8 mm dia GI wires. All switches, bus bar, ducts and distribution boards of rating 200 amps and above shall be earthed with a minimum of 2 Nos. separate and independent 25 mm x 3 mm copper/25mm x 6 mm GI tape.

10.12 PROHIBITED CONNECTIONS

Neutral conductor, sprinkler pipes, or pipes conveying gas, water, or inflammable liquid, structural steel work, metallic enclosures, metallic conduits and lighting protection system conductors shall not be used as a means of earthing an installation or even as a link in an earthing system.

10.13 RESISTANCE TO EARTH

No earth electrode shall have a greater ohmic resistance than **5 ohms** as measured by an approved earth testing apparatus. In rocky soil the resistance may be upto 1 ohms. The electrical resistance measured between earth connection at the main switchboard and any other point on the completed installation shall be low enough to permit the passage of current necessary to operate fuses or circuit breakers, and shall not exceed 1 ohm.

10.14 Earth Enhancement Compound

- Earth enhancement material is a superior conductive material that improves earthing effectiveness, especially in areas of poor conductivity (rocky ground, areas of moisture variation, sandy soils etc.). It improves conductivity of the earth electrode and the ground contact area. It shall be tested and conform to the requirements of IEC 62561-7 having the following characteristics:-
- Shall be carbon based with min 95% of fixed carbon content premixed with corrosion resistant cement to have set properties. Cement shall not mix separately & shall not have Bentonite.
- Shall have high conductivity, improves earth's absorbing power and humidity retention capability.
- Shall be non-corrosive in nature having low water solubility but highly hygroscopic.
- Shall have resistivity of less than 0.12 ohms -meter.
- Shall be suitable for installation in dry form or in a slurry form.
- Shall not depend on the continuous presence of water to maintain its conductivity.
- Shall be permanent & maintenance free and in its "set form", maintains constant earth resistance with time.
- Shall be thermally stable between -10 °C to +60 °C ambient temperatures.
- Shall not dissolve, decompose or leach out with time.
- Shall not require periodic charging treatment nor replacement and maintenance.
- Shall be suitable for soils of different resistivity.

- Shall not pollute the soil or local water table and meets environmental friendly requirements for landfill, shall not be explosive & shall not cause burns, irritation to eye, skin etc. In this regard “Safety Data Sheets” shall be submitted by the manufacturers.

10.15 Earth Pit Cover

An Earth Inspection pit cover is an inspection chamber used to give safety to an earthing arrangement and also provide an easy access to earth resistance testing. Earth Pit cover shall be made of Poly Plastic material. Earth pit cover shall be tested at 5 ton load.

11.0 ROUTINE AND COMPLETION TESTS

11.1 INSTALLATION COMPLETION TESTS

At the completion of the work, the entire installation shall be subject to the following tests:

- (a) Wiring continuity test
- (b) Insulation resistance test
- (c) Earth continuity test
- (d) Polarity of single pole switch
- (e) Earth resistivity test

Besides the above, any other test specified by the local authority shall also be carried out. All tested and calibrated instruments for testing, labour, materials and incidentals necessary to conduct the above tests shall be provided by the contractor at his own cost.

11.2 WIRING CONTINUITY TEST

All wiring systems shall be tested for continuity of circuits, short circuits, and earthing after wiring is completed and before installation is energised.

11.2.1 INSULATION RESISTANCE TEST

The insulation resistance shall be measured between earth and the whole system conductors, or any section thereof with all fuses in place and all switches closed and except in concentric wiring all lamps in position of both poles of the installation otherwise electrically connected together, a direct current pressure of not less than twice the working pressure provided that it does not exceed 1100 volts for medium voltage circuits. Where the supply is derived from AC three phase system, the neutral pole of which is connected to earth, either direct or through added resistance, pressure shall be deemed to be that which is maintained between the phase conductor and the neutral. The insulation resistance measured as above shall not be less than 50 megohms divided by the number of points provided on the circuit the whole installation shall not have an insulation resistance lower than one megohm.

The insulation resistance shall also be measured between all conductors connected to one phase conductor of the supply and shall be carried out after removing all metallic connections between the two poles of the installation and in those circumstances the insulation shall not be less than that specified above.

The insulation resistance between the frame work of housing of power appliances and all live parts of each appliance shall not be less than that specified in the relevant Standard specification or where there is no such specification, shall not be less than half a megohm or when PVC insulated cables are used for wiring 11.5 megohms divided by the number of outlets. Where a whole installation is being tested a lower value than that given by the above formula subject to a minimum of 1 Megohms is acceptable.

11.2.2 TESTING OF EARTH CONTINUITY PATH

The earth continuity conductor including metal conduits and metallic envelopes of cable in all cases shall be tested for electric continuity and the electrical resistance of the same along with the earthing lead but excluding any added resistance of earth leakage circuit breaker measured from the connection with the earth electrode to any point in the earth continuity conductor in the completed installation shall not exceed one ohm.

11.2.3 TESTING OF POLARITY OF NON-LINKED SINGLE POLE SWITCHES

In a two wire installation a test shall be made to verify that all non-linked single pole switches have been connected to the same conductor throughout, and such conductor shall be labeled or marked for connection to an outer or phase conductor or to the non-earthed conductor of the supply. In the three or four wire installation, a test shall be made to verify that every non-linked single pole switch is fitted to one of the outer or phase conductor of the supply. The entire electrical installation shall be subject to the final acceptance of the Client as well as the local authorities.

11.2.4 EARTH RESISTIVITY TEST

Earth resistivity test shall be carried out in accordance with IS Code of Practice for earthing IS 3043.

11.3 PERFORMANCE

Should the above tests not comply with the limits and requirements as above the contractor shall rectify the faults until the required results are obtained. The contractor shall be responsible for providing the necessary instruments and subsidiary earths for carrying out the tests. The above tests are to be carried out by the contractor without any extra charge.

11.4 TESTS AND TEST REPORTS

The Contractor shall furnish test reports and preliminary drawings for the equipment to the Client/owners for approval before commencing supply of the equipment. The Contractor should intimate with the tender the equipment intended to be supplied with

its technical particulars. Any test certificates etc., required by the local Inspectors or any other Authorities would be supplied by the Contractor without any extra charge.

PART-II
CHAPTER-II
TECHNICAL SPECIFICATION OF EXTERNAL LIGHTING

1.0 STREET LIGHTING

1.1 SCOPE

- The Contractor shall design, supply, install, test and commission a high efficiency outdoor (street) lighting system for the area. Light fittings shall be complete with lamps, supports, lighting poles with distribution boxes, arms and accessories. The light fittings and all associated accessories shall be subject to the acceptance of the Engineer.
- Lighting levels shall be uniformly distributed throughout the area, and shall be designed such that glare, dark recesses and areas of poor lighting levels are avoided.
- All Outdoor fittings shall be IP66 compliant seal safe or equivalent.

1.2 CODES & STANDARDS

The luminaries and associated equipment shall comply with the following codes & standards:

IS: 1913	General Safety Requirements for Luminaires
IS: 3553	Specification for Watertight Electric Lighting Fitting
IS: 3528-1966	Water Proof Electric Light Fitting
IEC 62031	LED modules for general lighting-Safety requirements
IEC 60598-1	Luminaires- General requirement and tests
IEC 61000-3-2	Electro Magnetic compatibility (EMC) -Limits for Harmonic current emission
IEC 61347-2-13	Lamp control gear : particular requirements for DC or AC supplied electronic control gear for LED modules
IS 10322	Specification for the luminaries
IEC 62384	DC or AC supplied electronic control gear for LED modules performance requirements
EN 13032-1	Measurement and presentation of photometric data of lamps and luminaires: Measurement and file format
EN 13032-2	Measurement and presentation of photometric data of lamps and luminaires: Presentation of data for indoor and outdoor work places
LM 79	Internationally recognized method for the electrical

	and photometric measurement of solid state lighting products
LM 80	Internationally recognized method for measuring lumen maintenance of LED light sources
IEC 60529	Classification of degree of protections provided by enclosures

1.3 SYSTEM DESCRIPTION

The street lighting shall comprise of the following:

1.3.1 Single Arm Poles

The ornamental decorative single arm poles with 7000 mm height shall be provided with LED luminaires with lumen output of 11000 lumens or higher. These poles shall be provided on branch roads as per requirements. The spacing between two adjacent poles shall be selected such that no dark spots are seen on the roads.

1.3.2 Double Arm Poles

The ornamental decorative double arm poles with 9000 mm height shall be provided with LED luminaires with lumen output of 13000 lumens or higher. These poles shall be provided on main road from entrance gate to HHRI building. The spacing between two adjacent poles shall be selected such that no dark spots are seen on the roads.

1.4 INTERNAL WIRING

- a. IS: 732-1989 Code of practice for electrical wiring installations shall followed.
- b. Type of wiring conductor Multistranded copper conductor 1100V grade FRLS only.
- c. Not more than 800w connected load or more than 10 points on any single circuit shall be provided.
- d. Load balancing in the circuits.
- e. Test for earth continuity; load balancing, insulation resistance & polarity test.
- f. Only looping system of wiring shall be followed.
- g. Joints in the wiring shall not be permitted.
- h. Single pole MCBs shall be provided on each pole to control individual luminaire.

1.5 LIGHTING LUMINARIES

1.5.1 Lighting Features

Following features are required in the lighting fixtures:

- a. Energy efficient
- b. Long Life
- c. Rugged and durable
- d. Smaller lighting fixture
- e. Environmental friendly – no Mercury
- f. Better heat management
- g. Use of good quality lens

1.5.2 Design Parameters

Following parameters shall be met in the Luminaire:

- CRI of the source, must be >70
- Usable lumen per watt of fitting, must be >125 lm/W
- Life of lamp, must be 50k+
- THD<10%,
- PF >0.95,
- IP-66,
- IK>=08,
- CCT of 5700/6500K
- Operating working temp range - $0^{\circ}\text{C} < T_a < 50^{\circ}\text{C}$
- Operating Voltage Range of 140 - 270V.
- Internal Surge Protection 4KV
- The internal wiring to be done with FRLS wires.
- The fixture should comply with the parameters as per IS10322.
- The LED driver should comply to IEC61000-3-2 ed.3.2, 2009 for Harmonics, IEC61347 -2 -13, 2006 in Conjunction with IEC61347-1 ed.2.0, 2007 for Electrical Safety, IEC62384 ed.1.1, 2011 for performance and IEC61547 ed.2.0, 2009, CISPR-15 for EMI.
- Manufacturer shall have inhouse lab approved by NABL or Ministry of Science, Govt of India or reports to be verified at NABL approved labs for parameters by firm.
- LM79 and LM80 reports need to be submitted from a NABL/UL accredited lab to verify above parameters.
- Both the fixture and Driver should have BIS approval.

1.5.3 Construction

The luminaire shall be made of pressure die cast aluminium, otherwise as specified in the BOQ.

1.5.4 LED Chip

Suitable number of LED lamps shall be used in the luminaires. LED lamps of NICHIA/CREE/OSRAM/ SEOUL/BRIDGELUX/ make shall be used for the purpose.

The working life of the lamp at junction temperature of 85 Deg C at rated current shall be more than 50,000 working hours @ L70 of accumulative operation.

These features shall be supported with data-sheet. The output of LED shall be more than 125 lumen per watt at minimal operating current and shall ensure guaranteed Lumen maintenance report as per guidelines shall be produced for the power LEDs used. Power factor of complete fitting shall be more than 0.95 at full load

1.5.5 Secondary Optic:

Suitable lenses shall be provided to increase the illumination uniformity and distribution.

1.6 LIGHTING POLE

1.6.1 Construction

Decorative Ornamental pole with Single/Double arm bracket shall be made out of ribbed mild steel tube and cast iron in two steps as per attached drawing. Total height of the pole with Single arm Bracket shall be 7000/9000 mm nominal above the ground. Cast Iron embellishments are fitted with the help of grub screws. A built in service window is provided to accommodate a 6 A, SP, MCB and 32 A heavy duty connector for mains connections in the bottom part of the pole as shown in attached drawing. The different sections of the pole are joined together by means of Welded joints. The decorative bracket is made out of mild steel and cast-iron. The mild steel and cast-iron parts are joined together & are fabricated to get the desired design as per attached drawing. The decorative bracket should have the arrangement to fix the required luminaire. The bracket should have the arrangement suitable to be fitted on the required pole. The dimensions of the pole and bracket should be as per attached drawing. The Decorative Pole and Single arm bracket Shall be machined and Polished properly to give it a smooth Surface. The Decorative pole with Single arm bracket is duly pretreated and painted in U.V. ray resistant P.U. coating in approved color shade.

1.6.2 Foundation

Decorative pole shall be installed at desired location including foundation of the pole by making cement concrete foundation of 1:1.5:3 (1 cement: 1.5 course sand : 3 graded stone aggregate 40mm nominal size) with the help of anchor bolts and 38 mm G.I sleeve as required.

1.7 TESTS OF LUMINAIRE

The electronics covered for this equipment shall pass all the tests called for in the specification. The tenderer shall indicate the deviation or compliance otherwise the offer may be rejected.

Tests are classified as:

- Type test,
- Routine and

Type Test:

Type tests shall be carried out to prove confirmation with the requirement of specification and general quality/design features of the unit. In case of any change in design of unit, complete type test shall be repeated.

Routine Tests:

These tests shall be performed by the manufacturer on sample(s) taken from a lot as per sampling plan specified by BIS at NABL accredited labs in the presence of Client Representative. The charges for the above tests to be borne by the manufacturer/supplier. The test results shall be submitted to the Engineer. The firm shall maintain the records with traceability.

1.7.1 Test Scheme:

Routine Test

1. Visual and Dimensional check
2. Checking of documents of purchase of LED
3. Resistance to humidity
4. Insulation resistance test
5. HV test
6. Over voltage protection
7. Surge protection
8. Reverse polarities
9. Temperature rise Test
10. Ra % (Color Rendering Index) as per BOQ specifications
11. Lux measurements
12. Tests for IP as per BOQ specifications

1.8 TESTS OF LIGHTING POLE

Decorative ornamental poles shall be subjected to tests at manufacturer's site as per applicable IS or relevant standards before despatch of the material. These poles may also be tested during manufacturing process, if desired by Engineer in Charge.

1.9 WARRANTY

All Luminaires and its gears shall carry replacement warranty from OEM for a period of 05 (Five) years from the date of commissioning.

2.0 SCOPE OF WORK & TECHNICAL SPECIFICATIONS FOR 30 M HIGH MAST

2.1 SCOPE:

The scope of this specification covers the design, manufacture, supply, transport, installation, testing and commissioning of the complete lighting system, using Raising and Lowering type of High Mast Towers, including the Civil Foundation Works on turnkey basis. All mechanical/ electrical/ hydraulic accessories, providing all material, equipment, plant & machinery, labour, transport, tools and tackles, required services etc. for the work, as described in conditions of contract, technical specifications, Price schedule and elsewhere in this tender shall be provided by the vendor. The owner will only provide the supply point for the feeder cable of the required size, inside the Terminal.

The scope also covers illumination design using LED flood lights on High Mast Light Tower, as mentioned in Price schedule. The illumination design should ensure minimum lumen illumination of 20 Lux just beneath the High Mast Towers on the ground and upto a distance of 80 Mtrs from centre of High Mast Tower. Beam angle of Luminaries positioning must be suitable to cover minimum illumination (20 Lux) on ground as well as other existing structures.

However, all items required for the safe and efficient operation and maintenance of the lighting system, including the high mast, whether explicitly stated in the following pages or not, shall be included in the scope of the contractor.

2.2 APPLICABLE STANDARDS:

The overall design and installation shall conform to latest editions of the following reference standards/ stipulations in addition to specifically mentioned reference standards against any particular item :

- Indian Electricity Rules & Act
- Regulations laid down by the Chief Electrical Inspector of State Govt.
- Any other regulations laid down by Central/State local authorities.
- IS: 875 (Part III) 1987 : Code and practice for design loads for Structures.
- BSEN 10025 : Grades of MS. Plates.
- BS.ISO 1461: Galvanizing
- IS: 2629 Hot dip galvanization

- TR. No.7 2000 of ILE, UK : Specification for Mast and foundation
- AISI 316 for Steel wire rope

2.3 DESIGN CRITERIA

- 2.3.1** The lighting mast shall be of continuously tapered polygonal cross section hot dip galvanized fabricated from special steel conforming to IS. The mast shall be of height 30 meter (minimum) with lantern carriage to enable raising and lowering for ease of maintenance, including the dead frame, double drum winch, continuous stainless steel wire rope, In built power supply tool, luminaries, suitable aviation warning light, lightning protection electrode, Necessary cables and wiring accessories etc.as required to complete the work in totality.
- 2.3.2** The mast shall be delivered only in three sections and shall be joined together by slip stress fit method at site. No site welding or bolting joints shall be done on the mast. The minimum over lap distance shall be as described in the technical specification
- 2.3.3** Lantern carriage shall be fabricated suitably and hot dip galvanized for fixing and holding flood light fixtures and their control gear boxes, Lantern carriage shall be provided with Luminaries as described in the technical specification.
- 2.3.4** Feeder Panel & Junction box shall be Flame proof conforming to Class IIA/IIB Gas Group protection class or higher made up of cast aluminum and mounted on the carriage to facilitate interconnection of light luminaries
- a. Regional Basic Wind speed : 50 m/sec (180 km/hr)
 - b. Gust Factor : 1.15 (as specified in IS 875 (Part 3)
 - c. Topography configuration : for Plain Area as per in IS 875 (Part 3)
 - d. Mean probable design life : 25 years
 - e. Terrain Category : Category 1 Class A, IS 875 (Part 3)
 - f. Height Variation factor : The values for different heights viz 10m, 15m and 30m depending upon the height of the mast from ground level to be taken from IS 875 (Part 3) for the category and class specified.
 - g. Wind Frontage Area : To be calculated by the manufacturer based on the size of their luminaire. To design with minimum one third of the lights facing one direction.

2.4 SPECIFIC REQUIREMENTS – SUPPLY

2.5 HIGH MAST SYSTEM:

2.5.1 Structure

The Highmast shall be of continuously tapered, polygonal cross section, at least 20 sided, presenting a good and pleasing appearance and shall be based on proven In-Tension design conforming to the standards referred to above, to give an assured

performance, and reliable service. The structure shall be suitable for wind loadings as per IS 875 part3 1987.

2.5.2 Construction

The mast shall be manufactured using special steel plates, conforming to material as described in technical specification and shall be delivered in multiple sections of effective length 10 metres. Thus a 30M mast shall be delivered in three sections respectively to site. Each section shall be fabricated out of single plate duly folded and welded. There shall be only one longitudinal seam weld per section. Sections with more than one weld, circumferential or longitudinal, shall not be accepted. At site the sections shall be joined together by slip-stressed-fit method. No site welding or bolted joint shall be done on the mast. The minimum over lap distance shall be as described in technical specification. The minimum top diameter shall be 208 mm. Bottom diameter and plate thickness shall be as per the structural requirements. Detailed design calculation of the mast shall be submitted for verification. Manufacturer of the mast must have conducted Wind Tunnel testing on their mast sample. Parameters considered for design shall be taken from the Wind Tunnel testing. Wind Tunnel test report to be submitted for IOC's approval.

The mast shall be provided with fully penetrated flange, which shall be free from any lamination or incursion. The welded connection of the base flange shall be fully developed to the strength of the entire section. The base flange shall be provided with supplementary gussets between the bolt-holes to ensure elimination of helical stress concentration. For the environmental protection of the mast, the entire fabricated mast shall be hot dip galvanized, internally and externally, having a uniform average thickness of 86 microns for plates with 5 mm thickness or more and 65 microns for less than 5 mm thickness. Galvanizing shall be done in single dipping method for better adhesion and life.

2.5.3 Door Opening:

An adequate door opening shall be provided at the base of the mast and the opening shall be such that it permits clear access to equipment like winches, cables, plug and socket, etc. and also facilitate easy removal of the winch. The door opening shall be complete with a close fitting, vandal resistant, weatherproof door, provided with a heavy-duty double internal lock with special paddle key. The door opening shall be carefully designed and reinforced with welded steel section, so that the mast section at the base shall be unaffected and undue buckling of the cut portion is prevented. Size of door opening shall not be more than 1200 x 300 mm to avoid buckling of the mast section under heavy wind conditions.

2.5.4 Head Frame:

The driving head shall be made of hot dip galvanised steel and shall be fixed to the top of the plate by a flange secured to the mast top by at least 6 bolts. The driving head shall be pre-assembled and tested in the factory prior to shipment and supplied complete with 3 stainless steel ropes (Grade AISI 316) and associated pulley assemblies and electrical power cable. Each steel rope and power cable shall have their own separate arm, housing the pulleys made of Cast Aluminium.

Three latching sleeves assuming correct positioning, entering and locking of the mobile part of the crown when raised and locked in final position shall be provided. The locking system shall take up vibration free all horizontal and vertical loads of the mobile part of the crown even when exposed under the most severe climatic conditions. Arrangements shall be provided to ensure that the power cables and stainless steel wire ropes are separated before passing over their respective pulleys, and close-fitting guides shall protect the pulleys to prevent ropes and cables leaving the pulley grooves.

- | | |
|---|---|
| 1. Height of MAST | 30 Metre. |
| 2. No. of sections | Three sections |
| 3. Make of the mast | Bajaj / Philips/ Wipro/
Valmont/Transrail |
| 4. Material construction (any of the following) | <ul style="list-style-type: none">• BS-EN10025, S-355• Grade Fe410WA as per IS 2062• AASTM A 572 GR 50 (S-12) |
| 5. Minimum Thickness of sections | <ul style="list-style-type: none">• Top : 4mm ,• Middle: 5 mm ,• Bottom :6 mm |
| 6. No. of longitudinal welds/section | One |
| 7. No. of circumferential welds/section: | None |
| 8. Cross section of Mast : | 20 sided polygon |
| 9. Length of Individual sections: | <ul style="list-style-type: none">• Top : 9440 mm• Middle :10980 mm• Bottom : 10980 mm |
| 10. Base dia. and top diameter | <ul style="list-style-type: none">• Top diameter :208 mm• Bottom diameter : 666 mm |
| 11. Type of joints: | Stress fit at site |
| 12. Length of overlap: | |

- Top : 600 mm
 - Bottom : 800 mm
- i. Metal protection :
- Hot dipped galvanized(inside & outside as per BSEN ISO 1461/ASTM A123
 - Method of hot dipping : Single dipping
 - Average thickness of galvanization :
 - 86 micron(Middle & Bottom)
 - 65 micron(Top)
- ii. Details of slack board inside the base compartment: PVC board .
- iii. Provision for cable termination : MCB isolator
- iv. Weight : 1500 kgs. (approx)
- v. Base plate thickness : 32 mm (minimum)
- vi. PCD of Foundation Bolts : 790 mm
- vii. Type/Diameter/length of Foundation bolts :TS600/ 30mm Dia. /1200mm long(min.)
- viii. Lightning protection : G I single spike of length 1200mm
- ix. Mast structures are continuously tapered of polygonal cross section presenting Good visual appearances.

2.6 Dynamic Loading as prevailing at Site

The mast structure shall be suitable to sustain an assumed maximum reaction arising from a wind speed as per IS:875 (three second gust), and shall be measured at a height of 10 metres above ground level. The design life of the mast shall be 25 years. Safety factors shall be as defined in technical specification.

- i. Max.wind speed: As per IS 875 part 3 that is 50 meter /Second
- ii. Max.gust speed time : 3 seconds
- iii. Height above ground level these two factors are measured : 10 meters.
- iv. Factor of safety for wind load : 1.25
- v. Factor of safety for other load : 1.15

2.7 Foundation Details:

- i. Type of foundation : Suitable type of foundation based on soil investigation report
- ii. Design safety factor : As per IS -456
- iii. Considered wind pressure (kg/mt²): As per IS -875-1987

- iv. Depth of foundation : Minimum 2 metre below FGL
- v. Number of foundation bolts : 20 nos.
- vi. PCD of foundation bolts: 790 mm
- vii. Type of Foundation bolts : TS600
- viii. Length of Foundation Bolt : 1200mm Long (min)
- ix. Bolt diameter : 30 mm

2.8 Lantern Carriage: 4.4.1.Fabrication:

A fabricated Lantern Carriage shall be provided for fixing and holding the flood light fittings and control gearboxes. The Lantern Carriage shall be of special design and shall be of steel tube construction, the tubes acting as conduits for wires, with holes shall be fully protected by grommets. The Lantern Carriage shall be so designed and fabricated to hold the required number of flood light fittings and the control gearboxes, and also have a perfect self-balance. The Lantern Carriage shall be fabricated in two halves and joined by bolted flanges with stainless steel bolts and nyloc type stainless steel nuts to enable easy installation or removal from the erected mast. The inner lining of the carriage shall be provided with protective PVC arrangement, so that no damage is caused to the surface of the mast during the raising and lowering operation of the carriage. The entire Lantern Carriage shall be hot dip galvanised after fabrication.

2.9 Junction Box.

Weather proof junction box (IP-66) CE ROHS compliant, made of Cast Aluminum/ Plyamide shall be provided on the Carriage Assembly as required, from which the inter-connections to the designed number of the flood light luminaries and associated control gears fixed on the carriage, shall be made.

2.10 Raising and Lowering mechanism:

For the installation and maintenance of the luminaries and lamps, it will be necessary to lower and raise the Lantern Carriage Assembly. To enable this, a suitable Winch Arrangement shall be provided, with the winch fixed at the base of the mast and the specially designed head frame assembly at the top.

- i. Material construction : 50 NB ERW Class C- M S pipe
- ii. Diameter of carriage ring (mm) : 710 mm (ID)/1200-2200mm (OD) (Approx)
- iii. Construction : 12/24 arm / To suit Lighting design
- iv. Number of joints : 2

- v. Buffer between carriage & masts : PVC/ PTFE sleeve on carriage.
- vi. Load carrying capacity: 750 kgs. (including carriage)
- vii. Number of fittings: Maximum 24 nos. Symmetrically/ 24 nos. Asymmetrically.

2.11 Cable:

A suitable terminal box shall be provided as part of the contract at the base compartment of the high mast for terminating the incoming cable. The electrical connections from the bottom to the top shall be made by special trailing cable. The cable shall be EPR insulated and PCP sheathed to get flexibility and endurance. Size of the cable shall be minimum 5 core 4 sq mm copper. The cable shall be of reputed make. At the top there shall be weatherproof junction box to terminate the trailing cable. Connections from the top junction box to the individual luminaries shall be made by using 3 core 1.5 sq. mm flexible PVC cables of reputed make through IP-66 CE & RoHS compliant connectors.

Also, suitable provision shall be made at the base compartment of the mast to facilitate the operation of internally mounted, electrically operated power tool for raising and lowering of the lantern carriage assembly. The trailing cables of the lantern carriage rings shall be terminated by means of specially designed, metal clad, multipin plug and socket provided in the base compartment to enable easy disconnection when required.

- i. Type : Trailing cable
- ii. Material : Copper conductor , EPR insulated and PCP sheathed.
- iii. Current carrying capacity : As per requirement of fixtures
- iv. Conductor size : 4 sq.mm
- v. No. of cores : 5
- vi. No. of circuits : One.
- vii. Plug & Socket: Flameproof
- viii. Junction Box : Flameproof IIA/IIB Gas Group

2.12 Winch:

The winch shall be of completely self sustaining type, without the need for brake shoe, springs or clutches. Each driving spindle of the winch shall be positively locked when not in use, gravity activated pawl. The capacity, operating speed, safe working load, recommended lubrication and serial number of the winch shall be clearly marked on each winch.

The gear ratio of the winch shall be 53 : 1(or as per OEM). However, the minimum-working load shall be not less than 750 kg. The winch shall be self-lubricating type by means of an oil bath and the oil shall be readily available grades of reputed producers.

The winch drums shall be grooved to ensure perfect seat for stable and tidy rope lay, with no chances of rope slippage. The rope termination in the winch shall be such that distortion or twisting is eliminated and at least 5 to 6 turns of rope remains on the drum even when the lantern carriage is fully lowered and rested on the rest pads. It should be possible to operate the winch manually by a suitable handle or by an integral power tool. It shall be possible to remove the double drum after dismantling, through the door opening provided at the base of the mast. A test certificate shall be furnished by the Contractor from the original equipment manufacturer, for each winch in support of the maximum load operated by the winch.

The winch shall be type tested and the type test report to be submitted.

- i. Make of winch : as per PL-9 07/ TR no. 7/ BIS approved make
- ii. Number of drums : Double drum type
- iii. Gear ratio : 53:1
- iv. No of Speeds: Single Speed, 6 Pole
- v. SW Capacity /Lifting capacity: 750 kgs.
- vi. Method of Operation : Manual /Electrical (Motorized)
- vii. Lubrication arrangement : Permanent oil bath
- viii. Motor Capacity : 2.2 kW (Flameproof)

2.13 Stainless Steel Wire Rope:

The suspension system shall essentially be without any intermediate joint and shall consist of only non-corrodible stainless steel of AISI 316 grade.

The stainless steel wire ropes shall be of 7/19 construction, the central core being of the same material. The overall diameter of the rope shall not be less than 8 mm. The breaking load of each rope shall not be less than 2350 kg. giving a factor of safety of over 5 for the system at full load as per the TR-7 referred to in the beginning of this specification . The end constructions of ropes to the winch drum shall be fitted with talurit. The thimbles shall be secured on ropes by compression splices. Two continuous lengths of stainless steel wire ropes shall be used in the system and no intermediate joints are acceptable in view of the required safety. No intermediate joints/terminations, either bolted or else, shall be provided on the wire ropes between winch and lantern carriage.

- i. GRADE : AISI 316(non-corrosive marine type)
- ii. Number of ropes : 2 continuous ropes
- iii. Construction : 7/19
- iv. Suspension System : 3 point tension suspension
- v. Centre core material : stainless steel core
- vi. Diameter : 8 mm (min)
- vii. Braking load capacity : minimum 2350 kgs x 2
- viii. Factor of safety : > 5 for system at full load.

2.14 Winch Driving Power Tool:

A suitable, flame proof, high-powered, electrically driven, internally mounted power tool, with manual over ride shall be supplied for the raising and lowering of the lantern carriage for maintenance purposes. The speed of the power tool shall be to suit the system. The power tool shall be single speed, provided with a motor of the required rating. The power tool shall be supplied complete with suitable control. The capacity and speed of the electric motor used in the power tool shall be suitable for the lifting of the design load installed on the lantern carriage.

The power tool mounting shall be so designed that it will be not only self-supporting but also aligns the power tool perfectly with respect to the winch spindle during the operations. Also, a handle for the manual operation of the winches in case of problems with the electrically operated tool shall be provided and shall incorporate a torque-limiting device. The power tool operation shall always be through a separate torque-limiting device to protect the wire ropes from over stretching. It shall be mechanical with suitable load adjusting device. The torque limiter shall trip the load when it exceeds the adjusted limits. There shall be suitable provision for warning the operator once the load is tripped off. The torque limiter is a requirement as per the relevant standards in view of the over all safety of the system. Each mast shall have its own power tool motor.

- i. Model : Integral
- ii. Input supply : 3 phase , 415 V AC
- iii. Operating speed : 1.5 to 1.8 meters/second.

2.15 Winch Driving Torque Limiter :

- i. Lifting capacity: 750 kg
- ii. Adjustable/Non Adjustable : Adjustable
- iii. Tripping device : Mechanical /electrical tripping facility

2.16 Feeder Panel

Each high mast shall have one feeder pillar distribution box located near it. The feeder pillar box shall be hinged, metal enclosed, free standing type, FLP type for Gas Group IIA & IIB and IP 65 protected . The Feeder Pillar Box shall be Approved by CCOE. Additional FRP canopy for protection for complete feeder pillar shall be provided.

The FLP feeder pillar box shall have incomer and outgoing ELMCBs as per BoQ item, motor starters, MBR for winch drive, lighting distribution outgoing circuits, single phase 2 pole ELMCBs to high mast luminaries and cable glands. This box shall have space to receive incoming and outgoing cable terminations for 3 phase, 415 V, TPN supply loop in loop out. The feeder pillar box shall be connected through cable (length 5-10 metres approx.) to control station for raising and lowering of lantern carriage. The feeder pillar box shall be mounted on a raised concrete platform 800 mm above ground level. The feeder pillar box shall have required interface for remote control PB station through cable for raising and lowering of lantern carriage. The light fittings provided on the light mast shall have individual switch controls in the feeder pillar box to have the flexibility to put the selected light fittings ON / OFF.

Details of Items/Switchgears to be provided in feeder pillar are as under:

- i. 4P 63 A “C” curve RCBO (30mA) – 1Nos.
- ii. 2P 16 A “C” curve RCBO (30mA)– 3 Nos.
- iii. 4P 40 A “C” curve RCBO (30mA)– 1 Nos.
- iv. Bus bars 150 Amp – 4 nos.
- v. LED Indicating Lamp – 3 Nos.
- vi. MBR for winch motor with raise and lower push button (2.0 HP) – 1Nos using 9 Amp Double pole contactors with suitable overload protection relay.
- vii. Astronomical Timer – 1Nos.
- viii. Contactors for astronomical timer circuit – 3 Nos.(Amperage as per requirement)
- ix. Auto Off Manual Switch – 1 Nos.

2.17 Earthing

Hi-Mast Lighting Tower shall be provided with Lightning & Earthing protection through 2(nos.) earth pit , comprising of an Earthing electrode of size 100mm dia, C Class 3.6 meters Long

Pipe with bricks enclosures and cover - 2Nos. (As per relevant IS). Laying and termination of 2 Nos. x 32mm X 6mm G.I strips for interconnection of earthing stud at Mast & Feeder pillar box to earth electrode at earth pit. All metal work including

luminaries, control gear units and luminaries carriage shall be bonded to the earth core of the luminaries supply cable. The earth continuity from luminaries carriage shall be via a single core of the multi- core cable

2.18 Incoming Power Cable

A cable of suitable size Aluminum conductor, Armoured cable for power supply and 4 x 2.5 sq.mm Copper conductor Armoured cable for motor supply shall be provided from feeder pillar to the base compartment of the High Mast. Cable shall be taken to the base compartment of the High Mast through the provision made in the foundation.

Power cable of suitable size up to the feeder pillar from supply point shall be laid as per design requirement.

2.19 Lighting Protection

a) Lightning Finial

One number heavy duty hot dip galvanized lighting finial shall be provided for each mast. The lightning finial shall be minimum 1.2 M in length and shall be provided at the centre of the head frame. It shall be bolted solidly to the head frame to get a direct conducting path to the earth through the mast. The lightning finial shall not be provided on the lantern carriage under any circumstances in view of safety of the system.

The lightning air terminal shall be an Early Streamer Emission terminal which should respond dynamically upon leader activity in the near area.

- i. The Stormaster ESE air terminal should successfully withstand minimum 4 current impulse equivalent to 150 KA conforming to IEC 60-1:1989 & test reports confirming to NFC 17-102
- ii. The Stormaster ESE air terminal should be tested with the “Switching Impulse Voltage” of 700 KV & “Direct Voltage” of 70 KV
- iii. The lightning air terminal should be configured as a spheroid which is comprised of separate electrically isolated panels surrounding an earthed central finial.
- iv. The insulation material used to electrically isolate the panels should be comprised of a base polymer which provides high ozone and UV resistance with a dielectric strength of 24 – 38 KV/mm.
- v. The external shape of the advanced lightning rod should be such that it will limit the development of sharp point corona discharge under static thunderstorm conditions.

- vi. The central finial should be elevated above the spheroid to a length of 90mm.
- vii. The upper section of the central finial should be rated to withstand 200KA.
- viii. An air gap should be provided between the individual electrically isolated panels (4 panels) and the finial tip of the central rod.
- ix. Arcing should occur between the panel sections of the spheroid and the finial tip only upon the progression of a lightning leader.
- x. The lightning air terminal should have no moving parts and no dependency on external power supply or batteries.
- xi. Under a normal atmosphere all components of the advanced lightning terminal shall be non-corroding.
- xii. The lightning air terminal should be insulated from all surrounding points and features of the structure being protected.

b) Mounting Support

- i. The mounting pole used to support the lightning air terminal should either be of G.I/ FRP mast at a minimum height of 2 meter.
- ii. The mounting pole and supports should be securely fixed with brackets and guy wires where required.

c) Down Conductor

- i. Each lightning air terminal should be fixed with one down conductor. The down conductor should be fixed securely every one meter.
- ii. The High Voltage Shielded Cable should be of 7 Layer Cable consisting of a Inner Core, Concentric Conductor, Inner Binding Tape, Insulation Materials, Metallic Screen, Outer
- iii. Binding Tape & Outer Sheath.
- iv. The main copper conductor within the High Voltage Shielded Cable shall have a minimum cross-sectional area of 50 sq.mm
- v. The outer diameter of the High Voltage Shielded Cable should not be more than 37mm & the thickness of the Sheath should be minimum 3mm.
- vi. The High Voltage Shielded Cable should not be less than permissible inductance level of 25nH/m.
- vii. The main copper conductor should allow for direct connection to the Lightning Rod (Air Terminal) through the use of compression lug.
- viii. The High Voltage Shielded Cable shall be tested as per IEC 600601, 2nd edition,

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- ix. The High Voltage Shielded Cable should withstand the Lightning Impulse Voltage of minimum 200KV (positive polarity) and 250KV (negative polarity)
- x. The High Voltage Shielded Cable shall be installed as per manufacturer's instructions and shall not be subjected to bends of less than 0.6 metre radius.
- xi. DC resistance of conductor at 20°C (Max) should be of 0.387 Ohm/Km.
- xii. DC resistance of screen at 20°C (Max) should be of 0.448 Ohm/Km.
- xiii. Insulation resistance at 20°C (Min) should be 1830 MOhm/Km
- xiv. Thermal short circuit current (1 sec) should be 7.15 KA

d) Lightning Strike Recorder

- i. The Lightning system should be installed complete with the lightning strike recorder.
- ii. The lightning strike recorder should contain a mechanical 6-digit display which will register all lightning discharges with a sensitivity of 1500A 8/20 µs peak current impulse.
- iii. The lightning strike recorder should be housed in a IP 65 rated enclosure and will operate without reliance on batteries or an external power source.
- iv. The lightning strike recorder should withstand a maximum current impulse equivalent to 450 KA (8/20 micro sec waveform) (conforming to IEC 60-1:1989)

2.20 Aviation obstruction Lights:

Suitable Aviation Obstruction Lights of reliable design and reputed manufacturer shall be provided on top of high mast.

2.21 Earthing Terminals:

Suitable earth terminal using 12 mm diameter stainless steel bolts shall be provided at a convenient location on the base of the Mast, for lightning and electrical earthing of the mast.

2.22 Led Luminaires

- 2.23 LED luminaires shall be BIS approved as per the specifications detailed in the annexed data sheet of standard. The luminaire shall be tested as per Indian Standards and Test Reports shall be submitted along with the materials. The Luminaires must be suitable for installation on High Mast.

2.24 Warranty for LED :

The supplier shall provide Comprehensive guarantee for a period of five years with effect from the date of commissioning that the LED based Lighting Luminaires, Including all their components shall be repaired or replaced, as the case may be on priority basis at suppliers's own risk and expense in case the same have been found to be defective in respect of material, workmanship, or under-performing from rated operation.

2.25 SCOPE OF SERVICES

- A. Services of all skilled/ unskilled/ supervisory workforce, erection tools-tackles, testing equipment, implements, supplies, consumables, hardware etc. as required for complete Installation, Civil foundation, Storage , Handling , Erection, Testing Commissioning and putting into successful commercial operation of the High Mast Illumination System and efficient execution of the job.
- B. Receiving, Loading, Unloading and Transportation of all materials to work site.
- C. Unpacking, inspection, preparation & submission of short supplied/damage items.
- D. Arranging to repair/ replacement of damaged items and /or re-order of short supply item, if any.
- E. Earth excavation, structure fabrication, civil/concrete foundation, cable laying etc.
- F. Assembly of loose accessories, complete erection of high-mast, fixing of luminaires, connection of cables & wirings with glands/ sockets/ tags/ marking ferrules, earthing of equipment/ fitting/ structure etc.

DATA SHEET FOR HIGH MAST		
	DESCRIPTION	SPECIFICATION
	HIGH MAST SYSTEM	
	Height of High Mast (M) (including Luminaires Carriage)	30
	Material of Construction	BS-EN10 025, S-355 /Grade Fe 410WA as per IS 2062 / ASTM A 572 GR 50 (S-12)
	Cross section of Mast in polygon (No. of sides)	20 Sided polygon
	Number of Vertical Sections (Nos.)	3
	Individual sections Length (mm) x Thickness (mm)	
	Top Sections	9440X4
	Middle Section	10980X5
	Bottom Section	10980X6
	Minimum Over Lapping (between Sections)	600/800
	Type of joints	Slip stress fit
	Welding Spec	As per IS

	Metal Treatment protection for Mast	Galvanised
	Thickness of Galvanisation (min)	min 65 micron for sheet thickness of 2mm to 4 mm and 86 Microns for 5 mm and above.
	Size of opening and door at base	1200mm x 300mm
	Type of locking arrangement	Anti-Vandalism
	Base Plate Diameter (mm)	890
	Base Plate Thickness (mm)	32
	Lightning Protection	GI single spike of length 1200mm
	Aviation Obstruction light	2 Nos. LED
	DESIGN CONSIDERATION	
	Max. wind speed (as per IS 875) (m/s)	50
	Max. gust speed time (s)	3
	Height above the ground level these two factors are measured (M)	10
	Factor of safety for wind load	1.25
	Factor of safety for other load	1.15
	FOUNDATION DETAILS	
	Type of Foundation	Preferably Isolated Raft Foundation
3.2	Size of Foundation	To be designed by the contractor
3.3	Depth of Foundation	Min 2M
3.4	Size of Foundation Bolts (mm)	M30 x 1200
3.5	Details of Anchor Plate (mm)	730 x 730 x 6
3.6	Details of Template (mm)	730 x 730 x 6
3.7	No. of Foundation Bolts	20
3.8	PCD of Foundation Bolt (mm)	790
	3 POINT HEAD FRAME	
4.1	Material of Construction	50NB ERW Class C MS Pipe
4.2	Metal Treatment protection for Head Frame	Galvanised
4.3	Pulley Arrangement (For Steel wire rope)	3 sets
4.4	Pulley Arrangement (For Electric cable)	1 set
	LANTERN CARRIAGE	
5.1	Material of Construction	50NB ERW Class C MS Pipe
5.2	Construction	MS Fabricated
5.3	Diameter of Carriage (mm)	710(ID), 1200 to

		2200(OD)
5.4	No. of Joints	2
5.5	Buffer arrangements between Carriage & Mast	To be provided
5.6	Compensation Disc between L-Ring & DD Ring	To be provided
5.7	Safety Locking at both sides at Base of Mast	To be provided
5.8	Load Carrying Capacity (kg)	750
5.9	No. of fittings	24
5.10	Weight of each fitting (kg)	-
	WINCH	
6.1	No. of Drums per winch	Double Drum
6.2	Capacity (kg)	750
6.3	Gear Ratio	53:1/50:1
6.4	Method of operation	Manual & Electrical
	STAINLESS STEEL WIRE ROPE	
7.1	No. of Ropes	2
7.2	Diameter (mm)	8
7.3	Carriage disc to Double drum winch	Two
7.4	Carriage disc to Lantern Ring	Three
7.5	Thimbles & Talurit	To be provided
7.6	Factor of safety	>5
	TRAILING CABLE	
8.1	Material	EPR Insulated PCP Seathed
8.2	Conductor	5C X 4 SQMM Cu Cable or as per design requirement
8.3	No. of circuit	04
	POWER TOOLS	
9.1	Model/Type	Integral
9.2	Input power supply	415 V, 50 Hz
9.3	Wattage (kW)	2.2
9.4	No. of Speed	Single
9.5	Operating Speed (RPM)	
9.6	Reversible/ Non-reversible	Reversible
10	TORQUE TRANSMITTER	
10.1	Adjustable/Non-adjustable	Adjustable
10.2	Tripping device	Mechanical/ Electrical

Note :

- 1 Dimensions are subjected to tolerance allowed as per IS.
- 2 Motor to be supplied in single and three phase as per requirement of site.

PART-II

CHAPTER - III

**TECHNICAL SPECIFICATION OF DG SET, UNDERGROUND HSD TANK AND
PIPELINE**

SPECIFICATION FOR DIESEL GENERATING SETS

1.0 GENERAL

This specification is intended to cover supply, installation, testing and commissioning of 500 KVA, 1010 KVA and 1500 KVA silent type, air-cooled (radiator type) Diesel Engine Alternator Sets in outdoor type acoustic enclosure.

1.1 SCOPE OF WORK

The scope of work shall include under this specification design, manufacture, supply, loading, unloading, storage, installation, testing and commissioning of the Diesel engine alternator sets including labour, tools, tackles and plants, hardwares and consumables, steel fabrication etc.

- Silent type Diesel engine alternator set complete with base frame & accessories and with outdoor type acoustic enclosure.
- Fuel oil system including day service oil tank, piping, valves, filters etc. from engine to service day oil tank. Return fuel line with fuel cooler and piping with accessories upto day service tank etc.
- Lube oil system with piping etc.
- To design the mechanical ventilation system for D.G. enclosure with fans and duct etc. as per system requirements.
- Suitable rating of 4 pole ACB with sheet-steel enclosure shall be mounted on D.G. set suitable for cable connection from top/bottom.
- Exhaust emission shall meet latest CPCB & SPCB norms and residential silencer, exhaust piping with mineral wool insulation and aluminium cladding as called for.
- Steel fabricated structure/support/hanger including fixing, grouting and bolting etc.
- Painting of steel work.
- Auxiliary control panel if required.
- All equipment shall be of the class most suitable for working under the conditions specified and shall withstand the atmospheric conditions without deterioration.
- Minor civil work is included in the contractor's scope of work. However, the responsibility of coordination with the civil and other contracting agencies ensuring completion of turnkey contract rests with the contractor.
- Contractor shall co-ordinate with all other agencies working at site for interconnection and safety aspects.
- Also the D.G. supplier will furnish back up combined guarantee for 2 years from the date of supply from Engine and alternator supplier for smooth running. In case there is

any defect the free replacement of any part or in whole will be made immediately at not loss to Owner.

1.2 FEES & PERMITS

The contractor shall obtain all sanctions and permits required for the running of DG sets from all the relevant authorities. All actual fee payable in this regard will be reimbursed against receipt/documentary proof (evidence). On completion of the work, the supplier shall obtain N.O.C from concerned authorities including Chief Electrical Inspectorate, of State, and shall be delivered in original to the employer.

1.3 CODES & STANDARDS

The design, construction, manufacture, inspection, testing and performance shall comply with all the currently applicable statutes, safety codes, relevant Bureau of Indian Standards (BIS), British Standards (BS), International Electro Technical Commission (IEC) publication, NEMA & VDE Standards amended upto date.

Some of the applicable standards are listed below:

IS – 1601	Performance and testing of IC engines for general purpose.
BS– 649	Performance and testing of IC engines for general purpose.
BS – 4613	Electrical performance of rotating electrical machine.
BS – 4999/ 5000	[Applicable parts of BS 4999/5000.
IEC – 34-1/ IS – 4722/ VDE – 0530	Specification for rotating electrical machines.
IS – 4889	Method of determination of efficiency of rotating electrical machinery.
IS – 6491	Degrees of protection provided by enclosures for rotating Electricity machinery.
IS – 4729	Measurement and evaluation of vibration of rotating Electrical machines.

AIEE – 606	Recommended specification for speed governing (1959) of internal combustion engine generator units.
IS – 2705	Current transformers.
IS – 1248	Electrical indicating instruments.
BS – 5514 / IS – 03046 or IS – 08528 Part 2	Reciprocating internal combustion (I.C) engine driven A.C. Generators.
IEEE – 115	Test procedure for synchronous machine.
IS-7098 Part I & II	XLPE insulated PVC sheathed for working voltage 1.1 to 11 KV.
IS-3975	Mild steel wire, strips & tapes for armouring cable.
IS-3961	Current rating of cables.
IS-694	PVC / HRPVC insulated (heavy duty) electric cables for working. voltage upto and including 1100 volts.
IS-424-1475 (F-3)	Power cable flexibility test.
IS-1554 (Part-I)	PVC/.HRPVC insulated cables upto 1100 volts.
IS-5083	Extruded inner/outer seath.
IS-6121	Cable glands.
IS-10418	Cable drums.
IS- 13947/ IEC 947	Air circuit breaker/moulded case circuit breaker.

IS-8623	Specification for factory built assemblies of switch gear and control gear for voltage upto and including 1000vac/1200vdc.
IS 1018	Switchgear and control gear selection/installation and maintenance.
IS-13779	Digital measuring instruments and testing accessories.
IS-2705	Current transformer for metering and protection with classification burden and insulation.
IS-2147 (Part I, II & III)	Degree of protection provided by enclosures for low voltage. Switchgear & control gears.
IS-3427	Metal enclosed switchgear and control gear.
BS-162	Safety clearance.
IS-3202	Code of practice for climate proofing of electrical equipment.
IS-375	Marking and arrangement for switchgear, busbars, main connections and auxiliary wiring.
IS-722	Ac electric meters.
IEC-255	Electrolytic copper/aluminium bus bars.
IS-5082	Electrolytic copper & aluminium
IS-4201	Application guide for Current Transformer.
IS-4146	Application guide for Voltage Transformer.
IS-3034	Code of practice for fire safety of industrial building-electrical generating and distribution station.
IP-30	National electrical code(NEC) BIS publication.
IS-2959	Contactors.

IS-1030-
1982

Specification for carbon steel castings for
general engineering purpose

- Indian Electricity Act.
- Indian Electricity Rules.
- Factory Act

1.4 DESIGN

The design and workmanship shall be in accordance with the best engineering practices, to ensure satisfactory performance and service life. The equipments offered by the contractor shall be complete in all respects. Any materials or accessories, which may not have been specifically mentioned, but which are usual and necessary for the satisfactory and trouble free operation and maintenance of the equipment shall be provided without any extra cost to the purchaser. This shall also include & panes for commissioning of equipments.

All work to be performed and supplied shall be as a part of contract require specific approval/review of Owner or his authorized representative. Major activities requiring approval/review shall include but not to be limited to the following:

Bidder shall be responsible for:

- Detailed co-ordination with other services, shop drawings for various electrical layouts such as equipment layout, cabling layouts, earthing layouts, including equipment installation and cable termination details etc. prior to start of work.
- Preparation of bill of materials for cabling, earthing and miscellaneous items etc.
- Cable schedule (as per site requirement).
- Interconnection drawing.
- Protection co-ordination drawings.
- Shop inspection and testing procedures.
- Field testing and commissioning procedures.
- Preparation of as built drawings.

1.4.1 SITE CONDITIONS

- | | |
|-------------------------|---|
| 1. Design ambient :- | 50 Deg.C. maximum for engine and
40 deg C for alternator |
| 2. Altitude :- | 300M above sea level |
| 3. Relative Humidity :- | 98% maximum |
| 4. Site environment :- | Normal |

1.4.2 DESIGN CRITERIA

ELECTRICAL DETAILS OF INCOMING SUPPLY

- | | |
|-------------------|----------------------------|
| 1. Supply Voltage | 33 KV as per SEB approved. |
|-------------------|----------------------------|

- | | |
|---|--|
| 2. Fault level (sym.) at supply of point (designed) | 1500 MVA (to be confirmed from State Electricity Board by Tenderer). |
| 3. Neutral | : As per supply company |
| 4. Voltage Variation | : 5% |
| 5. Frequency Variation | : 3% |

L.T. POWER DISTRIBUTION SYSTEM

- | | |
|---|---------------------|
| 1. Voltage | 415 V |
| 2. Frequency | 50 Hz |
| 3. Neutral | Solidly Grounded |
| 4. Short Circuit Fault withstand Capacity | 10 - 65 KA (1 Sec.) |

CONTROL SUPPLY FOR ELECTRICAL SYSTEM

The various supply voltage to be used in the control panels for main equipments are:

- | | |
|---------------------------|-------------|
| 1. Spring Charge Motor | 230 Volt AC |
| 2. Closing/Trip Coil | 24 V DC |
| 3. Alarm/Indication/Relay | 24 V DC |
| 4. Heaters | 230 V AC |

Painting of panel	Powder coating of approved shade as per Specification Clause of painting.
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Painting of cable tray and structure steel	Powder coating of approved shade as per Specification Clause of painting.
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CABLE DETAILS

L.t. control cables	Copper conductor FRLS/PVC insulated 1.1 KV grade.
Power cables (l.t.)	Aluminum / copper conductor FRLS/PVC / XLPE armored.
Grounding conductor	Copper/G.I. as per BOQ.

ACCURACY CLASS OF METERS

- | | |
|---|-----------------------------------|
| a) Revenue Meters | Class 0.5 or as per SEB approved. |
| b) Ammeter Voltmeter and Other Instrument | Digital Type. |

1.4.3 DRAWINGS

- i) The list of drawings along with this specifications is given. These drawings are meant to give general idea to bidder regarding the nature of work covered by these specifications.
- ii) Any information/data shown/not shown in these drawings shall not relieve the contractor of his responsibility to carry out the work as per the specifications. Additional information required by the bidder for successfully completing the work shall be obtained by him.
- iii) Shop Drawings

The contractor shall prepare detailed coordinated electrical shop drawing. Cable Schedule with other relevant services and submit to the Consultant for approval or the Engineer-in-Charge before commencing the work. The shop drawings shall indicate all setting out details and physical dimensions of all components with wiring and cable details including system operating write up in the system i.e. Control and Relay Panel D.G.'s, cable schedule and routes, manhole trap and fixing details for the above mentioned work. All work shall be carried out on the approval of these drawings. However, approval of these drawings do not relieve the contractor of his responsibility for providing maintenance free and fool proof system including any missing component/accessories to meet with the intent of the specifications. Contractor will submit 2 prints for preliminary approval and finally six prints for distribution.

- iv) Completion Drawings/As Built Drawings

On completion of the work and before issue of certificate of virtual completion, the contractor shall submit to the consultant 6 sets alongwith soft copy of 'As Built' drawings of the work alongwith originals including write up (trouble shooting, installation, operation and maintenance manual with instructions) incorporating all such changes and modifications during engineering and execution.

These drawings must provide:

- Location of all earthing stations, route and size of all earthing conductors.
- Layout and particulars of all cables.

- Location and details of D.G. control panel/aux. panel, and relay panels with description detailed control wiring diagram.
- Layout of cable trays with support and their fixing details.

1.5 MANUFACTURER'S INSTRUCTIONS

Where manufacturers have furnished specific instructions, relating to the material/equipments to be used on this job, covering points not specifically mentioned in this documents, manufacturer's instructions shall be followed.

1.6 MATERIALS AND EQUIPMENTS

All the materials and equipments shall be of the approved make and design. Unless otherwise called for any approval by Owner's Engineer-in-Charge, only the best quality materials and equipment shall be used.

1.7 VENTILATION OPENING

In order to ensure adequate ventilation, compartments shall have ventilation openings provided with fine wire mesh of brass to prevent the entry of insects and to reduce to a minimum the entry of dirt and dust. Outdoor compartment openings shall be provided with shutter type blinds.

1.8 DEGREE OF PROTECTION

The enclosures of the Control Cabinets, Junction Boxes and Marshalling Boxes, Panels etc. to be installed shall provide degree of protection as detailed here under.

- Installed out door :- IP-55.
- Installed indoor in air-conditioned area: IP-31.
- Installed in covered area :- IP-42.
- Installed indoor in non air conditioned area where possibility of entry of water is limited: IP-41.
- For L.T. switchgear (AC and DC distribution boards) : IP-42.

The degree of protection shall be in accordance with IS:13947 (Part-I)/IEC-947 (Part-I). Type test report for degree of protection test, on each type of the box shall be submitted for approval.

1.9 RATING PLATES, NAME PLATES AND LABELS

D.G. Sets, D.G. control panel and auxiliaries items installed in the building is to permanently attached to it in a conspicuous position. A rating plate of non-corrosive material with engraved manufacturer's name, year of manufacture, equipment name, type or serial number together with details of the loading conditions of equipment in question

has been designed to operate and such diagram plates as may be required by the purchaser. The rating plate of each equipment shall be according to IEC requirement.

All such nameplates, instruction plates, rating plates shall be bilingual with Hindi inscription first followed by English. Alternatively two separate plates one with Hindi and the other with English inscriptions may be provided.

1.10 FIRST FILL OF CONSUMABLES, OIL AND LUBRICANTS

All the first fill of consumables such as oils, lubricants, filling compounds, touch up paints, welding/soldering/brazing material for all copper/G.I. earthing and essential chemicals etc, *(including diesel required for testing of DG)*. which will be required to put the equipment/scheme covered under the scope of the specifications, into successful operation, shall be furnished by the Contractor unless specifically excluded under the exclusions in these specifications and documents.

1.11 DESIGN IMPROVEMENTS

The bidder shall note that the equipment offered by him in the bid only shall be accepted for supply.

If for any reason, Contractor wishes to deviate from specification, prior permission from Owner/Consultant shall be sought.

If any such change is agreed upon and that it affects the price and schedule of completion, the parties shall agree in writing as to the extent of any change in the price and/or schedule of completion before the Contractor proceeds with the change. Following such agreement, the provision thereof, shall be deemed to have been amended accordingly in the specification.

1.12 QUALITY ASSURANCE PROGRAMME

To ensure that the equipment and services under the scope of this Contract whether manufactured or performed within the Contractor's works or at his sub-contractor's premises or at the Purchaser's site or at any other place of work are in accordance with the specifications, the Contractor shall adopt suitable quality assurance programme to control such activities at all points necessary. Such programme shall be outlined by the Contractor and shall be finally accepted by the Purchaser after discussions. A quality assurance programme of the contractor shall generally cover the following:

- His organisation structure for the management and implementation of the proposed quality assurance programme.
- Documentation control system.
- Qualification data for bidder's key personnel.

- The procedure for purchases of materials, parts components and selection of sub-contractor's services including vendor analysis, source inspection, incoming raw material inspection, verification of material purchases etc.
- System for shop manufacturing and site erection controls including process controls and fabrication and assembly control.
- Control of non-conforming items and system for corrective actions.
- Inspection and test procedure both for manufacture and field activities.
- Control of calibration and testing of measuring instruments and field activities.
- System for indication and appraisal of inspection status.
- System for quality audits.
- System for authorising release of manufactured product to the Purchaser.
- System for maintenance of records.
- System for handling storage and delivery and
- A quality plan detailing out the specific quality control measures and procedures adopted for controlling the quality characteristics relevant to each item of equipment furnished and/or services rendered.

The Purchaser or his duly authorised representative reserves the right to carry out quality audit and quality surveillance of the system and procedure of the Contractor/his Vendor's quality management and control activities.

1.13 QUALITY ASSURANCE DOCUMENTS

The Contractor shall be required to submit the following Quality Assurance Documents within three weeks after despatch of the equipment.

- All Non-Destructive Examination procedures, stress relief and weld repair procedure actually used during fabrication and reports including radiography interpretation reports.
- Welder and welding operator qualification certificates.
- Welder's identification list, listing welder's and welding operator's qualification procedure and welding identification symbols.
- Raw material test reports on components as specified by the specification and/or agreed to in the quality plan.
- Stress relief time temperature charts/oil impregnation time temperature charts.
- Factory test results for testing required as per applicable codes/mutually agreed quality plan/standards referred in the technical specification.
- The quality plan with verification of various customer inspection points (CIP) as mutually and methods used to verify the inspection and testing points in the quality plan were performed satisfactorily.

1.14 PACKAGING

All the equipments shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at Site till the time of erection. While packing all the materials, the limitation from the point of view of availability of Railway wagon/truck/trailer sizes in India should be taken account of the Contractor shall be responsible for any loss or damage during transportation, handling and storage due to improper packing. Any demurrage, wharfage and other such charges claimed by the transporters, railways etc. shall be to the account of the Contractor. Owner takes no responsibility of the availability of any special packaging/transporting arrangement.

1.15 PROTECTION

All coated surfaces shall be protected against abrasion, impact, discolouration and any other damages. All exposed threaded portions shall be suitably protected with either a metallic or a non-metallic protecting device. All ends of all valves and pipings and conduit equipment connections shall be properly sealed with suitable devices to protect them from damage. The parts which are likely to get rusted, due to exposure to weather should also be properly treated and protected in a suitable manner.

1.16 HANDLING, STORING AND INSTALLATION

- In accordance with the specific installation instructions as shown on manufacturer's drawings or as directed by the Purchaser or his representative, the Contractor shall unload, store, erect, install, wire, test and place into commercial use all the equipment included in the contract. Equipment shall be installed in a neat, skillful manner so that it is level, plumb, square and properly aligned and oriented.
- Contractor shall follow the unloading and transporting procedure at site, as well as storing, testing and commissioning of the various equipment being procured by him separately. Contractor shall unload, transport, store, erect, test and commission the equipment as per instructions of the manufacturer's Engineer(s) and shall extend full co-operation to them.
- In case of any doubt/misunderstanding as to the correct interpretation of manufacturer's drawings or instructions, necessary clarifications shall be obtained from the Owner/Consultant. Contractor shall be held responsible for any damage to the equipment consequent for not following manufacturer's drawings/instructions correctly.
- Where assemblies are supplied in more than the one section, Contractor shall make all necessary connections between sections. All components shall be protected against damage during unloading, transportation, storage, installation, testing and commissioning. Any equipment damaged due to negligence or carelessness or otherwise shall be replaced by the Contractor at his own expense.

- The Contractor shall submit to the Owner every week, a report detailing all the receipts during the weeks. However, the Contractor shall be solely responsible for any shortages or damages in transit, handling and/or in storage and erection of the equipment at Site. Any demurrage, wharfage and other such charges claimed by the transporters, railways etc. shall be to the account of the Contractor.
- The Contractor shall be fully responsible for the equipment/material until the same is handed over to the Owner in an operating condition after commissioning. Contractor shall be responsible for the maintenance of the equipment/material while in storage as well as after erection until taken over by Owner, as well as protection of the same against theft, element of nature, corrosion, damages etc.
- The Contractor shall be responsible for making suitable indoor storage facilities, to store all equipment which require indoor storage.
- The words ‘erection’ and ‘installation’ used in the specification are synonymous.
- Exposed live parts shall be placed high enough above ground to meet the requirements of electrical and other statutory safety codes.
- The minimum phase to earth, phase to phase and section clearance along with other technical parameters for the various voltage levels shall be maintained as per relevant IS.

1.17 PROTECTIVE GUARDS

Suitable guards shall be provided for protection of personnel on all exposed rotating and/or moving machine parts. All such guards with necessary spares and accessories shall be designed for easy installation and removal for maintenance purpose.

1.18 DESIGN CO-ORDINATION

The Contractor shall be responsible for the selection and design of appropriate equipments to provide the best co-ordinated performance of the entire system. The basic design requirements are detailed out in this Specification. The design of various components, sub-assemblies and assemblies shall be so done that it facilitate easy field assembly and maintenance.

1.19 DESIGN CO-ORDINATION MEETING

The Contractor will be called upon to attend design co-ordination meetings with the Engineer, and the Consultants of the Owner during the period of Contract. The Contractor shall attend such meetings at his own cost at site/ office of Employer as and when required and fully co-operate with such persons and agencies involved during those discussions.

1.20 DIESEL ENGINE

Air cooled, High speed diesel engine, electric starting, with integrated DG Set Controller conforming to BS: 649/1958 with 10% over loading for one hour in any 12 hours duration. The engine will be fitted with the following standard accessories. The supplier can quote for equivalent engine and shall furnish complete details of the same along with tender quotation.

- a) Fly wheel to suite flexible coupling.
- b) Flexible coupling.
- c) Exhaust fan turbo charger with after cooler.
- d) Cooling water centrifugal pump.
- e) Radiator (engine mounted).
- f) Corrosion resistor.
- g) Automatic over speed trip protection.
- h) Lub. oil pump.
- i) Lub. oil priming pump (if Required).
- j) Lub. oil filter.
- k) By pass filter.
- l) Fuel pump.
- m) Fuel filter.
- n) Air intake manifold.
- o) PCC 3.3/EPC/wood ward/Powercom (having SEMs control system).
- p) Self starter 24 volts DC including battery and battery charger.
- q) Residential silencer.
- r) Flexible pipe for silencers.

1.21 GOVERNING SYSTEM

The Governor shall be electronic fuel control type for coupled Genset.

1.22 EXHAUST SYSTEM

Engine emission exhaust system shall be meet the latest CPCB/SPCB norms of exhaust emissions for D.G. Sets residential type silencer ducting, bends, hood/canopy, thermally insulated aluminum clad exhaust piping etc. shall be provided along with structural support with stays for each engine. Heat resistant paint shall be provided on exhaust pipe for the portion which is of outside the building including canopy. Exhaust system pollution level shall be indicated and shall be got approved by authorities. (Exhaust smoke quality & quantity should be within the norms of central & state pollution control board).

1.23 EXHAUST PIPE INSULATION

Exhaust pipe insulation shall be carried out with mineral wool (rigid pipe sections) of 150 Kgs./Cu.m for temperature above 250 deg.C. The material for pipe insulation shall be factory faced with aluminum foil reinforced with kraft paper. The aluminium foil of 24 SWG shall extend by minimum 50mm on one side of pipe side along the length to seal all longitudinal joints etc.

1.24 ENGINE INDICATORS

- a. Digital tachometer with running hour meter
- b. Starting attempt counter
- c. Lubricating oil pressure low
- d. Water temp. High/low.
- e. Water pressure low/high.
- f. Over speed
- g. Engine fail to start
- h. KVA
- i. Volts R-Y-B / RY-YB-BR.
- j. Amps R-Y-B.
- k. Fault condition with reset for engine.

1.25 ALTERNATOR (415V – 3 Phase, 4 Wire System)

The Alternator shall be industrial type screen protected drip proof. IP-23. Class – H insulation with temperature rise limited to Class-’H’, self ventilated, air cooled, rotating field, salient pole, brushless, machine with self excited, self regulated exciter and shall be rated for continuous duty.

The Alternator shall have a continuous rating of not less than the value specified under specific requirement.

The Alternator shall withstand without mechanical damage, an over load of 50% for a period of 30 sec.

The generator/alternator shall with stand over load of 10% for 1 hour every 12 hourly. The terminal voltage shall be adjustable and the range of adjustment shall be + 5% of nominal voltage.

The Alternator shall be capable of withstanding without damage/injury for 3 secs., 3 phase short circuit at its terminals, when operated at rated KVA and power factor at 5% over voltage with fixed excitation (3 times the line current for 10 Sec.).

The Alternator shall be capable of withstanding for thirty (30) secs. a current of fifty (50) percent in excess of its rated current, the voltage being maintained, as near the rated value as possible, consistent with max. capacity of the prime mover.

All external nuts and bolts shall be of high tensile steel only.

The alternator shall be capable to sustain the unbalanced current between the phases minimum 25% of rated current provide that the KVA rating and maximum current does not exceed of rated current in any phase as per BS-4999 Part-101.

The alternator shall be dynamically balanced complete with rotor and shaft.

Damper winding shall be provided in the pole to damp the oscillations and ensure satisfactory performance during parallel operation.

1.26 OUTDOOR TYPE ACOUSTIC ENCLOSURE FOR D.G. SET

- a) Silent DG set container is of modular construction with the provision to assemble and dismantle easily as per the site condition.
- b) There are no protruding parts.
- c) The container is fabricated out of CRCA sheet of 16 SWG.
- d) The sheet metal components are hot dip nine tank pretreated.
- e) To have long life of container it is pure polyester based powder coated (inside as well outside). All nut and bolts/hardware are zinc coated.
- f) Fuel tank at the base of silent DG set is having required capacity. It is provided with breather, drain plug.
- g) The fuel level can be indicated with the help of fuel gauge meter.
- h) There is provision for filling the fuel from outside as in the case of automobiles with locking arrangement.
- i) Battery is accommodated in a separate tray in the container.
- j) There is a provision for drain plugs for draining mobile oil/diesel.
- k) The doors are gasketed with high quality EPDM gaskets to avoid leakage of sound.
- l) The door handles are lockable type.
- m) Sound proofing of enclosure is done with high quality rock wool/mineral wool confirming to IS:8183 of 50mm thickness and density at 96 Kgs/Cu.m.
- n) The rock wool is further covered with fibre glass cloth and perforated powder coats sheet.
- o) A special residential silencer is provided with in the DG to control exhaust noise.
- p) Specially designed attenuators are provided to control sound at air entry to the container and exit from the container.

- q) To make the system vibration free, engine and alternator (single bearing) is mounted on anti-vibration pads.
- r) Noise level is 75 dB(A) at 1 meter distance.

1.27 TESTS

The Diesel Generator sets shall be tested as per the relevant IEC Standards. All the tests on individual and combined sets will be witnessed by the representative of employer with no extra claim to employer. The supplier shall submit test reports complete descriptions/testing procedure units accepted and value obtain from as per the following but not limited to:

A. Acceptance Tests on D.G. Set.

One (1) hour at variable load including 10% overload at manufacturer works.

Before each test, the engine shall be brought to a steady state under the conditions of the test.

B. Notice Period

Atleast 1 week notice time shall be maintained before the tests mentioned above by manufacturer.

Test Certificate

- a. Test Certificate shall be submitted in two (2) copies.
- b. The test certificates shall be furnished to the purchaser for prior approval before despatch of any equipment from works and the approval in writing from purchaser shall be essential to effect despatch of the equipment.
- c. The test reports shall furnish complete identification of the data including serial number of each equipment.

1.28 COMMISSIONING :-

The commissioning of DG sets shall be done under the supervision of authorized representative of OEM.

1.29 DEVIATION

Should the contractor desire to deviate from this specification in any way, he shall draw specific attention to such deviation giving complete reasoning/comparison with other products.

Unless such deviations are recorded in the separately attached Deviation Sheets, as submitted with offer, it will be taken for granted that the offer is made in conformity with this specification.

ANNEXURE-I

TECHNICAL PARTICULARS OF SILENT DIESEL GENERATOR SETS (RADIATOR TYPE)

1.	Quantity and Rating at prime duty	:	2 Nos. - 500 KVA, 1 No 1010 kVA & 1 No 1500 kVA at 0.8 PF (Unit shall be rated for feeding standby load) with integrated D.G. & Controller for paralleling
2.	Mode of Operation	:	(Auto Load Start & Auto Load Share & load management)
3.	Engine/Alternator		
3.1	Output rating at ambient temp. of 50 Deg.C (for each) at prime duty	:	2 Nos. - 500 KVA, 1 No 1010 kVA & 1 No 1500 kVA at 0.8 lag. P.F. standby load. Alternator suitable for 0.8.
3.2	Class of insulation for Stator & Rotor (For calculation & testing)	:	Class 'H' limited to Class 'H'
3.3	Rated voltage & Frequency	:	415 Volts, 50 Hz. three phase 4 wire A.C.
3.4	Maximum permissible time for building up rate and voltage from stand still	:	Less than 10 seconds
3.5	Variation of voltage from no load to full load	:	0.5% of rated voltage
3.6	Voltage variation	:	0.5%
3.7	Type of excitation system	:	PMG type/Auxiliary plus relating field diode.
3.8	Type of control for voltage regulator	:	AUTOMATIC
4.	Miscellaneous	:	

4.1	Type of fuel for engine	:	High speed diesel in accordance with F-DMA or F-DMS as per ISO 8217. (IS : 1460 1974 amended upto date)
4.2	Day Oil tank capacity	:	990 liters (outside) each for 1010/1500 KVA D.G. Set. & 700 liters each for 500 KVA D.G set
4.3	Maximum permissible starting time for attaining full speed	:	Within 15 seconds
4.4	Engine Starting	:	Electric starting system
4.5	Type of Governor Electronic Fuel Control	:	Electronic
4.6	Lubrication system	:	Pressure fed type.
4.7	Cooling System	:	Radiators
4. 8	Engine cranking system	:	To be included
4.9	Noise Level	:	75 dbA at 1 mtr.
4.10	Vibration limit	:	Less than 250 micron
4.11	Main Switch	:	2500A -4 pole ACB /800Amps 4 pole ACB
4.12	Acoustic Enclosure	:	Outdoor type

Technical literature, testing procedure with acceptable value shall be submitted along with the bid.

Any deviation (explained with supporting documents) shall also be submitted.

TECHNICAL SPECIFICATION OF BULK FUEL STORAGE TANKS

1.0 SCOPE OF WORK

1.1 The Scope of work covered under this Tender/Contract broadly consists of the following:

- a) Complete design, supply, manufacture, erection, painting, testing and commissioning etc. of HSD Storage Tanks along with all other accessories like piping instruments, control and safety system in conformity to the statutory requirements of Petroleum Rules 1981 and CCOE, Nagpur.

1.2 The scope of work shall consist of, but not be limited to the following:-

- a) Preparation of layout plans Scheme for HSD and as per the requirement of Statutory Petroleum Rules and Regulations.
- b) Obtaining Approval of HSD Scheme and layout plans from concerned office of the CCOE, Nagpur.
- c) Manufacture, supply, erection, grouting and testing of HSD unloading and transfer system (as per technical details) including pumps instrumentation's with pressure gauges, temperature gauge switches etc., piping and supports etc. and foundation including supply of civil materials.
- d) Inspection and approval by competent authority as acceptable to the CCOE. (HSD)
- e) Erection, testing and commissioning of the complete HSD tanks and accessories including excavation, making foundations, anchoring, back filling etc.
- f) Obtaining safety certificate from a competent authority approved by CCOE for the installation under rule 125 & 33 of IPR 1976 (Tank Safety & Testing certificate to be provided).
- g) Supply and installation, grouting, testing and commissioning etc. of control panels, auto starter, pumps, motors etc. for HSD system including piping materials and supports.
- h) Construction of proper tank lorry platform with all materials as per CCOE requirements.
- i) Supply of control panel, control switches, wiring, push buttons stations, MCB cabling, support, fixtures etc.

(Client will only provide one electrical termination point from where vendor to distribute and connect to different consuming points), for 415 V 3 ph. A.C. supply)

- j) Supply and fixing at proper places - required quantity of 9 litre fire buckets with fixing brackets, CO2/DCP portable fire extinguishers of capacity 9/10 Kg. as per IS:2878.

- k) Supply and installation of painting for complete equipment and piping system etc. along with earthing pit.
- l) Completing all such concerned works in all respects as per drawings, documents, specifications and instructions of the Site Engineers of Client/Consultant in order to fulfill the completeness of supply, installation, testing and commissioning of the whole installation.
- m) Supply and fixing “No Smoking” and “Flammable” sign board as per requirement of CCOE Nagpur.

1.3 EXCLUSIONS

This is a turn-key job, hence all works connected with or incidental to it, are included.

2.0 MATERIALS

- 2.1 All materials, equipment's, fittings and fixtures items etc. to be used shall conform to the attached specification, Data Sheets and Approved list of vendors for bought out items/materials. All materials shall be new, robust in construction and well finished. Surplus material after completion of work shall be taken back by the Contractor and the cost shall be recovered if the advance payment has been made earlier by the OWNER. Payment shall be made only for such materials, which have been erected, duly certified by the Site Engineer.
- 2.2 Unless otherwise stated in the conditions of contract sample of all materials, fittings and fixtures to be supplied by the Contractor shall be submitted to the OWNER for his approval. The Contractor shall not commence the work until the samples are approved, in writing. The Contractor shall ensure that all the materials incorporated in the work are identical in all respects with the approved sample.
- 2.3 Material, which is not specified, shall be considered a best make provided an ISO 9001 Company or approved by Consultant/Owner.

3.0 FUEL OIL SYSTEM

3.1 Bulk Fuel Storage Tanks

Fabrication, installation, testing and commissioning of bulk storage HSD tank complete with piping, valves, mounting accessories etc. in conformity with IS: 10987, IS: 823, IS: 1239, Petroleum Rule 1976 and Rules Laid down by the Chief Inspector of Explosives. All circumferential and vertical welds shall be of full penetration, full fusion butt welds. Radiography, if required as per code, will be arranged by the Contractor at his own cost. Weld areas to be radiographed will be designated by engineer-in-charge.

3.1.1 Construction

The Bulk Fuel Storage Tanks shall be suitable for storing HSD. The tanks shall conform to IS 10987 - 1992 and shall be suitable for underground installation. Tanks shall have dished ends and shall be fabricated from 6 mm thick boiler quality plates conforming to IS 2002 - 1982. Tanks shall be designed for a pressure of 0.05 MPa when full of water. Tanks shall be fabricated by welding. Welding procedure and qualification of welders shall be as specified in IS 9595-1980 and IS 817-1966. Cylindrical shell be of full penetration butt belt welded construction End plates shall be attached to the shell by double fillet welds.

The Diesel storage tank shall be constructed of 6 mm thick mild steel sheets for cylinder and 8 mm thick sheet for dished ends The tank shape shall be horizontal cylindrical. The dish ends shall be made of 8 mm thick MS sheet. The tank shall be protected against corrosion by way of anti corrosive coating or cathode protection as directed by the Chief Controller of Explosives, Nagpur

All tanks shall be provided with vent pipes leading into the open air. The open end of the vent pipe shall be covered with two layers of non-corrodible metal wire gauze of not less than 11 meshes per centimeter and with a hood.

The tank shall be provided with an air space of not less than 5 % of the total capacity of the tank.

The tanks shall be supported on well-designed saddle foundation. A bund wall shall be constructed around the tank. The wall height shall be not less than 1200 mm height.

The tank height shall be such that the free flow by gravity shall be ensured to day tanks.

Tank Anchorage: Tanks to be installed underground shall be anchored to resist the buoyancy force induced by high water tables that may occur seasonally. The anchorage could be either provided by means of steel flats of round bars having adequate cross section to resist the uplift at 29 stus level of 140 mp. The anchor should be embedded in RCC draft having necessary dead weight bonding and shear strength to resist the up refer force.

The construction of the tank shall be in conformity with relevant code of Practice and bureau of Indian Standards.

3.1.2 Accessories

The tanks shall be provided with all standard accessories, nozzles and appurtenances as indicated below.

- a. Lifting lugs - 2 nos per tank

- b. Earthing bosses - 2 nos per tank
- c. 600 mm dia manhole with hinged, gasketed, lockable cover and provided with a removable access ladder to go into the tank
- d. 80 mm NB fill pipe running down to within 100 mm of the tank bottom and with end chamfered at 45 Deg.
- e. Suction connection suitable for 50 mm NB suction pipe
- f. Dip connection with brass screwed cover and fitted with internal perforated pipe running down to within 100 mm of the tank bottom. A calibrated 12 mm square brass dip rod shall be provided.
- g. Properly supported 4 m high vent pipe shall be provided. Open end shall be covered with 2 layers of non rusting metal wire gauge having minimum 11 meshes per linear centimeter. The vent pipe shall be prevented from rain by a suitable hood or by bending it downwards.
- h. Spare appurtenance for 40 mm dia NB pipe suitably closed with solid flange

3.1.3 Shop Testing

The workmanship and finish of fabrication shall be of superior quality and shall be subject to close inspection by manufacturer's inspector and also, if so desired by Owner's Inspector. All welds shall be visually inspected. Tanks shall be subjected to hydraulic test at a pressure of 0.05 Mpa and checked for leaks. All gauges, templates, required for inspection and testing at works shall be provided by supplier.

3.1.4 Shop Painting

All external surfaces of tank shall be protected against corrosion by asphalt doping. Asphalt doping shall be carried out after final testing of the tanks only especially in respect of portions having welded joint. The outer surfaces of the tank, turnbuckle, anchor bolts, manhole cover, nozzles, saddles etc. shall be thoroughly cleaned by scrapping by wired brushes and sand papers to bare metal. All mill scales dirt shall be completely removed. The surface thus prepared shall be treated with two coats of "tankmastic" or equivalent primer, each coat being applied uniformly with a spreading of around 11 to 13 mtrs per liter after the first coat is thoroughly dry. After the application of primer coat, two coats of hot 30 / 40 grade bitumen shall be applied as per manufacturer's recommendation resulting in an overall coating thickness of 3.2 mm. The bitumen shall be heated as required for easy and uniform application. Finished appearance shall be of a rough cast plaster obtained by dabbing.

Internal surface of the tank shall be cleaned to remove all rust and foreign matters like grease, dirt etc. before dispatch.

The tank shall be painted internally and externally with approved quality oil resistant epoxy / bituminous paint over one coat of zinc chromate primer. The external surface of the tank shall be finished with two coat of bituminous-based paint over two coat of anticorrosive paint

3.1.5 Testing

The tank shall be hydraulically tested in conformity with Bureau of Indian Standards and Rule 126 of Petroleum Rule 1976. The water used for testing shall be free of petroleum.

4.0 PUMPS

4.1 Scope

The scope of this section comprises the supply, erection, testing and commissioning of various types of positive displacement pumps of rotary gear type suitable for handling HSD etc. as described in specifications and schedule of quantities. The capacity of pumps shall be in accordance with the requirement of schedule of quantities. All pumps shall have mechanical seal.

4.1.1 Rotary Screw Gear Pump

a) Case & Cover

Shall be made of closed grained cast iron accurately machined, bolted and dowed together.

b) Rotor

Shall consist of pair of gears made from special steel. Pump shall have spur gears or double helical gears as required. All gears shall be precision cut and accurately fitted.

c) Bearing

Shall be made of phosphor bronze and shall be fitted with grease lubricators to minimize wear and tear.

d) Relief valve

‘ADD’ ‘ON’ type pressure relief valve shall be provided to relieve 100% of capacity within 25% to 10% of the set pressure. Relieving shall be fast at higher setting and will be slow at lower setting.

e) Pipe connection

Suction and discharge ends shall be provided with flanges.

f) Drive

Pump shall be directly coupled to electric motor through flexible coupling/lovejoy coupling. The Drive motor shall be of flame proof construction.

g) Efficiency

Pumps shall be selected for higher volumetric efficiency.

h) Pump performance and characteristic curves

The Contractor shall submit pump characteristic curves along with the tender.

5.0 EARTHING

All HSD tanks and pipe line shall be provided with GI earthing and earthed in an efficient manner

6.0 PIPING AND PIPING ACCESSORIES

The pipes shall be class B MS of approved make. All valves and strainers shall be of gunmetal bodies. Gate valve shall be of approved make. Makes of all other components shall got approved by Owners.

The HSD piping shall be carried out with MS C class pipes conforming to IS 1239 and fittings in conformity with IS 226. The fittings shall be welded to the pipes in conformity with relevant Bureau of Indian Standards. All welding shall be carried out by qualified welders and in conformity with code of Practice for metal arc welding of mild steel IS 823. Tee off connections shall be with equal tees or reduced tees. Ferrule welded on main pipe shall also be acceptable. But drilling holes on main piping and tapping are not permissible. All pipe works shall be pressure tested in conformity with Rule 93 of Petroleum Rule 1976. All buried pipes shall be treated for corrosion.

The HSD tanks and piping work shall be earthed in conformity with Rule 127 of Petroleum Rule 1976. The earth station and earth connections shall be carried out in conformity with IS 3043. Threading of all screwed joints shall be as per IS-554. Support locations & type for pipe size 2" NB & above shall be indicated on the general arrangement drawings. For pipe size 1-1/2" & under supports may be installed to suit site conditions.

- 6.1 When a reducing tee of a particular size is not available, a combination of equal/reducing tee with corresponding reducer may be used. This is applicable for all pipes.
- 6.2 For carbon steel black pipes having sizes 1-1/2 NB and under to the extent possible, forged socket/butt welded elbows shall be used. Use of pulled bends with bend radius of 5 times the nominal diameter may be permitted after prior approval from the Engineer.
- 6.3 The entire piping work shall conform to the requirement of following relevant codes and standards.

General Piping Work	ANSI B31.3
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Welding qualification	IS:817-1966
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Code of procedure for metal arc welding of mild steel	IS 823
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The Contractor shall bear the cost of modification, repair, changes replacement etc. due to non-compliance with the standards, codes and this tender or due regard to the instructions given by the Engineer.

The maximum design pressure & temperature together with the fluid in line shall govern the selection of piping materials.

- 6.4 The specification of bought out materials for system included in this tender is given in Technical Specifications. Deviations of materials from given specifications may occur due to specific design conditions. These deviations are permissible if they are equal to or better than the given specifications.

6.5 Dimensions & Tolerances

- 6.5.1 Seamless pipes shall be in accordance with ANSI B 36.10

- 6.5.2 Carbon steel ERW black pipes shall conform to IS 1239.

6.6 Fittings

- 6.6.1 All fittings shall conform to ASTM standards A 234 WPB. Seamless/Welded/A 105 or IS 1875 Cl.2. Threads of all fittings shall conform to IS 1239 G.I. fittings which will have threads as per IS 554. Connections to Equipment's and Machines shall have threads matching the threads on the Equipment.

- 6.6.2 Dimensions of socket welded fitting shall conform to ANSI B 16.11

- 6.6.3 Dimensions of butt-welding fittings shall conform to ANSI B 16.9

6.6.4 Bore of socket welded fittings shall suit O.D of the corresponding pipe.

6.7 Bends, Mitres & Reducers Fabricated From Pipe

6.7.1 For pipe sizes 1-1/2" NB & under, cold pulled bends with a bend radius of 5 times the nominal diameter of pipes may be used.

6.7.2 Pipe bends must be made true to angle & maximum reduction in diameter shall not exceed 3%.

6.7.3 While bending, the pipe shall be tamped and vibrated into place. After bending sand shall be removed & bore of the pipe shall be thoroughly cleaned.

7.0 VALVES AND FITTINGS

Valves used in the work shall be ball type with bronze body. Pot strainers with cast iron body and bronze mesh shall be used. The flow direction shall be clearly marked on the pipe and opening and closing direction on the valves. Non-return valves shall be provided as required. Lift type non-return valves can be provided on horizontal runs of pipes. Strainers shall be used in the piping system. The strainer shall be made of cast iron body with GM or bronze mesh for the fine filtration. Cast iron valves, strainers etc. shall not be used for HSD System.

7.1 Valves

7.1.1 Flange dimensions of carbon steel valves shall conform to ANSI B 16.5

7.1.2 Unless otherwise noted, valves shall conform to the following standards:

Gate valves 2"NB & above (other than C.I.)	IS Standard
Gate valves 1 1/2"NB & under	API/ASA Standard
Gate valves	IS 780
Globe valves (all sizes)	IS 10605
Check valves (other than C.I.)	IS-10989/ASA Standard
Check valves	IS 5312
Cast steel ball valves	IS 1179/API Standard 6D/BS 5351

- | | |
|-----------------------|--|
| Flanges | ASTM A105 or
IS 1875 Cl.2
IS 2062 Fabricated |
| C.S. butterfly valves | IS 13095 |
- 7.1.3 Sizes & types not covered above shall conform to manufacturer standards & specifications & the tendered shall furnish details of such valves along with the order.
- 7.2 Gaskets**
- 7.2.1 Non metallic (CAF) gaskets shall conform to ANSI B 16.21
- 7.3 Bolts & Nuts**
- 7.3.1 Bolting shall conform to IS 1367 unless specified otherwise.
- 7.4 Strainers**
- 7.4.1 The strainers shall be bucket type of C.S. body with stainless steel internals, mesh size for fine filtration of the oil.
- 7.5 Flanges**
- 7.5.1 Dimensions of the flanges shall conform to ANSI B 16.5 Slip on flanges unless otherwise specified.
- 7.5.2 Bore of weld neck flanges shall be to suit bore of the pipe. The thickness of neck shall be to suit the thickness of pipe.
- 7.5.3 Threads for screwed flanges shall conform to IS-1239 standards except G.I. Flanges, which shall have threads as per, IS 554.
- 8.0 PRE-FABRICATION**
- 8.1 The Contractor shall fabricate all pipe work in conformity with the requirements of approved drawings. Wherever specific details of fabrications are not indicated on the drawings or not specified herein, the fabrication & erection work shall be done in accordance with the code ANSI B 31.3.
- 8.2 The Contractor shall be responsible for working to the exact dimensions as per the drawings subject to individual tolerances permissible, where errors or omissions are noted in the drawings it shall be the responsibility of the Contractor to notify the Engineer prior

of fabrication and erection and Contractor shall, if necessary, carry out actual field measurements.

9.0 ALIGNMENT

9.1 The pipes to be joined by welding shall be aligned correctly with the existing tolerances on diameter, wall thickness and out of roundness. The same alignment shall be maintained during the welding.

9.2 For internal misalignment due to difference in wall thickness of the matching components exceeding 1/16", the component with higher wall thickness shall be internally machined/ground, so that the adjoining surface are approximately flush. Dimensional tolerance on fabrication shall be as under: -

- | | | | |
|------|---|---|--|
| i) | Internal Misalignment | : | 1.0 mm (Max.) |
| ii) | External Misalignment | : | 2.0 mm (Max.) |
| iii) | Length | : | 0 to +3.0mm |
| iv) | Inclination of flange face
(i.e. angle between pipe
axis & flange face) | : | +1/20 (but not to exceed
2mm at flange end) |
| v) | Perpendicularity | : | 1 mm in 1000 mm |
| vi) | Horizontally | : | 1 mm in 1000 mm |
| vii) | Misalignment between pipe
Center and flange center | : | + 1.6mm |

9.3 Other Alignment Considerations

9.3.1 The root opening for welded pipes shall not be more than 2.5 mm. A wire spacer of proper diameter may be used for the weld root opening but must be removed after back welding and before applying the root pass.

9.3.2 For pipes with wall thickness 5 mm and above the ends to be butt-welded shall be secured with the aid of temporary weld attachments to maintain perfect alignment. These shall be welded with electrodes suitable for welding the parent metal and shall be detached after the completion of welding without causing any surface irregularities on the pipe. Tack welds for only qualified welders shall do the alignment.

- 9.3.3 Flame cut bevel ends shall be thoroughly ground till the shining metal surface appears. The V grooves thus prepared shall be tack welded with full penetration & shall become part of finished weld.
- 9.3.4 Flange bolt holes shall straddle the normal centerlines unless different orientations are shown in drawing to match equipment connections etc. For flanges in horizontal plane the bolt holes shall straddle the north south axis unless specified otherwise.
- 9.3.5 No butt joints with a distance of 20 times the pipe diameter up-stream & 8 times the pipe diameter downstream of orifice flange will be allowed in straight running pipes. The flange weld inside the orifice flange shall be ground flush.

10.0 CLEANING OF PIPES & TANKS

- 10.1 All pipes and fittings shall be cleaned inside and outside by wire brush, cleaning tools, compressed air etc. before fabrication and also after fabrication to ensure that the assembly is free from all loose foreign materials such as seals, sand, weld spatter, particles, cutting chips etc.
- 10.2 The area around the vessels shall be kept free from readily ignitable materials, such as weeds and long dry grass by providing stone pitching.
- 10.3 On completion of erection and before hydraulic/ pneumatic testing all pipelines shall be flushed with compressed air.
- 10.4 Cleaning requirements for special services if any shall be as specified by the Engineer.

11.0 WELDING

The welding procedure, types of electrodes etc. shall be in accordance with the following IS specifications.

Welding procedure IS 823-1964

Welding Electrodes IS 814-1974

Testing of Welders IS 817-1966

11.1 Welding Procedure and Welder's Qualification

- 11.1.1 The Contractor shall submit to the Engineer the welding procedure is intends to adopt for approval. All the necessary arrangements for the procedure qualification shall be made by the Contractor at his own cost. The Engineer or his representative shall witness the welding procedure qualification test.

- 11.1.2 Only welders approved by the CCOE/Site Engineer and experienced and personnel site staff shall be employed. The Contractor shall submit the welder qualification report before the commencement of the work.

12.0 NO SMOKING

A permanent notice with letters minimum 10cm. High, prohibiting smoking and naked lights shall be fixed to the fence surrounding the area.

13.0 AREA PROTECTION

The area where tanks, pumping equipment, loading and unloading facilities are located shall be well protected by providing 2m high barbed wire fence of approved design and requisite number of foam and chemical type fire extinguishers & sand buckets as per the requirements of Petroleum Rules and CCOE Nagpur.

14.0 ERECTION

- 14.1 For erection of piping, use of davite, welding of temporary supports on adjacent equipment/structure, use of existing facilities etc. shall be allowed only after approval of the Engineer.
- 14.2 All piping shall be routed and located as shown in “Approved for Construction” piping drawings. However in order to suit site conditions, if pipelines are to be rerouted or relocated, the same shall be carried out by the Contractor with the consent/approval of the Engineer.
- 14.3 Location and design of pipe supports shown in the drawings shall be adhered to. However, in order to suit site conditions, if the location of the pipe supports is required to be altered, the same shall be carried out by the Contractor with the consent/approval of the Engineer.
- 14.4 The addition to the pipe supports indicated in the drawings, if required, the Contractor shall have to provide additional supports to suit site conditions as desired/instructed by the Engineer.
- 14.5 Slopes specified for various lines in the drawings or relevant IS standards and as directed by the Engineer shall be maintained by the Contractor. In case the Contractor is unable to maintain the desired slope, he shall check the sagging of the pipeline with a precision spirit level.
- 14.6 In addition to the vents and drain shown in the drawing, the Contractor shall provide any additional vents and drains as required for hydraulic tests and as desired by the Engineer.

15.0 ASSEMBLY

- 15.1 All flanges shall be so fitted that the gasket contact faces bear uniformly on the gasket, and these made out with relatively uniform bolt stress.
- 15.2 All bolts shall extend completely through their nuts. Only bolts of adequate length required diameter and material as per relevant standard should be used.

16.0 INSPECTION

- 16.1 Inspection of welds shall be carried out in accordance with applicable codes. All finish welds shall be visually inspected for parallel and axial alignment of the work, excessive reinforcement, concavity of welds shrinkage, cracks, inadequate penetration, undercuts and other surface defects.
- 16.2 Wherever deemed necessary by the Engineer, the welded joints shall be examined for defects with dye penetrant test.
- 16.3 Defects ascertained through the inspection methods that are not under permissible limits shall be removed from the joint by the process of chipping or grinding. After re-weld the joint shall be checked again.
- 16.4 When the entire joint is unacceptable the weld shall be cut completely and the pipe ends shall be restored. After re-welding the joint shall be checked again.

17.0 TESTING

- 17.1 On completion of fabrication and/erection work, the Contractor shall inform Engineer in writing, which after carrying out through inspection, instruct the Contractor to prepare for pressure testing.
- 17.2 All equipment's, materials consumables and services etc. mentioned below required for carrying out pressure testing of piping shall be provided by the Vendor/Contractor at his own cost.

- Pump set for pressurization
- Hoses for water, air or other test fluid with accessories and adopter flanges.
- Supply, fabrication and erection of temporary piping with valves fittings.
- Pressure gauges and all such instruments with necessary connections.
- Temporary gaskets, supports, soap solution, grease, paints, tools and tackles etc.

- 17.3 Before testing all piping shall be cleaned and flushed with compressed air to make it free from dirt, loose scale, debris and other loose foreign materials. The procedure for Air flushing shall be as under:

The pipeline shall be pressurized by compressed air at the required pressure as directed by the Engineer. Then the pressure will be released by quick opening of valve already in line or installed temporarily for this purpose. This procedure will be repeated as many times as required till inside of the pipe is fully cleaned. Piping shall not be flushed into vessels, equipment's etc. and care shall be taken during flushing so as not to damage/spoil other agencies work.

- 17.4 With the exclusion of instrumentation, entire piping system shall be tested with water at tanks 1.5 times the design pressure. (The design pressure shall be taken as 1.10 times the operating pressure). The pressure shall be maintained for one hour.
- 17.5 In the event of failure of the system or any leakage noticed during testing, Contractor shall speedily replace the defective portion/item and rectify the leakage. On completion of rectification of system shall be again tested in accordance to above stipulations.

18.0 FLUSHING

After testing all pipelines shall be thoroughly flushed with dry compressed air.

19.0 CLEANING & PAINTING

- 19.1 On completion of all the above activities the outer surface of pipes fittings flanges etc. shall be thoroughly cleaned with wire brush to remove any rust, scale oil grease etc., before applying paint.
- 19.2 After cleaning to the entire satisfaction of the Engineer, the entire pipe line including fitting, flanges, valves etc. shall be painted with two coats of protective primer and two coats of final synthetic enamel paint of suitable colour code or specified by Consultant/Owner.

20.0 DRAWINGS

The drawings enclosed with the Tender are indicative type. For the piping installation work the Contractor has to prepare shop installation drawings to suit the actual site conditions and submit to Consultant/Client for approval. The final measurement of the work executed shall be in accordance with these approved shop drawings and site measurements.

The drawings, specifications and bill of quantities shall be considered as a part of this contract. Any work or materials shown on the drawings but not included in the Schedule of Quantities or vice-versa shall be executed as if specifically called for in both without any additional cost. The contract drawings indicate the extent and general arrangement of various equipment's and are essentially diagrammatic. The work shall be installed as

indicated on the drawings, however, any minor change if found essential to co-ordinate the installation of this work with other trades shall be made without any additional cost to the OWNER. The dimensions given herein and on the drawings are as could be secured, but its complete accuracy is not guaranteed. The drawings and specifications are for the assistance and guidance of the Contract, the exact locations, distances and levels will be governed by the site conditions.

21.0 FIRE FIGHTING MEANS

Trolley type foam fire fighting equipment shall be provided in conformity with Petroleum Rule 1976 with its up-to-date amendments. In addition to this, the fire extinguishers as specified in the Scheme approval shall form part of the scope of work.

22.0 WATER SUPPLY & ELECTRICITY

The Contractors shall be responsible for all the arrangements needed to obtain supply of water and electricity necessary for the works at his own cost. The Owner may agree to provide water and electricity supply at one point as mutually agreed and the Contractor subsequently shall arrange for further distribution for his requirements at his own cost. Electricity shall be given by the Owner to Contractor on chargeable basis at the sole discretion of the Owner.

23.0 ELECTRICAL WORKS

- 23.1 The electric work shall be carried out generally in accordance with the Indian Standard Specifications with amendment upto-date while complying in all respects with the requirements of the latest Indian Electricity Rules, Chapter IV of Petroleum Rule 1976.
- 23.2 The Electric work shall be carried out simultaneously with building work and will be continued till it is completed satisfactorily along with the completion of essential portions of building work.
- 23.3 If any minor alterations are found necessary, the Contractor will do the same within the tendered rates.
- 23.4 The workmanship of the work should be free from defects and any defect in the work or changes in the design etc., if pointed out shall be carried out by the Contractor within the tendered rates.
- 23.5 The Contractor shall employ adequate labour to complete the work within the stipulated time and make his own arrangements for housing labour and storage of materials etc. A whole time Electrical Supervisor/Engineer shall be employed by the Contractor who will remain at site of work to receive orders or any other instructions from the Engineer.

- 23.6 Any material supplied by the Client/Contractor/Vendor is damaged in any Way during cartage or execution of work or otherwise shall be made good by the Contractor at his own cost.

23.7 Completion Tests

On completion of electric installation the following tests shall be carried for:

- a) Polarity test of switch
- b) Earth resistance

23.8 Position of Switchers

- a) The recommended position of the switchgear etc. as shown on the layout drawings will be generally adhered to.
- b) Should there be any discrepancy or incomplete description, ambiguity or omission in the drawings and other documents whether original or supplementary, Contractor shall immediately on discovering the same, draw attention of the Engineer.
- c) Prior to the installation, the final position shall be ascertained by the Contractor with the Engineer.
- d) The dimensions and other details of the electrical drawings shall be compared with the civil drawings at site before execution of the work.

23.9 Bus Bars

Bus bars shall be of aluminium and housed in separate bus bar chambers. Bus bars shall be supported on unbreakable nonhygroscopic hylam supports rigidly held to the framework of the chamber. The bus bar shall be suitably insulated. Bus bar chamber shall have a separate screwed cover and the means shall be provided to identify the various phases of the bus bars.

23.10 Cable Compartment

A cable compartment running along the vertical module shall be provided for easy termination of all incoming and outgoing cable entering either from top or bottom. Adequate supports shall be provided for the cables where necessary. The cable compartment shall have its own screwed removable cover for easy access during cabling.

23.11 Cable Entry

Cubicles shall be designed to facilitate aluminium conductors PVC cable entry from top or bottom as the case may be removable sheet steel plates shall be fitted at the top and bottom to drill holes for cables entry at site.

24.0 INSPECTION AND APPROVAL BY OWNER

Soon after the work is completed, the Contractor shall inform the 'Engineer' in writing, who after carrying out through inspection, instruct the Contractor to carry out mechanical and other tests. The Contractor shall carry out all such tests to the entire satisfaction of the Engineer and keep the system ready for commissioning.

25.0 TENDER RATES

All tender rates will include the cost of materials, erection, connections, labour, supervision, tools, plant, transport, all taxes, contingencies, breakage, wastage, sundries, scaffolding, maintenance or installation etc. till the completion of work. The rates include cost of any work incidental to the items mentioned in the SOQ (See also para 1.3 of the next chapter – HSD oil storage & distribution).

26.0 APPROVALS

The Contractor, while executing the work, shall conform to the provision of any Government Act relating to the work and to the regulations and Bye laws of the local authorities and of the company to whose system of supply and the installation is proposed to be connected. The Contractor shall give all notices required by the Acts, Regulations or Bylaws. He will also undertake to provide Test Certificate and drawings as required and will make necessary arrangements to procure electricity supply without any extra charge. The Contractor shall also obtain all approvals for the items of work done under this contract from the appropriate authorities. All inspection fees or submission fees paid by the Contractor will be reimbursed by the Owner against valid official receipts. Contractor shall possess a valid electrical Contractor's license issued by the Inspectorate of the Local Government.

27.0 INSPECTION, APPROVAL AND OBTAINING LICENSE TO STORE HSD

The contractor shall prepare necessary shop drawings and documentation for the scheme and submit the same to the Chief Inspectorate of Explosives Nagpur and liaise with them for the preliminary and final inspection. Carry out necessary changes if any, and get the system re-inspected and obtain Approval and License to store HSD by CCOE, Nagpur & SICCL. The license shall be handed over to the client for their record.

Deposits if any shall be paid by the supplier and the same shall be reimbursed to them by the client on production of original cash receipt.

28.0 SAMPLES

Samples of materials and fabrication drawings will be submitted by the Contractor according to the schedule/ specification. Any deviation from the schedule/ specification will have the written consent of the Engineer. However approval given by the Engineer will not in any way exonerate the Contractor from his liability to carry out the work in connection with the terms of contract.

29.0 COMMISSIONING OF THE SYSTEM

On completion of inspection and testing to the entire satisfaction of the Engineer, the Engineer may instruct commissioning of each utility system with actual services to be handles. The entire system shall be operated continuously for 72 hours and as directed by the Engineer. Any defect noticed during the operation of the system is interrupted due to any reasons, the Contractor shall speedily make necessary adjustments, modification to the system etc. and again run the system continuously for 72 hours to the entire satisfaction of the Engineer.

29.1 Completion Certificate

29.1.1 Application for Completion Certificate

When the Contractor fulfills his obligation for taking over, he shall be eligible to apply for Completion Certificate. The Engineer shall normally issue to the Contractor the Completion Certificate within one month after receiving an application from the Contractor after verifying from completion documents and satisfying himself that the work has been completed in accordance with and as set out in the construction and erection drawings and the Contract Documents.

The Contractor after obtaining the Completion Certificate is eligible to present the final bill for the work executed by him under the terms of contract.

29.1.2 Completion Certificate Documents

The following documents shall form the completion documents:

- i) 6 Sets of the technical documents and descriptions according to which the work was carried out.
- ii) Six (6) sets of construction as-built drawings with 2 sets of reproduction drawings showing therein the modification and corrections made during the course of execution and signed by the Engineer.
- iii) Certificate of tests performed for various works. Material and inspection test certificates for supply items like pipes, fittings, valves etc.
- iv) Material appropriation statement for the materials issued by the client for the works and list of surplus materials returned to the client's store duly supported by necessary documents.
- v) Manufacturer's guarantee/warranties for the equipment's supplied, drawings etc. (4 copies).

30.0 STORAGE OF MATERIALS

- 30.1 The Contractor shall at his own expense provide suitable sheds and storage yards in such places and in such numbers as in the opinion of the Engineer are needed for orderly and proper storage of materials either supplied by the Company or as brought by the Contractor for the Works. He shall obtain approval in writing from the Engineer for the erection of such sheds and storage yards before undertaking construction thereof. Storage and safe custody of materials shall be the responsibility of the Contractor.

31.0 WORK AND WORKMANSHIP

- 31.1 The work to be done under the Contract or that may be necessary to be done in order to form and complete any part thereof shall be executed in the best and most substantial workmanlike manner, with material of the best and most approved quality of their respective kinds, and both the work and the materials should conform to the particulars contained in or implied by the specifications and as referred to in and represented by the drawings or in such other additional particulars, instructions and documents as may be found requisite to be given during the execution of the works and to the entire satisfaction of the Engineer according to the instructions and directions which the Contractor may from time to time receive from the Engineer. The materials may be subjected to tests by means of such machines, instruments and appliances as the Engineer may direct and such tests shall be carried out by the Contractor wholly at his expenses. The work shall be executed by good well-experienced and skilled staff. The Contractor if required shall produce requisite evidence regarding qualification, experience data of his Engineer and other staff

etc. The Contractor welders shall be subject to welding qualification tests before Site Engineer.

32.0 MEASUREMENT OF WORK

- 32.1 Payment will be made based on actual measurement of work completed as per BOQ; as per relevant IS standard on linear measurement.
- 32.2 Measurement of pipelines shall be based on the execution drawings. Pipelines shall be measured along with centre lines of pipes, curvilinear centre lines bends and elbows, centre lines of flanges and other fittings, such as tees, bends, etc. All in lines instruments and fittings (when paid for separately) shall be excluded from the measurement. Branch connections shall be measured from the outer surface of the header.
- 32.3 Fabrication of spool pieces for temporary use to aid Contractor's work such as fabrication. Erection, flushing and testing piping shall be done by him, from the pipes and plates procured by him, free of cost as part of piping work and no separate payment shall be made for this.

33.0 GUARANTEE

- 33.1 The Contractor shall guarantee that all the materials, machinery and components, supplied, fabricated, and installed by him shall be free from defects due to faulty supply of inferior material and/or workmanship.
- 33.2 The period of guarantee shall be 12 months from the date the completion certificate is issued, during which period any or all components found to be defective shall be replaced or repaired free of charge and any short coming found in the system shall be removed at no extra cost including supply the necessary personnel and tools for fulfilling the guarantee.
- 33.3 If the defects are not removed within a reasonable time, the client may arrange for rectification at Contractor's risk, and cost, without prejudice to any other rights.

34.0 DAMAGE TO OTHER WORKS

The Contractor shall take all possible care not to disturb the features of the building, as the construction work is complete. Any damage i.e. breaking of walls, floor and damage to painting surface etc. done by the supplier, the same shall be made good at his own cost and risk.

35.0 AS FITTED DRAWING AND DOCUMENTATION

The Contractor shall prepare as fitted drawing and documentation and hand over 3 sets of hard copy and one soft copy in CD for Client's record.

PART - II
CHAPTER - IV
TECHNICAL SPECIFICATION OF CIVIL WORKS

GENERAL TECHNICAL SPECIFICATION

All works shall be executed as per latest CPWD's specification as amended up to date, BIS Codes amended up to date and other relevant codes as per directions of Engineer in charge.

In terms of work for which CPWD specifications are not available, execution of work shall be carried out in accordance with standard practices and/or Manufacturer's catalogue and as per direction of Engineer in charge. Before execution of such items, Contractor has to submit his methodology of execution & Manufacturer's catalogues for approval to Engineer in charge. Decision of Engineer in charge in this regard shall be final & binding on the contractor.

PART - II
CHAPTER - V
LIST OF APPROVED MAKES

LIST OF APPROVED MAKES (ELECTRICAL)

SN	Details of Equipment/Material	Manufacturers Name
1.0	33 kV Equipments	
	Note : The VCBs and protection relays should be of same make.	
(i)	Oil immersed Transformer 33 kV with OLTC	Siemens, Schneider, Transformers & Rectifiers, CGL, Andrew Yule
(ii)	33 kV Vacuum Circuit breakers and 33 kV Switchgear Panels (OEM factory built panels only)	Siemens, ABB, Schneider
(iii)	33 kV Potential Transformers	Pragati, ECS, Vishal, Kappa
(iv)	33 kV Cast resin Current Transformers	Pragati, ECS, Vishal, Kappa
(v)	Protection Relay for 33 KV VCB Panel	Siemens, ABB, Schneider
(vi)	33 kV pallet type lightning accessories	WSI, Raychem, Ariva/Alstom
(vii)	33kV insulator Polymer	Jay shree, Raychem, Rashtriya
(viii)	33kV XLPE cables	KEI, Havells, Finolex, RPG, Polycab
(ix)	33 kV Cable joints (Heat shrinkable)	Raychem, Birla-3M
(x)	33 kV Jointing Kits	Raychem, Birla-3M
2.0	LT Equipments:	
(i)	415 volt Air Circuit Breakers - Incomer & Bus Coupler	Siemens-3WL, Schneider MTZ, ABB (E-MAX2)
(ii)	- Outgoings	Siemens-3WL, Schneider MTZ, ABB (E-MAX2)
(iii)	Protective Relays (Microprocessor) for L.T. Panel	Siemens, ABB, Schneider
(iv)	LT Switchboards (TTA of OEM of ACB)	Ambit Switchgear Ltd, Tricolite Electrical, Vidyut Controls, Neptune, Advance Panels or any other agency authorised by OEM of ACB

(v)	Bus Ducts	ABB, Schneider, Legrand
(vi)	MV Contactors, Timers (Solid stat)	Siemens, ABB, Schneider
(vii)	HRC Fuses	Siemens, ABB, Schneider
(viii)	Moulded Case Circuit Breakers (with rotary handle) (variable settings)	Siemens-3VA, ABB (T-Max), Schneider Electric (NSX)
(ix)	APFC Panel	Siemens, ABB, Schneider Electric
(x)	Capacitors	Siemens, ABB, Schneider Electric
(xi)	Measuring Meters (Digital)	Automatic Electric, Siemens, Enercon, Schneider
(xii)	Trivector meter	Secure, Enercon
(xiii)	Energy analyzer meter/MFM	Siemens (PAC), Schneider (PM), ABB
(xiv)	MCB/MCB- DB/RCCB	Siemens-Betagaurd, ABB-ITUS, Schneider (Acti 9),
(xv)	Selector Switches	Kaycee, Salzer, Siemens
(xvi)	Indication lamps (LED type) and Push Buttons	ABB, Siemens, Schneider
(xvii)	Earthing system	JMV, ERICO, Shubhra
(xviii)	1100 volts grade PVC/XLPE cables	KEI, Havells, Finolex, RPG, Polycab
(xix)	1100 volts grade PVC control cables	KEI, Havells, Finolex, RPG, Polycab
(xx)	Cable lugs/Ferrules	Dowells, Commet, Hansel
(xxi)	Cable compression glands	Dowells, Commet, Hansel
(xxii)	Cable tray	Ricco, Indiana, Pilco, MEM, OBO, Profab
(xxiii)	Fire extinguishers	Zenith, Minimax, Newage
(xiv)	Automatic Battery Charger	Kaldyne, Amararaja, MMax Power
(xxv)	Dry Battery	Exide, Amararaja, Panasonic
(xxvi)	G I pipes	GST, Jindal, Prakash (All ISI Marked)
(xxvii)	MS pipes	Tata, Jindal, Prakash (All ISI Marked)
(xxviii)	DWC- HDPE PIPE	REX, Dura Line, Pioneer

3.0	External/Internal Lighting:	
(i)	LED Type Internal Light Fixtures (Linear, Recessed, Downlighter, etc.)	Signify, LT, Regent, Osram, Bajaj, CG, Halonix
(ii)	External, Outdoor Landscape	Signify (CK), LT, Regent, Osram, Bajaj, CG, Halonix
(iii)	BLDC Fans	Havells, Atomberg, Halonix, Bajaj
(iv)	Exhaust Fans	Halonix, CG, Bajaj, Usha, Havells
(v)	Modular switches, socket outlets and wiring accessories with moulded cover plate	ABB(Ivie), Schneider(Zencelo), Legrand (Arteor), MK Honeywell (Blenze plus)
(vi)	Decorative Street Light Poles	Luster, Kasper, K-Lite
(vii)	FRLS Wires	KEI, Finolex, Havells, RR
(viii)	High Mast	Valmont, Bajaj, K-Lite
(ix)	MS black enameled, Galvanized ERW conduits	AKG, BEC, Steelkraft
(x)	MS Conduit accessories	AKG, BEC, Steelkraft
(xi)	PVC Conduit	Precision, BEC, AKG
(xii)	PVC Conduit Accessories	Precision, BEC, AKG
(xiii)	MCB Distribution Boards in sheet steel housing (double door)	Siemens-Betagard, ABB-ITUS, Legrand-Ekinox3, Schneider-Acti9
(xiv)	Miniature Circuit Breaker	Siemens-Betagard, ABB-SB series, Schneider-Acti9, Legrand- DX3
4.0	DG Set	
(i)	1100 volts grade PVC/XLPE cables	KEI, Havells, Finolex, RPG (IS marked)
(ii)	1100 volts grade PVC control cables	KEI, Havells, Finolex, RPG
(iii)	Cable lugs	Dowells, Commet, Hansel

(iv)	Cable compression glands	Dowells, Commet, Hansel
(v)	Cast resin Current Transformers	Pragati, ECS, Savior, Nortex, Avcon
(vi)	Measuring Meters (Digital)	Automatic Electric, Siemens, Enercon, Schneider
(vii)	DB/MCB	Legrand(Ekinox), Hager, Schneider(Acti9)
(viii)	Push Buttons	L&T, Siemens, Vaishno, Schneider
(ix)	Selector Switches	Kaycee, L&T, Salzer, Siemens, Schneider
(x)	Indication lamps (LED type)	L&T, Siemens, Vaishno, Schneider
(xi)	Chemical Earthing	JMV, ERICO, Shubhra
(xii)	Diesel Engine	Cummins, Cater Pillar, Perkins
(xiii)	Alternator	Stamford, Lerroy Somer
(xiv)	Pumps with Electric Motor	Kirloskar, KSB, Grundfos
(xv)	Mineral Wool (Compressed Type)	Lloyd, Minwool, Rock Wool
(xvi)	Aluminium Sheet	Indalco, Hindalco
(xvii)	Fuel Line (ERW As Per Is:1239	Tata, Jindal
(xviii)	MS Steel (Angle, Channel, Strip Sheet)	Tata, Sail, Jindal
(xix)	Anti-Vibration Pads	Gerb, Dunlop, Cummins
(xx)	Pressure Gauges	Febig, H.Guru, Zepson
(xxi)	Magnetic Level Controller (Float Type)	Nand Shyam, V-Automat
(xxii)	Diesel Flow Meter	Kent, Aqua Metro
(xxiii)	Rust Preventing Polymeric Tape & Primer for Buried Piping	Pypecot, Loatax, IWL
(xiv)	Battery Charger	Chhabi, Amaraja, BCH, Max Power
(xxv)	Batteries	Exide, AMCO, Amaraja

(xxvi)	Aluminium Grills	Garry Aire, Ruvi Star
(xxvii)	D.G. Set Enclosure	M/S Jakson Engineers P. Ltd. M/S Sudhir Engineer M/S Caterpillar M/S Sterling & Wilson
(xxviii)	G.I. Sheet	Jindal, Tata, SAIL
5.0	HSD Tank & Piping:	
(i)	Pumps with motors	CRI, KSB, Grundfos
(ii)	MS/GI pipes	Tata, Jindal
(iii)	Butterfly valves/Balancing valves	Audco, Advance, Sant
(iv)	Gate/Check valves	Audco, Advance, Sant
(v)	Strainers for water line	Sant, Venus, Rapid cool, Emerald
(vi)	Pressure/Temperature gauges	Fiebig, Guru, Zepson
(vii)	Insulation	Lloyd, Minwool, Rock wool
(viii)	Current transformer (Epoxy)	Gilbert Maxwell, Kappa, Precise, Advance
(ix)	Motor Circuit Breakers	Siemens, ABB, Schneider
(x)	Blower strainer	L&T, ABB
(xi)	Single phase preventer (current-base)	Siemens, Minilec, Schneider
(xii)	Rubber mats	Syntax
(xiii)	Rotary Gear Pump	Rotodel, Delta
(xiv)	Bulk Oil Tank	Rapid cool, Indo Asiatic- Engineering Pvt. Ltd., Raunak Industries, Hudro- them- Engineering Services, Swastic –Fabricator & engineers, S.K. Engineering & company
(xv)	Flame Proof Motors	ABB, KEC, Higen, Royal Electric
(xvi)	Red Oxide Primer Paint for Tank (Tank	Shalimar, Tar Products

	Mastic)	
(xvii)	Rust preventing polymeric tape and primer for buried piping	PYPECOT, LOATAX, IWL
(xviii)	Flow meter (Diesel)	Kent, Aqua Metro
(xix)	Bucket/Y strainers (Diesel)	Stainwell, Ameraled, Rapid cool, Aqua Metro
(xx)	Adapter	Kayess
(xxi)	Ball Valves for Diesel	Audco, Advance
(xxii)	Air preventor	Aqua metro
(xxiii)	Ball valve/Gate valve (upto 50mm)	Sant, Leader, Zoloto
(xiv)	Fire extinguisher	Zenith, Minimax, Newage
(xxv)	Stainless steel bellows	Kanwal, Alfa Flexi
(xxvi)	Flexible coupling with SS guard	Kanwal, Resistoflex
(xxvii)	Flame proof level switch	Veksler, Minilec

LIST OF APPROVED MAKES (CIVIL)

SN	Details of Equipment/Material	Manufacturers Name
1	AAC Block	Siporex, Ecolite, Ashtech, Clavecon
2	AAC Block Adhesive	Ferrous crete (<i>Ferro-1188</i>), ARDEX ENDURA (<i>White Star</i>)., Ultratech (<i>Fixed-Block</i>)
3	Acrylic Distemper, Emulsion, Synthetic Enamel Paint and Primer	Asian Paints, ICI Dulux, Berger, Nerolac
4	Epoxy Adhesive	FOSROC, Aquomix, Choksey, BAL-ENDURA
5	Aluminum Sections	Jindal, Hindalco, Indalco
6	Annealed Float Glass	Saint Gobain, Modi Guard, Asahi
7	Ceramic Tiles	Kajaria, Nitco, Orient Bell, Johnson
8	Chequered / Tactile Tiles	Dura, Unistone, Eurocon, Modern
9	CP fittings	Jaquar, Parryware, Grohe, Kohler, Hindware, Roca
10	CPVC Pipes & Fittings (<i>For Hot & Cold</i>)	Astral Flowguard, Ashirvad, Prince, Supreme, Finolex, VECTUS
11	Curtain Carrier / Drapery Rod	Marvel, Vista levlor, Johnson.
12	Hydraulic Door closer, Floor springs	Dorma, Hardwyn, Hettich, Hafele
13	Float Glass Mirror	Modi Float, Saint Gobain, Asahi
14	Flush Doors (<i>ISI Mark only</i>)	Century, Kitlam, Archid, A-1 Teak Products – Indore, Greenply
15	Galvanized/Stainless Steel Anchor Fasteners	Shakti, Arrow, Hilti, Fischer
16	GI Pipe & fittings	Tata, Zenith, Jindal, Prakash Surya, Swastik
17	Jet Assembly for EWC/Health Faucet	Parryware, Jaquar, Grohe, Kohler
18	Locks / Latch	Godrej, Harrision, Plaza, Dorma, Yale
19	Marine Plywood / BWP Ply	Duro, Century, Greenlam
20	Melamine Polish	Asian Paints, Pidilite, ICI Dulux, Berger

21	Plywood,	Greenply, Century, Duro
22	POP (<i>Plaster of paris</i>)	JK, Laxmi, Sriram Nirman, Sakarni
23	PVC Cistern	Steelbird, Jindal, Seabird, Prayag
24	PVC Connection Pipe	Supreme, Prince, Finolex
25	Ready Mix Concrete (<i>RMC</i>)	Lafarge, Alchon, ACC, L&T, Grasim, Ultratech
26	PVC Shutter	Rajshri, Sintex, Polygreen
27	PVC Water storage Tank (<i>Only ISI</i>)	VECTUS, Water well, Plasto, Polycon, Sintex
28	Stainless Steel	Jindal, Salem or equivalent
29	Towel Ring/Towel Rod/Towel Rack	Jaquar, Grohe, Kohler
30	UPVC Pipes & Fittings	Astral Flowguard, Ashirvad, Prince, Supreme, Finolex, VECTUS
31	Vitreous China Sanitary ware, Fittings & Fixtures	Hindware, Parryware, Jaquar, Somany, Roca, Cera
32	Vitrified Tile	Johnson -Marbonite, Kajaria, Orient Bell, NITCO
33	Wall Putty	JK, BIRLA, Ferrouscrete
34	Waste Pipe	Kamal, Viking, Jaquar
35	Water Proofing Compound (<i>Liquid</i>)	Pidilite, Cico, Impermo
36	White Cement	JK White, Birla White, Grasim
37	Gypsum Plaster	Ferrous crete, Gyproc saint Gobain, Ultratech
38	Industrial Flooring	Flowcrete, BASF or equivalent
39	Aluminium Rolling Shutter	Rama Rolling, Vijay Rolling

Notes:-

- i) Contractor shall use the material of approved make as indicated above unless specified otherwise in BOQ or as approved by the Engineer In-charge.
- ii) The Contractor shall ensure the correct selection of the approved Make meeting the specification and application duties. Before placing order for procurement, the sample of the approved Make shall be got verified for its suitability to the specification and application duty. However, in case Engineer In-charges, whose decision will be final and binding, considers that the Make/Model proposed by the Contractor does not meet the requirement, the contractor will be required to propose an alternative Make from the Approved Makes acceptable to the Engineer In-charge.
- iii) The Contractor shall quote the rates for material and equipment as per the list of approved Makes. In case of non-availability of the brand/make specified in the approved make list, the

Signature of Tenderer

contractor can propose alternate equivalent make after ensuring that what he proposes atleast meets both the quality and safety standard of the stipulated Makes and specifications as stated in the Technical Specification. He shall also stand full guarantee to his alternate proposal. The alternate Makes can be used only after an approval accorded by Engineer In-charge, whose decision will be final in the matter.

- iv) The contractor shall produce Manufacturer Test Certificates (MTC) and Warranty Certificates/Invoices for material/equipment supplied for verification.
- v) At the time of supply of item, the Contractor shall also furnish the OEM certificate for supplying maintenance spares, associated parts and any other support required for the period of codal life of the equipment.

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